DEPARTMENT OF CIVIL ENGINEERING

B.Tech. in CIVIL ENGINEERING
(BTC-CIE)

CURRICULUM AND SYLLABI
(2023)
GENERAL INFORMATION

ABBREVIATIONS USED IN THE CURRICULUM

Cat - Category
L - Lecture
T - Tutorial
P - Practical
Cr - Credits
ENGG - Engineering Sciences (including General, Core and Electives)
HUM - Humanities (including Languages and others)
SCI - Basic Sciences (including Mathematics)
PRJ - Project Work (including Seminars)
AES - Aerospace Engineering
AIE - Computer Science and Engineering - Artificial Intelligence
BIO - Biology
CCE - Computer and Communication Engineering
CHE - Chemical Engineering
CHY - Chemistry
CSE - Computer Science and Engineering
CIE - Civil Engineering
CUL - Cultural Education
EAC - Electronics and Computer Engineering
ECE - Electronics and Communication Engineering
EEE - Electrical and Electronics Engineering
ELC - Electrical and Computer Engineering
HUM - Humanities
MAT - Mathematics
MEE - Mechanical Engineering
PHY - Physics

Course Outcome (CO) – Statements that describe what students are expected to know, and are able to do at the end of each course. These relate to the skills, knowledge and behaviour that students acquire in their progress through the course.

Program Outcomes (POs) – Program Outcomes are statements that describe what students are expected to know and be able to do upon graduating from the Program. These relate to the skills, knowledge, attitude and behaviour that students acquire through the program. NBA has defined the Program Outcomes for each discipline.

PROGRAM OUTCOMES FOR ENGINEERING

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

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

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

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

10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

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

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

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**Program Educational Objectives**

- Achieve excellence in Civil engineering skills to engage in diverse career choices
- Develop an attitude of lifelong learning through research, multidisciplinary studies and professional organizations
- Demonstrate the ability to function in a team environment along with leadership, communication and management skills.
- Exhibit sensitivity in serving society as ethical and responsible professionals.

**Program Specific Outcomes**

- Apply the acquired engineering knowledge related to structures/ geotechnics/ transportation/ water & environment to address real-world problems.
- Implement innovative ideas in design and development using computational and simulation tools
- Apply concepts of design, construction, and management to ensure a sustainable and resilient infrastructure for the future
### CURRICULUM

#### SEMESTER I

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**TOTAL CREDITS**

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### Verticals

**Construction Engineering and Management**

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### Curriculum Structure - Vertical

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| Semester 6 | 2 Electives | 1. Concrete Technology (Vertical core)  
2. Sustainable Construction – Materials & Methods (Vertical core) |
| Semester 7 | 3 Electives | 1. Architectural Science  
2. Formwork Engineering & Practices (or) Construction Equipment and Techniques  
3. Construction Economics and Finances (or) Quality Control and Safety Management in Construction |
| Semester 8 | 1 Elective | 1. BIM for Construction Management (Project oriented course) |
Sustainability - Vertical

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Curriculum Structure - Vertical

| Semester 6 |   | 2 Electives | 1. Introduction to Sustainability (Compulsory) | 2. Sustainable Material Management (Compulsory) |
| Semester 7 |   | 3 Electives | 1. Functional Efficiency in Buildings (Compulsory) | 2. Water Conservation and Sustainability (Elective) | 3. Sustainable Environmental Management (Compulsory) | 4. Sustainable Transportation (Elective) | 5. Socio-Economic Sustainability (Elective) |
| Semester 8 |   | 1 Elective  | 1. Capstone Project on Sustainable Practices (Compulsory) |

*Professional Elective - Electives categorised under Engineering, Science, Mathematics, Live-in-Labs, and NPTEL Courses. Student can opt for such electives across departments/campuses. Students with CGPA of 7.0 and above can opt for a maximum of 2NPTEL courses with the credits not exceeding 8.

** Free Electives - This will include courses offered by Faculty of Humanities and Social Sciences/ Faculty Arts, Commerce and Media / Faculty of Management/Amrita Darshanam -International Centre for Spiritual Studies).

*** Live-in-Labs - Students undertaking and registering for a Live-in-Lab project, can be exempted from registering for an Elective course in the higher semester.
### PROFESSIONAL ELECTIVE COURSES (with Pre requisite)

#### Structural Engineering

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<td>Finite Element Methods</td>
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### Professional Elective Courses (without Pre Requisite / Open to all)

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### List of courses in Amrita Value Programme I & II

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# Professional Electives Under Science Stream

## Chemistry

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## Free Electives

### Free Electives Offered Under Management Stream

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#### THEORY COURSES

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Course Objectives:
- Learn the fundamentals of mechanics of writing
- Acquire the ability to draft formal correspondence and various technical documents
- Develop abilities in critical thinking and analysis
- Acquire skills of scanning for specific information, comprehension, and organization of ideas
- Enhance competency in technical presentation skills

Course Outcomes: The course will enable the student:

CO1 Apply the mechanics of writing in formal correspondence
CO2 Write technical documents with appropriate form and content
CO3 Organize technical information or ideas in a logical and coherent manner
CO4 Compose grammatically and stylistically accurate project reports/term papers
CO5 Make effective technical presentations

CO-PO Mapping

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Unit 1
Error Analysis
Mechanics of Writing: Grammar rules -articles, tenses, auxiliary verbs (primary & modal) prepositions, subject-verb agreement, pronoun-antecedent agreement, discourse markers and sentence linkers, impersonal passive, modifiers, phrasal verbs
General Reading and Listening comprehension - rearrangement & organization of sentences

Unit 2
Different kinds of written documents: Definitions- Descriptions- Instructions-Recommendations- User manuals - Reports – Proposals
Formal Correspondence: Writing Formal Letters/Emails
Punctuation
Scientific Reading & Listening Comprehension

Unit 3
Technical paper writing: Documentation style - Document editing – Proof reading - Organizing and Formatting
Tone and style
Graphical representation
Reading and listening comprehension of technical documents
Mini Technical project / Term paper (10 -12 pages)
Technical presentations
References
Course Objectives:
The following are the objectives of this course:
- Introduce the concepts of shifting and scaling of functions, their continuity, one- and two-sided limits, differentiability, and their applications.
- Introduce tangents, normals, binormals, curvatures, minima and maxima of functions of single variables, and their applications.
- Introduce derivatives of functions of multiple variables and concepts of partial differentiation.
- Provide a strong foundation on the techniques of integration, evaluation of definite integrals and their engineering applications.

Course Outcomes:
CO1: To understand the concepts of shifting, scaling of functions, limits, continuity, and differentiability.
CO2: To learn definite integral, partial and total derivatives.
CO3: To learn the scalar and vector fields, gradient, divergence and curl of vector fields and their physical interpretations.
CO4: To learn line integral, surface integral and volume integrals. To understand Greens Theorem, Divergence theorem and Stokes theorem.

CO-PO Mapping:

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Graphs: Functions and their Graphs. Shifting and Scaling of Graphs. (5 hrs)
Limit and Continuity: Limit of Functions. Continuous Functions, Discontinuities, Monotonic Functions. (5 hrs)
Graphing: Extreme Values of Functions, Concavity and Curve Sketching. (5 hrs).
Integration: Definite Integrals, The Mean Value Theorem for definite integrals, Fundamental Theorem of Calculus. (5 hrs)
Functions of severable variables: Functions, limit and continuity. Partial differentiations, total derivatives, differentiation of implicit functions and transformation of coordinates by Jacobian. Taylor’s series for two variables. (10 hrs)
Vector Differentiation: Vector and Scalar Functions, Derivatives, Curves, Tangents, Arc Length, Curves in Mechanics, Velocity and Acceleration, Gradient of a Scalar Field, Directional Derivative, Divergence of a Vector Field, Curl of a Vector Field. (10 hrs)
Vector Integration: Line Integral, Line Integrals Independent of Path.
Green’s Theorem in the Plane, Surfaces for Surface Integrals, Surface Integrals, Triple Integrals – Gauss Divergence Theorem, Stoke’s Theorem. (10 hrs)

Text Book

References:
Course Objectives

- This course provides the foundations of computational problem solving.
- The course focuses on principles and methods thereby providing transferable skills to any other domain.
- The course also provides foundation for developing computational perspectives of one’s own discipline.

Course Outcomes

**CO 1:** Apply algorithmic thinking to understand, define and solve problems  
**CO 2:** Design and implement algorithm(s) for a given problem  
**CO 3:** Apply the basic programming constructs for problem solving  
**CO 4:** Understand an algorithm by tracing its computational states, identifying bugs and correcting them

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Syllabus

**Unit 1**  
Problem Solving and Algorithmic Thinking Overview – problem definition, logical reasoning; Algorithm – definition, practical examples, properties, representation, algorithms vs programs.

**Unit 2**  
Algorithmic thinking – Constituents of algorithms – Sequence, Selection and Repetition, input-output; Computation – expressions, logic; algorithms vs programs, Problem Understanding and Analysis – problem definition, input-output, variables, name binding, data organization: lists, arrays etc. algorithms to programs.

**Unit 3**  
Problem solving with algorithms – Searching and Sorting, Evaluating algorithms, modularization, recursion. C for problem solving – Introduction, structure of C programs, data types, data input, output statements, control structures.

Text Book(s)


Reference(s)

Course Objective:
- To expose the essentials of newtonian mechanics, wave optics and elemental quantum mechanics to the engineering students
- To enable them to apply in their engineering applications.

Course Outcomes:
CO1: To apply the principles of newtonian mechanics to engineering problems
CO2: To understand the fundamentals of wave optics and it’s applications in engineering
CO2: To understand the essentials of quantum mechanics and apply it to simple applications

Syllabus


Fundamentals of Wave optics: Theory of superposition -Qualitative: Superposition of two and many Wave trains of the Same Frequency and random phase, Vector addition of amplitudes, Fresnel and Fraunhofer Diffraction - Diffraction by a single and double Slit, intensity variation in single and double slit interference, Effect of increasing the number of Slits(Grating), Intensity distribution from an Ideal grating. Resolving power of grating and grating spectra. Principles of interferometry- Theory of Michelson’s Interferometer and its applications. (15 Lectures)

Quantum mechanics: Wave function, Probability density, expectation values - Schrodinger equation – time dependent and independent, Linearity and superposition, expectation values, operators, Eigen functions and Eigen values. Application of 1D Schrodinger Wave equation: Free particle, Particle in a box, Finite potential well- Essentials of semiconducting materials (15 Lectures)

References:
Course Objective

- To introduce experiments for testing the understanding of physics concepts in the areas of mechanics, optics, solid state and quantum mechanics and electricity and magnetism.
- To make the student to acquire practical skills in finding properties of matter, optical properties, electrical characteristics of semiconductor materials and quantum behavior of materials.

Course Outcomes

CO1: Be able to perform experiment to study elastic properties of materials.
CO2: Be able to design, perform experiments on dispersion, interference and diffraction.
CO3: Be able to design; perform experiments to measure semiconducting properties.
CO4: Perform experiment to study atomic spectrum of $H_2$ atom and quantum nature of light.

CO-PO Mapping

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List of Experiments:

1. Young’s modulus - non-uniform bending. [CO 1]
2. Rigidity modulus – moment of inertia of the disc and rigidity modulus of the wire using torsional oscillation. [CO 1]
3. Spectrometer- dispersive power of the material of prism. [CO 2]
4. Radius of curvature of given convex lens- Newton’s rings method. [CO 2]
5. Laser- wavelength of diode laser and mean size of Lycopodium particles. [CO 2]
6. Band gap of a semiconductor. [CO 3].
7. Solar cell - determining efficiency and fill factor. [CO 3].
8. Photoelectric effect - Planck’s constant and work function of the given metal. [CO 4]
9. Experiment to verify the quantum nature of hydrogen atom by measuring the wavelengths of spectral lines in Balmer series. [CO 4].
Course Objectives

The course is expected to enable the students,
- To develop drawings using Bureau of Indian Standards (BIS).
- To communicate effectively through drawings.
- To enhance visualization skills, which will facilitate the understanding of engineering systems.

Course Outcome

CO1: Understand the engineering drawing standards and their usage.
CO2: To understand and summarise technical documents Interpret engineering drawings.
CO3: Construct and dimension geometric entities and improve coherent visualization skills.
CO4: Understand the concepts of orthographic projections and isometric projection.
CO5: Understand the floorplan section and elevation of simple floor buildings

CO-PO Mapping

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Syllabus

Unit 1
Basic principles of engineering drawing, Standards and conventions, Drawing instruments and their uses, Lettering and types of lines. Concept of scale in drawings, Dimensioning of drawings. Orthographic projections of points, lines

Unit 2
Orthographic projections of planes and solids. Sections of regular solids, Development of lateral surface of regular solids.

Unit 3
Introduction to isometric views and projections, Orthographic projections of isometric drawings. Simple Residential buildings and single storey public buildings such as office and bank with flat and sloped roof – Plan, Section and Elevation

Text Books:

Reference Books:
5. John K.C., “Engineering Graphics for Degree”, 1e, Prentice Hall India,
Course Objective:

- To impart knowledge on the fundamental concepts of Electric circuits, Machines, Electronics Circuits and Measuring Devices.

Course Outcomes:

CO1  Familiarize the basic concepts in electrical magnetic circuits
CO2  Understand the construction and working of various electrical machines and measuring devices
CO3  Illustrate the working of basic electronic circuits and their applications
CO4  Analyze the performance of DC and AC circuits

CO-PO Mapping

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Syllabus

Unit 1

Unit 2

Unit 3
Voltage regulator, BJT- Transistor as a switch, 555 Timers, Operational Amplifiers – Inverting and Non-inverting amplifier – Instrumentation amplifiers.
Measuring devices- introduction to electro-mechanical, digital devices, sensors and actuators

Text Books


Reference Books
Course Objective

- To understand the basics of electrical connections and analyse the performance of electrical machines and electronic circuits.

Course Outcome

CO1: To create basic electrical connections for domestic applications
CO2: To measure the various electrical parameters in the circuit
CO3: To Analyse the performance of electrical machines.
CO4: To Analyse basic electronic circuits.

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LIST OF EXPERIMENTS:

Electrical
1. a) Wiring practices
   b) Study of Electrical protection systems.
2. Verification of circuit theorem
3. Experiment on DC machine
4. Experiment on single phase Transformer
5. Experiment on induction motor
6. V/I characteristics of PN junction and Zener diode
7. Implementation of Half wave and Full wave rectifier using PN junction diode
8. Transistor as a switch
9. Experiment on Thyristor
10. Implementation of inverting and non-inverting amplifier using Op-amp

REFERENCES / MANUALS / SOFTWARE:

Lab Manuals
Course Objectives:

- To introduce students to the depths and richness of the Indian heritage and knowledge traditions, and to enable them to obtain a synoptic view of the grandiose achievements of India in diverse fields.
- To equip students with a knowledge of their country and its eternal values.

Course Outcomes

CO1 Increase student understanding of true essence of India’s cultural and spiritual heritage. Emancipating Indian histories and practices from manipulation, misunderstandings, and other ideological baggage thus, shows its contemporary relevance.

CO2 Understand the ethical and political strategic concepts to induce critical approach to various theories about India.

CO3 Familiarize students with the multidimension of man’s interaction with nature, fellow beings and society in general.

CO4 Appreciate the socio-political and strategic innovations based on Indian knowledge systems. Gives an understanding of bringing Indian teaching into practical life

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Syllabus:

Unit 1
Chapters 1–4
Educational Heritage of Ancient India
Life and Happiness
Impact of Colonialism and Decolonization
A timeline of Early Indian Subcontinent

Unit 2
Chapters 5–8
Pinnacle of Selflessness and ultimate freedom
Indian approach towards life
Circle of Life
Ocean of love; Indian Mahatmas.

Unit 3
Chapters 9–12
Man's association with Nature
Celebrating life 24/7.
Metaphors and Tropes
Become A Strategic Thinker (Games / Indic activity)

Unit 4
Chapters 13 -16
India: In the Views of Other Scholars and Travellers
Personality Development Through Yoga.
Hallmark of Indian Traditions: Advaita Vedanta, Theory of oneness
Conversations on Compassion with Amma

Textbook

1. Foundations of Indian Heritage- In-house publication

Reference Book(s)

1. The beautiful tree by Dharampal – Other India Press, Mapusa, 2000
3. India, that is Bharat: Coloniality, Civilisation, Constitution by J Sai Deepak - Bloomsbury India, 2021
4. Awaken Children Dialogues with Mata Amritanandamayi, MAM Publications
5. Man, and Nature by Mata Amritanandamayi Devi , MAM Publications
Course Objectives:
- Understand the basic concepts of vector space, subspace, basis and dimension.
- Familiar the inner product space. Finding the orthogonal vectors using inner product.
- Understand and apply linear transform for various matrix decompositions.

Course Outcomes:
CO1: To understand the basic concepts of vector space, subspace, basis and dimension.
CO2: To understand the basic concepts of inner product space, norm, angle, Orthogonality and projection and implementing the Gram-Schmidt process, to obtain least square solution
CO3: To understand the concept of linear transformations, the relation between matrices and linear transformations, kernel, range and apply it to change the basis and to transform the given matrix to diagonal form.
CO4: To understand the eigen values and eigen vectors and apply to transformation problems.

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Vector Spaces: Vector spaces - Sub spaces - Linear independence - Basis – Dimension. (10 hrs)

Inner Product Spaces: Inner products - Orthogonality - Orthogonal basis - Gram Schmidt Process - Change of basis - Orthogonal complements - Projection on subspace - Least Square Principle. QR- Decomposition. (10 hrs)

Linear Transformations: Linear transformation - Relation between matrices and linear transformations - Kernel and range of a linear transformation - Change of basis. Symmetric and Skew Symmetric Matrices, Adjoint and Hermitian Adjoint of a Matrix. (10 hrs)


Text Book:

References:
5. Mike Cohen, Practical Linear Algebra for Data Science, Oreilly Publisher, 2022.
Course Objective:
- The objective of the course is to impart knowledge on the concepts of chemistry involved in the application of engineering materials that are used in the industry/day-to-day life.

Course Outcomes

CO1: Characterize the solids using X-ray diffraction technique and analyse the materials using computational tools.
CO2: Apply the fundamental principles of electrochemistry to illustrate the functioning of electrochemical energy systems.
CO3: Apply the knowledge of chemistry to predict the type of corrosion in engineering materials and suggest suitable prevention methods.

CO-PO Mapping

Syllabus

Solid state
Crystalline and amorphous solids, isotropy and anisotropy, - Miller indices, space lattice and unit cell, Bravais lattices, the seven crystal systems and their Bravais lattices, X-ray diffraction - Bragg’s equation and experimental methods (powder method and rotating crystal technique), types of crystals - molecular, covalent, metallic and ionic crystals - close packing of spheres – hexagonal, cubic and body centred cubic packing, elements of symmetry in crystal systems, defects in crystals – stoichiometric, non-stoichiometric, extrinsic and intrinsic defects. Vesta – for visualization of crystal structures.

Electrochemical energy system
Faradays laws, origin of potential, electrochemical series, reference electrodes, Nernst equation, introduction to batteries - classification - primary, secondary and reserve (thermal) batteries. Characteristics - cell potential, current, capacity and storage density, energy efficiency. Construction, working and application of Leclanche cell-Duracell, Li-MnO₂ cell, lead acid batteries. Ni-Cd battery, Lithium ion batteries. Fuel cell - construction and working of PEMFC.

Corrosion control and metal finishing

References:

Course Objectives:

- Using instrumental techniques to analyze the ions present in water.
- To understand the kinetics of chemical reactions and adsorption principles.
- To determine the rate of corrosion and its control.
- To synthesis nanoparticles and determine the surface charge of oxide particles.
- To estimate the amount of given substances using electrochemical methods.

Course Outcomes:

CO1 Analyze the ions present in the given sample water
CO2 Analyze the adsorption isotherm and determine the rate constant of a reaction
CO3 Apply the solid state chemistry principles for preparing nanoparticles and determining the surface charge on oxides.
CO4 Apply the fundamental principles of electrochemistry for the analysis of given substance and understand the corrosion kinetics

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Chemical Kinetics and surface chemistry – understanding the principle of adsorption, determining the rate constant of a reaction.
Electrochemistry – Evaluating the dissociation constant of acids, estimation of acid and ferrous ion present in water.
Corrosion and control – anodization and Tafel plot
Instrumentation techniques – Estimations of ions in water using flame photometer and UV-Visible spectrophotometer.
Solid state - Determination of point of zero charge of metal oxide.

List of Equipment required for meeting the COs

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<th>S. No.</th>
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<td>UV-Visible spectrophotometer</td>
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<td>1.</td>
<td>Adsorption of acetic acid by charcoal</td>
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<td>Adsorption of dye on charcoal</td>
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<td>Determination of rate constant for acid catalyzed ester hydrolysis</td>
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<td>Estimation of ferrous ion by potentiometric titration</td>
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<td>Potentiometric titration of dibasic acid Vs strong base</td>
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<td>Conductometric titration of mixture of acid Vs NaOH</td>
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<td>Verification of B-L law by UV-spectrophotometer</td>
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<td>Determination of point of zero charge of metal oxide</td>
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<td>Synthesis of polyaniline conducting polymer via electrochemical polymerization</td>
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<td>Synthesis of silver nanoparticle by chemical reduction method</td>
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<td>Determination of sodium and potassium ions in water using Flame photometry</td>
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<td>Kinetics of electrochemical reactions - Construction of Tafel linear polarization curves</td>
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<td>Determination of optimum current density for the anodization of aluminium</td>
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Pre-Requisite(s): 22CSE100 Problem Solving and Algorithmic Thinking

Course Objectives

- This course provides the foundations of programming.
- Apart from the usual mechanics of a typical programming language, the principles and methods will form the main focus of this course.
- Shift from learn to program to programming to learn forms the core of this course.

Course Outcomes

CO 1: Understanding the basics of Python and its packages along with assignment statement, basics, control structures, function definitions.

CO 2: Understanding the basics of MATLAB and its toolboxes along with arithmetic and array operations, control and function files.

CO 3: Make use of the programming constructs appropriately and effectively while developing computer programs.

CO 4: Develop computer programs that implement suitable algorithms for problem scenarios and applications.

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Syllabus

Unit 1: Python
Introduction to Programming and Python Languages, Python packages, Variables, Controls, Assignment Statement, Basic Types, Introduction to Lists, Loops, Strings, Tuples, Sets, Arrays. Introduction to Jupyter Notebook.

Unit 2: Python
Control Structures, Selection & Insertion, Sort, Recursion, Function definitions, Dictionaries & Files, Application of functions, Plotting in Python
Developing program for: Solving Polynomial Equations
Developing program for: Lagrange Interpolation, Numerical Integration: Newton-Cotes Integration formula.

Unit 3: Matlab
Introduction to MATLAB, Basics of programming using MATLAB and its Toolboxes, Arithmetic Operations, Arrays operations, Loops & execution Control, MATLAB files: Scripts & Functions, Plotting and Output, Iterative Methods, In-built MATLAB Functions
Developing program for: Errors in numerical computation, Numerical Differentiation, Solving linear Equation
Text Book(s)


Reference(s)

Course Objectives

- Demonstrate the importance of Computer Aided Drafting packages for industry practice
- Introduce standards and codes to produce engineering drawings
- Understand and interpret the engineering drawings
- Provide hands on training to become proficient with 2D Computer Aided drafting of single story buildings

Course Outcome

CO1: Appreciate the standard drawing codes and practices which is required for producing engineering drawings.
CO2: Construct accurate 2D geometry as per the dimensions following standard drawing practices with proper dimensioning using Computer Aided drafting software.
CO3: Create 2D representations of 3D objects as plan view, elevations, side views and sections / auxiliary views using Computer Aided drafting software.
CO4: Develop isometric drawings using orthographic views and single story buildings using Computer Aided drafting software.

CO-PO Mapping

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</table>

Syllabus

Unit 1
Drawing standards - Introduction to CAD software - CAD user interface - Data input modes - Coordinate systems. Units – Setting Limits – Draw Panel – Lines, Circles, Arcs, Ellipse, Rectangle, Polygons, Polylines, Splines - Status bar functions: Grid, Snap, Polar tracking, and Object snap. - Sketching basic geometric entities - Projections of planes and solids - Development of lateral surface of regular solids.

Unit 2

Unit 3

Text Book(s)


AUTO-CAD manual (In-House)
Course Objectives:

- To give an understanding about the areas of specializations available in the field of Civil Engineering
- To motivate the student to pursue a career in one of the many areas of Civil Engineering with deep interest and keenness.
- To expose the students to the various avenues available for doing creative and innovative work by showcasing many monuments and inspiring projects of public utility.

Course Outcome:

CO 1: Understand the relationship between the knowledge of basic science to civil engineering practice.
CO 2: Illustrate the importance of different component fields within civil engineering.
CO 3: Visualize the importance of civil engineering practice in the most ethical manner for sustainable development.

CO-PO Mapping

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Syllabus

Overview of Civil Engineering - Basic Understanding and History of Civil engineering - Fundamentals of Civil Architecture and Town Planning - Industrial Case Studies of National Infrastructure projects - Current national planning for civil engineering/infrastructure projects, scope of work involved in various branches of Civil Engineering-


Introduction to the civil engineering undergraduate curriculum map - the relationship between the courses in the curriculum.

PRACTICAL ACTIVITIES

- Bridge model construction
- House plan and model
- Stability of structures
- Dam Construction
- Entrepreneurial opportunities in civil engineering
Text Book(s)
1. Manabendra Saharia and Nagendra R. Velaga, "Introduction to Civil Engineering", AICTE, 2023
Course Objectives

- To understand the procedure for analysis of static objects; concepts of force, moment, and mechanical equilibrium.
- To analyze forces and moments in two and three dimensions due to concentrated and distributed forces in various systems such as beams, frames and trusses.
- To analyze the bodies in motion using the basics of kinetics and kinematics.

Course Outcome

CO1: Able to analyze force systems in plane and also in space
CO2: Able to solve two- and three-dimensional rigid body static equilibrium problems.
CO3: Able to determine the centroid of planes, center of gravity of masses and evaluate their moment of inertia.
CO4: Able to evaluate velocity and acceleration of a particle in rectangular and cylindrical coordinate systems and angular velocity of rigid bodies that are in plane motion.
CO5: Able to solve the problems related to bodies in dynamic equilibrium and bodies undergoing forced and free vibration using the laws of kinetics.

CO-PO Mapping

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Syllabus

Unit 1
Statics of rigid bodies in two dimensions and three dimensions: Moment of a force about a point – moment of a force about an axis – moment of a couple – equivalent force couple system – rigid body equilibrium – support reactions.

Unit 2

Unit 3
Dynamics: Rectangular and cylindrical coordinate system - Combined motion of rotation and translation - Newton’s second law in rectilinear translation - D’Alembert’s principle - Concepts of Mechanical vibration - free and forced vibrations, resonance and its effects; Degree of freedom; Frequency and amplitude of free vibrations without damping and single degree of freedom system, examples, Validation of theory using SkyCiv software.
**Text Book(s)**


**Reference Books**

Course Objective:

- Understand the fundamental concepts of thermodynamics and be able to define and apply the terms system, surroundings, boundary, thermodynamic equilibrium, properties, state, process, and cycle.
- Describe the principles of refrigeration, including mechanical refrigeration and the reversed Carnot cycle, and be able to calculate the coefficient of performance (COP) of a refrigeration system.
- Identify and define the various types of heat transfer, including conduction, convection, and radiation, and be able to apply the basic laws of heat transfer to practical applications.
- Understand the mechanical properties of metallic materials, including stress-strain curves, ductility, resilience, toughness, and hardness, and be able to classify metallic materials based on their properties and microstructures.
- Applying the necessary heat treatment methods to steels and explaining the properties, microstructures, and uses of different kinds of ferrous and non-ferrous alloys, such as cast iron, steel, brass, bronze, aluminium, nickel, and zinc alloys.
- Gain exposure by observing the laboratory experiments, including the performance study of refrigeration and air conditioning systems, microstructure analysis of ferrous and non-ferrous alloys, and weldability testing using ISO 17641 and a field visit to the manufacturing or fabrication industry.

Course Outcome

CO01 Comprehend the significance of thermodynamics in the fields of engineering and technology.
CO02 Apply the fundamental concepts and solve problems related to thermodynamics.
CO03 Distinguish the different types of heat transfer.
CO04 Identify metallic materials' significance in diverse engineering and technology fields.
CO05 Analyse and compare the properties of different types of ferrous and non-ferrous alloys.
CO06 Develop practical skills by observing laboratory experiments and through a field visit.

CO- PO mapping

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Program Specific Outcomes [PSOs]

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Syllabus

**Unit 1**

Unit 2


Unit 3

LAB only demonstration

1. Performance study of Refrigeration
2. Performance study of Air conditioning
3. Microstructure study of Ferrous and Non-Ferrous alloys
4. Effect of heat on hardened steel
5. Weldability study using ISO 17641 and 17642 Field visit to steel manufacturing/fabrication plant

Text Book

Course Objectives:

- Imparting the knowledge of general safety procedures that should be observed on the shop floor.
- Use modelling software to design and print simple geometry for additive manufacturing processes.
- Hands-on experience - arc welding and soldering operations.
- Use of different tools and accessories used for basic manufacturing processes.
- Familiarize with the essential pneumatic and electro-pneumatic components for automation and design pneumatic / electro pneumatics circuits for the given simple application.
- Understanding the functioning of various sub-systems of automobiles, such as the power train, steering system, suspension system, and braking system and realize the importance of recent developments in automotive technologies.

Course Outcomes

After successful completion of the lab course, students will be able to:

CO01 Practice safety procedures in a shop floor environment.

CO02 Select appropriate tools and methods for basic manufacturing processes.

CO03 Build simple geometries using additive manufacturing process.

CO04 Perform basic metals joining using welding and soldering.

CO05 Design, simulate and test simple pneumatic and electro pneumatic circuit for automation application.

CO06 Understand the functioning of automotive systems and realize the importance of recent developments in automotive technologies.

CO-PO Mapping:
Syllabus

1. **Additive Manufacturing Laboratory – 12 hours**

2. **Mechanical Engineering Laboratory – 12 hours**
   Study of tools and equipment used for basic manufacturing processes.
   Manual arc welding practice for making Butt and Lap joints - Soldering Practice
   Introduction to Machine Tools and Machining Processes

3. **Automation lab – 12 hours**
   Design, simulate and test pneumatic and electro-pneumatic circuits. Introduction to PLC – PLC programming for automation applications.

4. **Automobile Engineering lab – 9 hours**
   Overview of automobiles – components – functioning of various sub-systems; Power train, steering system, suspension system and braking system. Introduction to electric vehicles, hybrid vehicles, alternate fuels. Introduction to E Mobility.

**Reference Books:**

**Lab Manual**

**List of Equipment required for meeting the COs**

<table>
<thead>
<tr>
<th>Name of the lab.</th>
<th>List of Equipment</th>
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<tbody>
<tr>
<td>Additive Manufacturing Laboratory</td>
<td>1. Fused filament 3D printing machines</td>
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<td>2. Modelling software &amp; Computers (Minimum i5 Processor)</td>
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<td>3. Slicing software</td>
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<tr>
<td>Mechanical Engineering Laboratory</td>
<td>1. Tools and accessories for welding &amp; soldering.</td>
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<td>2. SMAW welding power source with electrodes and safety equipment.</td>
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<td>3. Soldering setup</td>
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<td>4. Basic machine tools for process demonstration – Lathe, Drilling, Milling,</td>
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<td>Grinding and CNC.</td>
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<td>Automation lab</td>
<td>1. Basic pneumatic kit</td>
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<td>2. Basic electro-pneumatic kit</td>
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<td>3. PLC trainer kit</td>
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<td>4. Software : Fluid SIM/ Automation Studio</td>
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<td>Automobile Engineering lab</td>
<td>1. Cut section/ Working model of 2-stroke and 4-Stroke engine.</td>
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<td>2. Cut section/ Working model of Braking Mechanism, Steering Mechanism, suspension System, Automobile Gearboxes &amp; Differential Unit</td>
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<td>3. Electric vehicle</td>
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<td>4. Hybrid Vehicle</td>
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**List of Exercises**

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<th>Name of the Lab.</th>
<th>List of Exercises</th>
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<td>General Workshop Safety Measures and Practices</td>
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<td>CO01</td>
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<tr>
<td>Additive Manufacturing Laboratory</td>
<td>1. Introduction to sketching and CAD modelling for Additive manufacturing.</td>
<td>CO02, CO03</td>
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<td>2. Conversation of CAD Model to STL file, slicing and G-code generation</td>
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<td>3. Prototyping using 3D printing</td>
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<tr>
<td>Mechanical Engineering Laboratory</td>
<td>1. Manual arc welding practice- butt and Lap joint.</td>
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<td>2. Soldering practice- wire joints</td>
<td>CO02, CO04</td>
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<td>3. Introduction to basic Machine tools and Machining Process – Demonstration</td>
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<tr>
<td>Automation lab</td>
<td>1. Study of pneumatic actuators and control valves.</td>
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<td>2. Design, simulate and testing of pneumatic circuits.</td>
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<td>3. Design, simulate and testing of electro-pneumatic circuits</td>
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<td>4. PLC programming for automation applications</td>
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<tr>
<td>Automobile Engineering lab</td>
<td>1. Demonstrating the working of various subsystems of automobiles- Power train,</td>
<td>CO06</td>
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<td>steering system, suspension system and braking system.</td>
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AMRITA VISHWA VIDYAPEETHAM

BTECH CIE2023

Page 40 of 158
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<tr>
<td>2.</td>
<td>Demonstrate the working of electric and hybrid vehicles.</td>
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22AVP103  
Mastery Over Mind  
L-T-P-C 1-0-2-2

Course Objectives:

The course will enable the students to

- Mastery Over Mind (MaOM) is an Amrita initiative to implement schemes and organize university-wide programs to enhance health and wellbeing of all faculty, staff, and students (UN SDG -3)
- It gives an introduction to immediate and long-term benefits of MA OM meditation and equips every attendee to manage stressful emotions and anxiety, in turn facilitating inner peace and harmony.
- This course will enhance the understanding of experiential learning based on the University’s mission: “Education for Life along with Education for Living” and is aimed to allow learners to realize and rediscover the infinite potential of one’s true Being and the fulfilment of life’s goals.

Course Outcomes

After successful completion of the course, Students will be able to:

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<thead>
<tr>
<th>S.No.</th>
<th>Course Outcomes</th>
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<tbody>
<tr>
<td>CO01</td>
<td>To be able to describe what meditation is and to understand its health benefits</td>
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<tr>
<td>CO02</td>
<td>To understand the causes of stress and how meditation improves well-being</td>
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<tr>
<td>CO03</td>
<td>To understand the science of meditation</td>
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<tr>
<td>CO04</td>
<td>To learn and practice MAOM meditation in daily life</td>
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<tr>
<td>CO05</td>
<td>To understand the application of meditation to improve communication and relationships</td>
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<tr>
<td>CO06</td>
<td>To be able to understand the power of meditation in compassion-driven action</td>
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E. CO-PO Mapping: [affinity#: 3 – high; 2- moderate; 1- slightly]

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Unit 1:
Describe Meditation and Understand its Benefits (CO1)

A: Importance of meditation. How does meditation help to overcome obstacles in life (Pre-recorded video with Swami Shubhamritananda Puri)
Reading 1: Why Meditate? (Swami Shubamritananda ji)

Unit 2:
Causes of Stress and How Meditation Improves Well-being (CO2)

A: Learn how to prepare for meditation. Understand the aids that can help in effectively practicing meditation. Understand the role of sleep, physical activity, and a balanced diet in supporting meditation. (Pre-recorded video with Dr. Ram Manohar)

**Unit 3:**
*The Science of Meditation (CO3)*
A: A preliminary understanding of the Science of meditation. What can modern science tell us about this tradition-based method? (Pre-recorded video with Dr. Shyam Diwakar)
B: How meditation helps humanity according to what we know from scientific research (Pre-recorded video with Dr. Shyam Diwakar)
Reading 1: Does Meditation Aid Brain and Mental Health (Dr Shyam Diwakar)

**Unit 4:**
*Practicing MA OM Meditation in Daily Life (CO4)*
Guided Meditation Sessions following scripts provided (Level One to Level Five)
Reading 1: MA OM and White Flower Meditation: A Brief Note (Swami Atmananda Puri)

**Unit 5:**
*Improving Communication and Relationships (CO5)*
How meditation and mindfulness influence interpersonal communication. The role of meditation in improving relationship quality in the family, at the university and in the workplace. (Pre-recorded video with Dr Shobhana Madhavan)

**Unit 6:**
*Meditation and Compassion-driven Action (CO6)*
Understand how meditation can help to motivate compassion-driven action. (Pre-recorded video with Dr Shobhana Madhavan)

**Course Assessment Specification Table:**

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*The Group Activities could be related to CO1, CO2 or CO3 depending on the preference of the instructor*

Text Books/Reference Books:
1. Meditation and Spiritual Life-Swami Yatiswarananda, Ramakrishna Math
3. Dhyan Yoga-Holy Gita Swami Chinmayandaya
4. Voice of God, Chandrasekharendra Saraswati, 68th Acharya of Sri Kanchi Kamakoti Peetam,
5. *Hindu Dharma-Chandrasekharendra Saraswati, 68th Acharya of Sri Kanchi Kamakoti Peetam*,
6. Mind: It’s Mysteries and control-Swami Sivananda Saraswati
8. Books on Amma’s teachings like Awaken children, From Amma’s Heart etc.
Course Objectives:

- The course aims at introducing Bharath in nutshell to the student, which includes the sources of Indian thoughts, eminent personalities who shaped various disciplines, India’s significant contribution to mankind, the current stature of India in geopolitics and the Indian approach to science and ecology.

Course Outcome Statements (Cos):

After the completion of the course, the student:

CO1 - Will be able to recognise the call of Upanishads and outstanding personalities for confronting the wicked in the real world while admiring the valour, pursuit and divinity in both classical and historical female characters of India.

CO2 - Will get introduced to Acharya Chanakya, his works, and his views on polity and nation to find synchrony between public and personal life, alongside understanding India's cultural nuances and uniqueness concerning the comprehension of God across major global communities.

CO3 - Will be able to appreciate Bhagavad Gita as the source of the Indian worldview through the various Yogic lessons enshrined in it, making it one of India's numerous soft powers, and also understand the faith-oriented mechanism of preserving nature.

CO4 - Will be informed about the enormous contribution of Indian civilisation over two and a half millennia to humanity and develop awareness about India's approach toward science, devoid of dogmas and rooted in humanism.

CO-PO- Mapping:

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Unit-1

1. Chapter 1 – Face the Brutes
2. Chapter 2 – Role of Women in India
3. Chapter 3 – Acharya Chanakya
4. Chapter 4 – God and Iswara

Unit-2

5. Chapter 5 – Bhagavad Gita: From Soldier to Samsarin to Sadhaka
6. Chapter 6 – Lessons of Yoga from Bhagavad Gita
7. Chapter 7 – Indian Soft powers
8. Chapter 8 – Preserving Nature through Faith

Unit-3

9. Chapter 9 - Ancient Indian Cultures (Class Activity)
10. Chapter 10 - Practical Vedanta
11. Chapter 11 - To the World from India
12. Chapter 12 - Indian Approach to Science
Text Book:

1. Glimpses of Glorious India- (In-house publication)

Reference Course material:

1. Fear Not: Be Strong (Swami Tathagatananda)
2. Essays on Gita (Sri Aurobindo)- Aurobindo Ashram
3. Indian Contribution to Science (Vijana Bharati Publication)
4. The Culture And Civilisation Of Ancient India In Historical Outline (D. D. Kosambi)
Course Objectives:

- To model spatiotemporal variations in engineering systems and processes using differential equations
- To analyze and solve ordinary differential equations (ODE)
- To analyze stability of systems of first order ordinary differential equations
- To define Laplace transforms and utilize them to solve linear first and second order ODEs
- To understand partial differential equations and its applications in engineering.
- To apply the numerical techniques for solving ODE and PDE.

Course Outcomes:

CO1: Define first-order ordinary differential equations and demonstrate ability to use techniques to solve them and apply these solutions in engineering contexts.
CO2: Reduce higher-order ordinary differential equations to a system of first-order differential equations, solve them using the method of eigenvector expansions and apply the solutions to engineering problems.
CO3: Define second-order ordinary differential equations and demonstrate ability to use techniques to solve them and apply these solutions in engineering contexts.
CO4: Define Laplace transforms and their inverses, apply their properties to solve linear ordinary differential equations.
CO5: Understand the types of partial differential equations arising from two-dimensional modeling. Use separation of variables to solve linear partial differential equations.

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Syllabus:
One-Dimensional Modeling: Origin of Ordinary Differential Equations (1st and 2nd Order); First Order OD: Direct Integration, Integrating Factor – Linear and Nonlinear Equations; Systems of First Order ODEs. Stability. (12 hrs)
Second Order ODE: Homogeneous and Non-homogeneous – Linear equations with constant coefficients; Laplace Transforms: Definition, Properties and Inverse Laplace Transforms; Solution of Linear First and Second Order ODEs using Laplace Transforms. Fixed points, stability of fixed points.
Numerical methods for solving ODE: Euler’s method, Improved Euler’s method and Runge-Kutta method. (15 hrs)

Textbook:

References:
Course Objectives

- To explain the properties of materials and concepts of stress and strain
- To illustrate the deformational characteristics of elements and components.
- To highlight the response of structural elements under various loading conditions.

Course Outcome

CO1: Understand the concepts of mechanics of deformable solids and apply them to problems on the strength andstability of structural elements and mechanical components.

CO2: Evaluate the shear force, bending moment and stress variation in structural elements subjected to static loads.

CO3: Understand the basic principles and analyze problems pertaining to structural members subjected to axial load, torsion, bending, transverse shear, and combination loading.

CO4: Develop the necessary theoretical background necessary for courses in structural analysis and design.

CO5: Introduction to basic MATLAB coding for solving structural members under various type of loading and validation using available software.

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Syllabus

Unit 1
Bars of varying section – composite bars –thermal stresses – strain energy in tension, compression and shear - resilience – stresses due to impact and suddenly applied load.

Unit 2
Torsion of circular solid and hollow shafts – combined bending moment and torsion on shafts.

Unit 3
Introduction to basic MATLAB coding for solving structural members under various type of loading and validation using available software

Text Book(s)

Reference(s)
Course Objectives

- To develop basic knowledge about properties of fluid and fluid flow.
- To explain the hydrostatic pressure, principle of buoyancy and stability of floating bodies.
- To explain the conservation principles of mass, momentum and energy equations in fluid flow along with their applications.
- Exposure on the methods to estimate the flow and losses in pipe network under various conditions.
- To explain the concepts of dimensional analysis and model testing.

Course Outcome

CO1: Explain the behavior of fluids under various flow conditions
CO2: Analyze the hydrostatic forces, conditions of buoyancy and stability of various floating bodies.
CO3: Apply mass, momentum and energy equations in the measurement of fluid flow.
CO4: Solve pipe network problems by considering major and minor losses.
CO5: Calculate laminar flow characteristics through pipes and parallel plates.
CO6: Formulate dimensional analysis using various methods and apply the concept of similarities.

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Syllabus

Unit 1
Elementary concepts – properties - concept of gauge and absolute pressure, measurement of pressure using manometers of different types.
Hydrostatic force on solid surfaces - center of pressure – buoyancy and stability of submerged and floating bodies - metacentric height - period of oscillation.
Types of flow, definitions and explanations of unsteady, steady, non-uniform, laminar and turbulent flows, rotational and irrotational flows. Stream function, potential function. Path line, streak line and streamline – continuity equation – derivation, application of one dimensional steady flow – circulation and vorticity - Basic flow fields such as uniform flow, source, sink, doublet, vortex flow, spiral flow – superposed flows.

Unit 2
Derivation of Bernoulli’s energy equation and Euler’s equation, examples illustrating the use of energy equation.
Flow meters - venturimeter, Orifice meter, nozzle, derivation of equations of discharge, pitot tubes – applications to flow measurements- notches and weirs.
Laminar flow through circular pipe – shear stress, pressure gradient, velocity profile, Hagen-poiseuille's equation, power calculations, laminar flow between parallel plates - Couette flow and Poiseuille flow.

Unit 3
Analysis – Rayleigh’s method – Buckingham Pi-theorem – Hydraulic Similitude – model analysis – dimensionless numbers – Model testing of partially submerged bodies – Distorted models and scale effects.

Text Book(s)

Reference(s)
Course Objectives

- To highlight the importance of linear/angular measurement methods in site plan preparation
- To impart basic skills of levelling and theodolite survey.
- To explain about errors in measurements and their adjustments in a traverse.
- To provide an exposure on the use of minor and modern instruments in surveying

Course Outcome

CO1: Understand the principles, types and methods of surveying, to apply them in practice with minimum or no error.

CO2: Analyse and rectify the errors in the horizontal-linear and horizontal-angular measurements to calculate area.

CO3: Analyse and evaluate the measurements in leveling to obtain reduced levels, contour lines and earthwork estimation.

CO4: Analyse and evaluate the horizontal and vertical coordinates using a theodolite.

CO5: Understand and use minor instruments and advanced technologies in surveying.

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Syllabus

Unit 1
Introduction - classification of surveys – reconnaissance - principle of working from whole to part – provision of control – conventional signs.

Unit 2
Areas and volumes – earthwork volume calculation.
Unit 3
Tangential system – direct reading tacheometer - subtense bar – trigonometric levelling.
Curves – elements of simple, compound, transition and reverse curves - vertical curves - curve setting by various methods.
Modern field survey systems: EDM - total station - introduction to photogrammetry -electro-magnetic spectrum - remote sensing - global positioning systems - Geographic information systems – advantages and applications.

Text Book(s)

Reference(s)
Course Objectives

- To expose students to the various building and general construction materials and products.
- To impart knowledge of common construction systems and methods.

Course Outcome

CO1: Understand role of building regulations and materials in construction.
CO2: Select appropriate materials for construction of buildings.
CO3: Understand and recommend options in substructure and superstructure construction.
CO4: Choose suitable finishes and services for buildings.
CO5: Identify the uses of modern construction materials.

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Syllabus

Unit 1

Unit 2

Unit 3

Term projects
- Setting out of building plans
- Reading and Interpreting building drawings
- Report on visit to construction sites
Text Book(s)

Reference(s)
Course Outcomes:
CO1: Understand the various data visualization methods.
CO2: Understand the basics of the descriptive statistics.
CO3: Understand and apply the basic concepts of correlations and regressions to the given data.
CO4: Understand and apply the basic concepts of sampling techniques and simple hypothetical testing to the given data.

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Syllabus:

Unit 1

Unit 2
Randomness, Probability, Introduction to Statistics, Sampling, Sample Means and Sample Sizes, Descriptive statistics – Central tendency, dispersion, variance, covariance, kurtosis, five-point summary, Distributions, Bayes Theorem, Error Probabilities; Permutation Testing, Statistical Inference. (15 hrs)

Unit 3

Textbook(s)


Reference(s)

Course Objectives

- To find the mechanical properties of material under various loading conditions.
- To obtain the response of structures under various loading conditions.

Course Outcome

CO1: Conduct experiments to validate physical behaviour of material and prepare laboratory reports on the interpretation of experimental results.
CO2: Conduct experiments on strength and stability of structural elements.
CO3: Conduct experiments to analyse the structural members subjected to axial load, torsion, transverse shear, bending and combination loading.

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List of Experiments

1. Tension test on metals
2. Tensile test on thin wires – Mild steel and Copper
3. Compression test – Wood specimen and brick
4. Hardness test on Ferrous and non-ferrous material - Rockwell Hardness test - Brinell Hardness test
5. Double shear test on mild steel rods
6. Deflection test on beams
7. Impact test on metal specimens – Izod and Charpy
8. Flexural test on timber beams
9. Test on helical Spring - Open coiled and close coiled
10. Torsion test
11. Column Buckling
Course Objectives
- To impart knowledge in linear/angular measurement using various surveying instruments.
- To learn booking and determination of reduced levels of accessible and inaccessible points.
- To provide an exposure on the use of minor and modern instruments in surveying

Course Outcome
- Compute area of field using linear and angular measurements.
- Determine the elevations of different points using various methods
- Understand the usage of minor and modern instruments in surveying

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Syllabus

1. Chain & Compass survey- Traversing and plotting of details
2. Plane table survey - three-point problem
3. Levelling - Plane of collimation & Rise and fall method
4. Contour surveying
5. Theodolite surveying - Measurement of angles and traversing
6. Heights and distances by tacheometry and solution of triangles (single plane and double plane)
7. Total Station – Traversing and Area Calculation
Course Objectives

- Through a study of the Rāmāyaṇa, the student should gain a deeper understanding of the ethical grandeur of Indian culture, and be inspired to follow the ideals of the characters depicted therein.

Course Outcomes:

After the completion of the course the student will be able to:

CO1 Appreciate the significance of Rāmāyaṇa as an itihāsa, and important aspects of Bālakāṇḍa.

CO2 Understand the family values and ideal human relationships portrayed in the Ayodhyakāṇḍa and Aranyakāṇḍa of Rāmāyaṇa.

CO3 Understand dharma and its nuances, emphasizing its applicability in an individual’s life through Kishkindhakāṇḍa and Sundarakāṇḍa of Ramayana.

CO4 Appreciate the triumph of dharma over adharma through Yuddhakāṇḍa of Rāmāyaṇa.

CO5 Appreciate the spiritual values from Rāmāyaṇa in resolving personal and social conflicts through varied effective presentations of important episodes of the Rāmāyaṇa.

Mapping of course outcomes with program outcomes:

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Syllabus

Unit 1

An overview of Valmiki’s epic. Introduction to the content and structure of the epic text and it’s principal characters.

Bala-Kāṇḍa: Preparing for the renowned mission.

Unit 2


Aranya-Kāṇḍa: Tale of the forest life.

Unit 3
Kishkindha-Kāṇḍa: The Empire of Holy Monkeys.

Sundara-Kāṇḍa: Heart of the Ramayana

**Unit 4**
Yuddha-Kāṇḍa: The most popular part of the Ramayana

Uttara-Kāṇḍa: An attempt to explain the untold stories.

**Unit 5**
Ramayana and Modern-day learning

Ecological Awareness in the Ramayana

Different Ramayana: Epic that connects the world.

**TEXT BOOKS/REFERENCES:**

2. Rajagopalachari. C, *The Ramayana*
Pre-Requisite(s): Probability & Statistics, Introduction to Computing, Foundation of Data Science

Course Objectives

- To understand the basics of machine learning and its need for Civil Engineering.
- To learn the concept of supervised learning, unsupervised learning with reinforcement learning.
- To be able to apply the techniques to build models for different applications in Civil Engineering.

Course Outcome

CO1: Understanding the basics of machine learning and its real-world applications.
CO2: Understanding the concept of supervised learning, unsupervised learning with reinforcement learning
CO3: Apply the techniques to build models for different applications in Civil Engineering.

CO-PO Mapping

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Syllabus

Unit 1
Introduction of Machine Learning (ML), Historical context, Necessities, ML in modern civil engineering, Real-world application examples. Recapitulation of linear regression, Logistic regression, Model evaluation

Unit 2
Adaline, Backpropagation, Neural Networks Learning, Learning rate, Unsupervised Learning, Clustering, Reinforcement Learning, Overview of DL. Applications: Density-based clustering Rainfall-runoff modelling, Soil strength prediction.

Unit 3
Supervised Learning, Decision Tree, Bayes Classifier, Bayesian Networks, k-Nearest Neighbour, Support Vector Machines and Kernel Machines. Applications: Soil Classification, Gap acceptance characteristics of traffic, Forecasting.

Text Book(s)

2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer 2009 (freely available online)

Reference(s)

Course Objectives

- To explain the influence of geological conditions of the earth on construction practices.
- To provide an exposure to the concept of three phase system and apply it for estimation of soil properties.
- To elucidate the role of water in soil behavior and its applications in soil stresses, permeability and seepage.
- To explain the volume-change behavior in soil and consolidation settlement.
- To explain the concepts and methods to determine shear strength parameters and stress changes in soil.

Course Outcome

CO1: Identify and classify rocks using basic geologic features and to apply those concepts on rock engineering projects and understand the role of geology in construction processes.

CO2: Ability to classify soil with reference to their characteristics and the calculated index and engineering properties and relate compaction of soil to its properties.

CO3: Analyze and evaluate permeability characteristics of soils and estimate seepage through soils.

CO4: Analyze stress distribution in soil and evaluate consolidation properties along with settlement.

CO5: Analyze the shear strength of soil and factors influencing its magnitude.

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Syllabus

Unit 1
General geology – Weathering - Geological work of wind and water. Mineralogy, Petrology - Three–fold classification of rocks and their characteristic features. Structural geology - Types and classification of structures (Folds and faults) and their effect on civil engineering projects, Rock mass classification systems – intact rocks & rock mass discontinuities- classifications based on (a) stand-up time, (b) Rock quality designation (RQD), (c) Rock structure rating (RSR), (d) Rock mass rating (RMR), (e) Rock mass quality (Q-system), (f) Geological strength index (GSI) & (g) Modulus of jointed rock mass. Geology in Civil Engineering - Tunnels, dams, reservoirs, bridges, runways, roads and buildings. Origin and formation of soils. Soil structure and clay mineralogy – Adsorbed water – Mass- volume relationship – Relative density. Index Properties of Soils: Grain size analysis – Sieve and hydrometer methods – Consistency limits and Indices – I.S. Classification of soil.

Unit 2
Compaction: Mechanism of compaction – factors affecting – effects of compaction on soil properties – Field compaction equipment - compaction control.
Seepage through soils: Total, neutral and effective stresses –Quick sand condition – Seepage through soils –Flownets: characteristics and uses.

Unit 3
Stress distribution in soils: Boussinesq’s and Westergaard’s theories for point loads and areas of different shapes – Newmark’s influence chart.
Consolidation: Stress history of clay; e-p and e-log p curves, Standard 1-d Consolidation Test, Computation of Consolidation Settlement, Rate of One-Dimensional Consolidation theory of Terzaghi, Settlement Analysis
Shear strength of soils: Stress-Strain Curve, Mohr-Coulomb Failure theory, Laboratory measurement of Shear Strength, Shear strength of Saturated Cohesive Soils, Pore pressure Coefficients, Shear strength of Granular Soils.

**Text Book(s)**

**Reference(s)**
Course Objectives

- To impart knowledge on different methods of analyzing determinate and indeterminate structures.
- To explain the structural behavior and analysis of cables and arches.
- To introduce the matrix methods of structural analysis.

Course Outcome

CO1: Analyze the determinate and indeterminate structures by applying the energy principles.
CO2: Categorize the structures and analyze the structural elements using force and displacement method of analysis.
CO3: Analyze the response in structural elements for the moving loads using method of influence line diagram.
CO4: Calculate the internal forces in arch and cable structures by applying the basic engineering knowledge.
CO5: Structural analysis of selected structural elements like beams, trusses and frames using MATLAB and validation using available software.

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Syllabus

Unit 1
Statically indeterminate structures - degree of static and kinematic indeterminacies. Introduction to force and displacement methods of analysis.
Energy principles – Castigliano’s theorems - Engessor’s theorem - Maxwell Betti’s theorem - Principle of least work – Method of virtual work (unit load method) - applications in statically determinate and indeterminate structures (analysis of Propped cantilever and fixed beams).

Unit 2
Cables-maximum tension-types of supports-forces in towers-suspension bridges with three and two hinged girders.
Theory of Arches-Eddy’s theorem-analysis of three hinged and two hinged arches-settlement and temperature effects.

Unit 3
Moving loads and influence lines – influence lines (IL) for statically determinate and indeterminate beams for reaction, SF and BM-effect of moving loads-concentrated and uniformly distributed loads-load position for maximum BM and SD-equivalent UDL.
IL for determinate structures-truss, arch and suspension bridge.
Structural analysis of selected structural elements like beams, trusses and frames using MATLAB and validation using available software.
Text Book(s)


Reference(s)

Course Objectives

- To explain the concepts of momentum principles and its applications in the working of pumps and turbines.
- To understand the open channel flow for different flow conditions and the hydraulic design of channels.
- To understand the concepts of specific energy, critical flow and their applications.
- To understand the various irrigation canal systems.

Course Outcome

CO1: Apply the linear momentum principle to evaluate the forces exerted by the jet on inclined, curved and stationary bodies.
CO2: Apply the principles of basic engineering to analyze and choose suitable hydraulic machinery.
CO3: Select most economical channel section and to analyze uniform flow.
CO4: Apply the principles of energy to analyze non-uniform flow conditions in open channel.
CO5: Understand the general aspects of irrigation canals and design the irrigation canal systems for field conditions.

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Syllabus

Unit 1

Impulse momentum principle – application – impact of jet - force exerted by a jet on normal, inclined and curved surfaces for stationary and moving cases – torque in rotating machines – jet propulsion.
Hydroelectric power: low, medium and high head plants - Power house components – Microhydel schemes.
Turbines - classifications – construction and working of Pelton Wheel, Francis and axial flow reaction turbines - selection of turbines – draft tube.
Classification of pumps – Centrifugal pumps – types and working – characteristics. Reciprocating pumps - types and working – selection of pumps.

Unit 2

Open channel flow - Comparison with pipe flow, Types of channels - Classification of flow, uniform flow – Uniform flow using Chezy’s and Manning’s formulae - Most efficient channel section – Circular, Rectangular and Trapezoidal channel sections, open channel section for constant velocity at all depths of flow. Specific energy and critical depth, Specific force curve, critical flow computation.
Non-uniform flow, Gradually Varied Flow, Dynamic equation for gradually varied flow, Different forms of the dynamic equation, Flow profiles in prismatic channels, integration of the varied flow equation - Computation of the length of the backwater curve and afflux. Rapidly Varied Flow- Hydraulic Jump, Hydraulic jump equations for a rectangular channel - Practical applications.
Unit 3

Text Book(s)

Reference(s)
Course Objectives

- To introduce the historical road development activities in India
- To highlight the important factors in highway alignment
- To introduce the design approaches for flexible and rigid pavements
- To explain the basic principles of traffic engineering and design of intersections

Course Outcome

CO1: Explain the history of road development in India
CO2: Carry out geometric design of highways
CO3: Analyse the suitability of materials for construction of pavements
CO4: Design of Flexible and Rigid Pavements
CO5: Explain the principles of Traffic Engineering and conduct surveys
CO6: Perform analysis and design of intersections

CO-PO Mapping

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Syllabus

Unit 1
Highway development and planning - Classification of roads. Road development in India - Salient features of first, second, third and fourth road development plans in India. Current road projects in India - NHDP, PMGSY and Bharatmala project. Highway alignment and project preparation. Geometrical Design – highway cross section elements, sight distance, design of horizontal alignment and design of vertical alignment.

Unit 2
Pavement Materials – Aggregate and Bitumen - desirable properties, tests, requirements for different types of pavements. Bituminous Mix Design-Marshall Mix Design.
Pavement Design Introduction – types of pavements and their use. Flexible pavements - factors affecting design and performance; stresses in flexible pavements; design of flexible pavements as per IRC. Rigid pavements-components and functions; factors affecting design and performance of rigid pavements; stresses in rigid pavements; design of rigid pavements as per IRC. Softwares for the pavement design

Unit 3
Text Book(s)

Reference(s)
6. IRC SP 41-1994, “Guidelines for the Design of At-Grade Intersections in Rural and Urban Areas”
Course Objectives

- To impart knowledge in measuring pressure and discharge of fluid flow using various instruments
- To highlight the major and minor Losses in pipe flow
- To train the students in performance analysis of Hydraulic Turbines and Pumps

Course Outcome

CO1: Conduct experiments to understand the principles and working of different hydraulic machines like pumps and turbines.
CO2: Examine and analyze fluid flow through various discharge and pressure measuring instruments.
CO3: Prepare laboratory reports on the interpretation of experimental results.

CO-PO Mapping

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Syllabus

2. Verification of Bernoulli’s equation.
3. Determination of Coefficient of discharge for a small orifice by a constant head method.
4. Determination of Coefficient of discharge for an external mouth piece by variable head method.
5. Calibration of Triangular Notch
6. Determination of friction factor of pipes
7. Impact of jet on vanes
8. Calibration of Venturimeter, Orificemeter, rotameter and watermeter
9. Determination of metacentric height
10. Efficiency test on centrifugal pump and reciprocating pump.
11. Performance test on Pelton wheel turbine and Francis turbine.
Course Objectives

- To deal with experimental determination and evaluation of mechanical characteristics and behavior of metallic and non-metallic structural materials.
- Introduce to experimental procedures and common measurement instruments, equipment and devices.
- To provide students with information concerning practical application of mechanical characteristics.
- To evaluate the quality and suitability of construction materials.

Course Outcome

CO1: Compute engineering values from laboratory measures and identify failure modes of construction materials.
CO2: Analyze stress versus strain curve for modulus and other related attributes
CO3: Prepare the laboratory reports on the interpretation of experimental results

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Syllabus

List of Experiments:
Tests on cement
1. Fineness, Normal consistency, Initial and Final Setting times, Specific gravity, Compressive strength, Soundness

Tests on fine aggregate
2. Grain size distribution – Uniformity coefficient and fineness modulus, Specific gravity, Density, Void ratio, Bulking & Absorption

Tests on coarse aggregate
3. Grain size distribution – Uniformity coefficient and fineness modulus, Specific gravity, Density, Void ratio, Absorption, Crushing & Impact values, Flakiness & Elongation, Los Angel’s Abrasion test

Concrete mix proportioning approaches

Test on fresh and hardened concrete
5. Workability test - Slump test, Compaction factor test, Flow table test, Vee-Bee Consistometer,

6. Use of water reducing admixtures

7. Compressive strength, Split tensile strength, Flexure test on beams, Modulus of elasticity

8. Tests on bricks – Crushing strength, water absorption and efflorescence

9. Basic tests on unmodified bitumen and modified binders with polymers.

Reference(s)

1. Various related updated & recent standards of BIS, IRC, ASTM, RILEM, AASHTO, etc. corresponding to materials used for Civil Engineering applications


Pre-requisite: An open mind and the urge for self-development, basic English language skills, knowledge of high school level mathematics.

Course Objectives
- Assist students in inculcating Soft Skills and developing a strong personality
- Help them improve their presentation skills
- Support them in developing their problem solving and reasoning skills
- Facilitate the enhancement of their communication skills

Course Outcomes
CO1 - Soft Skills: To develop greater morale and positive attitude to face, analyse, and manage emotions in real life situations, like placement process.
CO2 - Soft Skills: To empower students to create better impact on a target audience through content creation, effective delivery, appropriate body language and overcoming nervousness, in situations like presentations, Group Discussions and interviews.
CO3 - Aptitude: To analyze, understand and employ the most suitable methods to solve questions on arithmetic and algebra.
CO4 - Aptitude: To investigate and apply suitable techniques to solve questions on logical reasoning and data analysis.
CO5 - Verbal: To infer the meaning of words and use them in the right context. To have a better understanding of the basics of English grammar and apply them effectively.
CO6 - Verbal: To identify the relationship between words using reasoning skills. To develop the capacity to communicate ideas effectively.

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Syllabus

Soft Skills

Soft Skills and its importance: Pleasure and pains of transition from an academic environment to work-environment. New-age challenges and distractions. Learning to benefit from constructive criticisms and feedback. Need for change in mindset and up-skilling to keep oneself competent in the professional world.

Managing Self: Knowing oneself, Self-perception, Importance of positive attitude, Building and displaying confidence, Avoiding being overconfident, Managing emotions, stress, fear. Developing Resilience and handling failures. Self-motivation, Self-learning, and continuous knowledge up-gradation / Life-long learning. Personal productivity - Goal setting and its importance in career planning, Self-discipline, Importance of values, ethics and integrity, Universal Human Values.

Aptitude

Problem Solving I

Ratio, Proportion & Variation: Basics, Alligations, Mixtures, and Partnership.
Averages: Basics, and Weighted Average.
Data Interpretation: Tables, Bar Diagrams, Venn Diagrams, Line Graphs, Pie Charts, Caselets, Mixed Varieties,
Network Diagrams and other forms of data representation.

**Verbal**

**Vocabulary:** Familiarize students with the etymology of words, help them realize the relevance of word analysis and enable them to answer synonym and antonym questions. Create an awareness about the frequently misused words, commonly confused words and wrong form of words in English.

**Grammar (Basic):** Help students learn the usage of structural words and facilitate students to identify errors and correct them.

**Reasoning:** Stress the importance of understanding the relationship between words through analogy questions.

**Speaking Skills:** Make students conscious of the relevance of effective communication in today’s world through various individual speaking activities.

**References:**
5. The hard truth about Soft Skills, by Amazon Publication.
6. Verbal Skills Activity Book, CIR, AVVP
7. English Grammar & Composition, Wren & Martin
8. Nova’s GRE Prep Course, Jeff Kolby, Scott Thornburg & Kathleen Pierce
9. Cracking the New GRE 2012
10. Kaplan’s – GRE Comprehensive Programme
14. How to Prepare for Data Interpretation for the CAT, Arun Sharma.

**Evaluation Pattern**

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Pass / Fail

*CA - Can be presentations, speaking activities and tests.
Course Objectives

- Through a study of the Mahabharata, the student should gain a deeper understanding of the ethical grandeur of Indian culture, and be inspired to follow the ideals of the characters depicted therein.

Course Outcomes:

After the completion of the course the student will be able to:

CO1 Understanding the impact of itihasas on Indian civilization with a special reference to the Adiparva of Mahabharata.

CO2 Enabling students to importance of fighting adharma for the welfare of the society through Sabha and Vanaprava.

CO3 Understanding the nuances of dharma through the contrast between noble and ignoble characters of the epic as depicted in the Vana, Virata, Udyoga and Bhishma parvas.

CO4 Getting the deeper understanding of the Yuddha Dharma through the subsequent Parvas viz., Drona, Karna, Shalya, Sauptika Parvas.

CO5 Making the students appreciative of spiritual instruction on the ultimate triumph of dharma through the presentations of the important episodes of the MB with special light on Shanti, Anushasana, Ashwamedhika, Ashramavasika, Mausala, Mahapraasthnikika and Swargarohana Parvas.

Mapping of course outcomes with program outcomes:

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Syllabus

Unit 1

Introduction and Summary of the Mahabharata

A Preamble to the Great Itihasa

Unbroken Legacy

Unit 2

Dharmic Insights of a Butcher
The Vows We Take
Kingship and Polity Acumen

Unit 3
Karna – The Maestro that Went Wide off the Mark
Tactics of Krishna
Yajnaseni

Unit 4
Popular Regional Tales
Maha Prasthanam – The Last Journey.

Unit 5
Mahabharata - An All-Encompassing Text
Mahābhārata- Whats and WhatNots

Nyayas in Mahabharata

TEXT BOOKS/REFERENCES:
4. Leadership Lessons from the Mahabharat, ASCSS
Course Objectives

To familiarize methods of soil investigation,
Analysis of slope stability and design reinforced slopes
Analysis of earth pressure theories and design of reinforced earth structures.
To determine safe bearing capacity of shallow and deep foundation
Settlement consideration for various ground conditions and understand the effects due to inclusion of drains

Course Outcome

CO1: Identify and suggest site investigation program to evaluate soil behaviour and obtain design parameters.
CO2: Analyze the stability of natural and reinforced slopes
CO3: Analyze the stability of retaining walls and geotextile reinforced earth retaining structures.
CO4: Estimate settlement of soil and accelerated consolidation due to geosynthetic drains.
CO5: Estimate allowable bearing pressures and load carrying capacities of shallow and deep foundation systems.

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Syllabus

Unit 1


Unit 2

Slope stabilization –Soil reinforcement – Geosynthetics- Types of geosynthetics- Geotextiles, Geogrid, Geomembranes, Geocomposites- functions of geotextiles- Seperation, drainage, fluid barrier, reinforcement- Principle and mechanism of reinforced soil – Design concepts for slope stabilization- Brief overview of different IS code- Case studies on geotextile-stabilized slopes
Earth Pressure Theories: Rankine’s theory of earth pressure, Earth pressure in layered soils, Coulomb’s earth pressure theory, Culmann’s graphical method, Friction Circle Method.
Toe Walls, Types of Retaining Walls & Modes of Failure-Rigid retaining walls, Flexible retaining walls and MSE retaining walls. IS Recommendation. Soil retention by soil reinforcement using geotextiles- Design and construction of geosynthetics, Reinforced soil retaining structures, Walls and slopes.

Brief discussion on ground improvement methods: geotextiles and their types, Soil Nailing, Gabion Walls, Sand Compaction Piles and Stone Columns.

**Software Applications: 2-dimensional Finite Element Software: Description of the Software & methodology:**
- Determining Factor of safety for the slopes

**Unit 3**

Shallow Foundations: Types - choice of foundation – Location of depth – Safe Bearing Capacity – Terzaghi, Meyerhof, Skempton and IS Methods. Bearing Capacity calculations based on various Field Test and Settlement, Design of a footing in soil based on settlement and bearing capacity criteria. Bearing capacity improvement using geotextiles- geocell reinforced sand overlaying soft clay- preloading with prefabricated vertical drains -Rate of settlement with geotextile drainage-

Pile Foundation: Types of piles, Pile load tests, Load carrying capacity of piles based on Static pile formulae & Dynamic pile formulae, Load carrying capacity of pile groups in sands and clays, Settlement of pile groups, IS Recommendations. Basics of Laterally loaded piles & Under-reamed piles.

**Software Applications: 2-dimensional Finite Element Software: Description of the Software & methodology:**
- Settlement and Bearing capacity analysis of shallow foundation

**Text Book(s)**

**Reference(s)**
Course Objectives

- To discuss the current status of Indian Environment and responsible Government agencies.
- To explain the different water quality parameters and their significance.
- To explain the different water treatment options for domestic consumption.
- To explain the different techniques of solid waste management

Course Outcome

CO 1: Understand the impact of humans on environment and environment on humans and be conversant with basic environmental legislation

CO 2: Analyze the water quality from different source and estimate the water quantity for domestic purpose

CO 3: Select and design the most appropriate technique for the treatment of water

CO 4: Understand the most appropriate technique for the treatment of solid waste

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Syllabus

Unit 1

Water: Sources of water and quality issues, water quality requirement for different beneficial uses, Water quality standards, water quality indices, water safety plans, Water supply systems, Need for planned water supply schemes, Water demand industrial and agricultural water requirements – Design period - Population forecasting

Unit 2
Components of water supply system; Intake structures -Transmission of water, Types of pipe conduits- distribution system, Pumps, Various valves used in W/S systems, service reservoirs and design. Computer aided design of water supply system

Water Treatment Units: Conventional surface water treatment flow charts - Principles of coagulation, flocculation and sedimentation - Design principles -Filtration - Principles -Classification: slow sand filters and rapid sand filters. Disinfection - methods and disinfectants

Unit 3
Design of complete water treatment - Design of Primary sedimentation tank and secondary sedimentation tank - Design of Sand filter unit.

Introduction to advanced water treatments - polishing treatments.

Introduction to Air Pollution and control devices, Municipal Solid Wastes management and Noise Pollution
Text Book(s)

Reference(s)
Course Objectives
- To equip the students with basic understanding of theory and application of analysis and design of reinforced concrete structures.
- Understand the behavior and design of reinforced concrete components and systems subjected to gravity loads according to Indian standard building code requirements

Course Outcome
CO1: Apply knowledge of material properties, understanding design philosophies and methodologies.
CO2: Apply knowledge of design philosophies to design and analyze simple structural elements.
CO3: Evaluate, analyze and design structural elements in a building.

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Syllabus

Unit 1

Unit 2

Unit 3
Introduction to types of footing. Design of isolated footing for axially loaded & eccentrically loaded columns and combined footing. Introduction to prestress-concrete

Text Book(s)

Reference(s)
1. Park and Paulay, “Reinforced Concrete Structures”, Wiley India (P) Ltd, 2010
3. P.Dayaratnam, “Design of Reinforced Concrete Structures”. Published by Mediech, New Delhi 2018
Course Objectives

- To explain the importance of the various components of a railway track
- To impart knowledge on the design of various geometric elements of a railway track
- To highlight the factors in site selection for an airport
- To explain the design guidelines for various elements of a harbor

Course Outcome

CO1: Identify and explain the role of different components in a railway track
CO2: Design the geometric elements of a railway track
CO3: Assess the suitable location for an airport and design the landing area
CO4: Specify design guidelines for the various elements within the harbor

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Syllabus

Unit 1
Railway Engineering: Components and Geometrical Design of Railways – Horizontal Curves, Radius, Super elevation, Cant Deficiency, Transitional Curves, Different types of Gradients, Grade Compensation, Points and Crossings and their Design; Signaling & Interlocking.

Unit 2

Unit 3

Text Book(s)

Reference(s)
Prerequisite(s): 23CIE212 Structural Analysis I

Course Objectives

- Introduce to the approximate methods for analyzing Multi-storey frames.
- To make the student familiar with latest computational techniques used in structural analysis software.

Course Outcome

CO1: Analyze the multistory frames using approximate methods.
CO2: Apply flexibility matrix method to analyze the beams, frames and truss system.
CO3: Analyze the beams, frames and truss system using stiffness matrix method.
CO4: Understand the basics of Finite element analysis of structural elements

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Syllabus

Unit 1
Slope deflection method-application to the analysis of statically indeterminate beams with and without settlement of supports –rigid pointed plane frames with and without side sway
Analysis of continuous beams-theorem of three moments
Sway and non-sway analysis by moment distribution method and Kani’s method (introduction level)

Unit 2

Unit 3
Matrix methods of structural analysis – stiffness and flexibility matrices for elements and structures- analysis of continuous beams, simple rigid jointed frames and plane trusses by stiffness and flexibility method.
Introduction to FEM, Development of MATLAB code for the analysis of structural elements and validation using available software.

Text Book(s)

Reference(s)

Course Objectives

- To develop graphical skills for communicating concepts, ideas and designs
- To train students for preparing and interpreting 2D & 3D drawings for conventional structures

Course Outcome

CO1: Prepare the functional plan of the residential, commercial and public building as per building development rules
CO2: Prepare the building information models.
CO3: Prepare the detailed plan, manually and using IT tool for different buildings according to the given requirements and site conditions

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Syllabus

Developing BIM 3D models
Building Information modelling - Creating Levels and Grids, Walls Modelling, Object Modification, Doors and Windows, Floors and Roofs, Curtain, Stairs and Ramps, Dimensions and Constraints, Annotation and Documentation. Importing and modifying families of objects and elements

Functional planning – Building development rules - Space planning of buildings – Design process – planning principles. Preparation of drawings as per building development rules
- Residential building- flat and pitched roof, economic domestic units, cottages, bungalows
- Public building – small public utility shelters, dispensaries, banks, schools, offices, libraries, hostels, restaurants, commercial complexes, factories etc.
- Preparation of site plans and service plans as per Building Rules

Text Book(s)


Reference(s)

Pre Requisite:

Course Objectives
- To equip the students with basic understanding of detailing of RC structural elements
- Understand the implication of detailing in the behaviour of building

Course Outcome
CO1: Apply the knowledge of design to detail beams and slabs
CO2: Apply the knowledge of design to detail columns, beam-column joints and footings
CO3: Analyze, design and detail structural elements in a multi-storey building using a commercially available software

CO-PO Mapping

| CO  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|-----|-----|------|
| CO1 | 3   |     |     |     |     |     |     |     |     |      |      | 2   | 3    |      |      |
| CO2 | 3   | 2   | 2   |     |     |     |     |     |     |      |      |     |      | 3    |      |
| CO3 | 3   | 3   | 3   | 2   |     |     |     | 2   | 1   |      |      | 3   | 3   | 2    |      |

Syllabus

Unit 1
Preparation of Design basis report - recap of elevations, plan and section of buildings - Introduction to functions of detailing – Structural drawing for detailing – General detailing requirement – bar bending schedule - Transport, storage, fabrication, assembly and placing of steel reinforcement - Typical structural drawings - Welding

Unit 2
Detailing of (a) beams: singly, doubly, and T beams, (b) slabs: one-way, two-way, corners held down, and corners held up, (c) columns: axially loaded and bi-axially loaded, (d) beam-column joint: exterior, interior, corner, (e) footing: isolated and combined footing and (f) staircase.

Unit 3
Computer aided analysis, design, and detailing: Multi-Storey frame analyses

Text Book(s)

Reference(s)
3. Park and Paulay, “Reinforced Concrete Structures”, Wiley India (P) Ltd, 2010
5. P.Dayaratnam, “Design of Reinforced Concrete Structures”.Published by Meditech, New Delhi 2018
Course Objectives

- To give an exposure on the laboratory tests for determination of Index and Engineering properties of soil.
- Provide students the basic knowledge to carry out field investigations and to identify soils in geotechnical engineering practice.

Course Outcome

CO1: Conduct experiments to find the index and engineering properties of different types of soil.
CO2: Prepare laboratory reports on the interpretation of experimental results.
CO3: Assess the strength parameters of soil using various field tests.

CO-PO Mapping

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List of experiments

- Grain Size Distribution
- Atterberg’s limits and indices
- Determination of field density (a) sand replacement method (b) core cutter method
- Determination of coefficient of permeability by (a) Constant head method; (b) Variable head method
- Consolidation test
- Compaction test (IS light compaction)
- California Bearing Ratio test
- Direct Shear Test
- Triaxial Test
- Unconfined compressive strength test
- Demonstration of Laboratory vane shear test & Field tests – Standard Penetration Tests/Plate Load Test
Course Objectives

- To expose students to the industry working environment and get acquainted with the organization structure, business operations and administrative functions.
- To have hands-on experience so that they can relate and reinforce the teaching-learning process.
- To promote cooperation and to develop synergetic collaboration between industry and the institution.
- To set the stage for future recruitment by potential employers.

Course Outcome

CO1: Work in actual working environment.
CO2: Utilize technical resources
CO3: Prepare technical documents and give oral presentations related to the work completed.

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Students have to undergo minimum of one-week practical training in Civil Engineering related organizations of their choice with the approval of the department. At the end of the training student will submit a report as per the prescribed format to the department.
Course Objectives

- Identify and analyse the various challenge indicators present in the village by applying concepts of Human Centered Design and Participatory Rural Appraisal.
- User Need Assessment through Quantitative and Qualitative Measurements
- Designing a solution by integrating Human Centered Design concepts
- Devising proposed intervention strategies for Sustainable Social Change Management

Course Outcome

CO1: Learn ethnographic research and utilise the methodologies to enhance participatory engagement.
CO2: Prioritize challenges and derive constraints using Participatory Rural Appraisal.
CO3: Identify and formulate the research challenges in rural communities.
CO4: Design solutions using human centered approach.

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Syllabus

This initiative is to provide opportunities for students to get involved in coming up with technology solutions for societal problems. The students shall visit villages or rural sites during the vacations (after 4th semester) and if they identify a worthwhile project, they shall register for a 3-credit Live-in-Lab project, in the fifth semester.

Thematic Areas

- Agriculture & Risk Management
- Education & Gender Equality
- Energy & Environment
- Livelihood & Skill Development
- Water & Sanitation
- Health & Hygiene
- Waste Management & Infrastructure

The objectives and the projected outcome of the project will be reviewed and approved by the department chairperson and a faculty assigned as the project guide.
Pre-requisite: An inquisitive mind, basic English language skills, knowledge of high school level mathematics.

Course Objectives
- Assist students in inculcating Soft Skills and developing a strong personality
- Help them improve their presentation skills
- Aid them in developing their problem solving and reasoning skills
- Facilitate them in improving the effectiveness of their communication

Course Outcomes
CO1 - Soft Skills: To develop greater morale and positive attitude to face, analyse, and manage emotions in real life situations, like placement process.
CO2 - Soft Skills: To empower students to create better impact on a target audience through content creation, effective delivery, appropriate body language and overcoming nervousness, in situations like presentations, Group Discussions and interviews.
CO3 - Aptitude: To analyze, understand and employ the most suitable methods to solve questions on arithmetic and algebra.
CO4 - Aptitude: To investigate and apply suitable techniques to solve questions on logical reasoning and data analysis.
CO5 - Verbal: To learn to use more appropriate words in the given context. To have a better understanding of the nuances of English grammar and become capable of applying them effectively.
CO6 - Verbal: To be able to read texts critically and arrive at/predict logical conclusions. To learn to organize speech and incorporate feedback in order to convey ideas with better clarity.

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Syllabus

Soft Skills

Communication: Process, Language Fluency, Non-verbal, Active listening. Assertiveness vs. aggressiveness. Barriers in communication. Digital communication

Presentations: Need, importance, preparations, research and content development, structuring and ensuring flow of the presentation. Ways and means of making an effective presentation: Understanding and connecting with the audience – using storytelling technique, managing time, appropriate language, gestures, posture, facial expressions, tones, intonations and grooming. Importance of practice to make an impactful presentation.

Aptitude

Problem Solving II
Equations: Basics, Linear, Quadratic, Equations of Higher Degree and Problems on ages.
Logarithms, Inequalities and Modulus: Basics
Time, Speed and Distance: Basics, Average Speed, Relative Speed, Boats & Streams, Races and Circular tracks.
Logical Reasoning: Arrangements, Sequencing, Scheduling, Venn Diagram, Network Diagrams, Binary Logic, and Logical Connectives.

Verbal
Vocabulary: Aid students learn to use their vocabulary to complete the given sentences with the right words. Usage of more appropriate words in different contexts is emphasized.

Grammar (Basic-intermediate): Help students master usage of grammatical forms and enable students to identify errors and correct them.

Reasoning: Emphasize the importance of avoiding the gap (assumption) in arguments/statements/communication.

Reading Comprehension (Basics): Introduce students to smart reading techniques and help them understand different tones in comprehension passages.

Speaking Skills: Make students be aware of the importance of impactful communication through individual speaking activities in class.

Writing Skills: Introduce formal written communication and keep the students informed about the etiquette of email writing.

References:
5. The hard truth about Soft Skills, by Amazon Publication.
6. Verbal Skills Activity Book, CIR, AVVP
7. English Grammar & Composition, Wren & Martin
8. Nova’s GRE Prep Course, Jeff Kolby, Scott Thornburg & Kathleen Pierce
9. Cracking the New GRE 2012
10. Kaplan’s – GRE Comprehensive Programme
14. How to Prepare for Data Interpretation for the CAT, Arun Sharma.

Evaluation Pattern

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*CA - Can be presentations, speaking activities and tests.
Course Objectives
To explain
- the concepts of typical waste water collection and treatment system
- the design of a typical waste water collection system
- the different treatment techniques for treating domestic waste water

Course Outcome
CO 1: To understand the concepts of typical waste water collection and treatment system
CO 2: To Design and estimate for a typical waste water collection schemes
CO 3: To Design the most appropriate technique for the treatment of domestic wastewater.

CO-PO Mapping

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Syllabus

Unit 1
Waste water- Domestic and Storm water, Quantity of Sewage, Sewage flow variations. Conveyance of sewage- Sewers, shapes design parameters, operation and maintenance of sewers, Sewage pumping; Sewerage, Sewer appurtenances, Design of sewerage systems. Small bore systems, Storm Water- Quantification and design of Storm water.

Unit 2

Unit 3

Text Book(s)

Reference(s)
Course Objectives
- To equip the students with basic understanding of theory and analysis of steel buildings
- Understand the Steel’s material properties
- Understand the behavior and design of connections and structural steel elements subjected to different actions.

Course Outcome
CO1 Design the connections considering load combinations and deflection limitations.
CO2 Design members subjected to tension & Compression and built up members incorporating flexure, shear, deflection and bearing
CO3 Analyze the plastic behaviour of structural steel and design of beams and portal frames
CO4 Estimate the load on the truss due to dead weight, live load and wind load

Syllabus

Unit 1
Introduction to different structural systems, load paths, loads on buildings, and serviceability requirement – Hands-on: Modelling of steel buildings using commercially available software - Introduction to fabrication, erection aspects and inspection of completed structure. – Introduction to structural steel sections, material property, geometric properties, classes of sections, stresses, residual temperature stresses in rolled steel sections, loads. Introduction to Tubular sections. Types of connections - rigid, semi rigid. Limit state design method – basic concepts, partial safety factors, load combinations, deflection limitations as per IS 800. Analysis and design of bolted and welded connections to resist direct force and moment. Design of tension members - single and double angle ties – concepts of net section including shear lag effects and block shear.

Unit 2

Unit 3

Text Book(s)

Reference(s)
4. BIS codes (IS800-2007,IS875-1987-Parts1,II,IS875-2016-PartsIII,SP:6–Part1to6)
Course Objectives

- To provide a basic idea on construction dynamics - various stakeholders, project objectives, processes and resources required.
- To develop an ability to plan, control and monitor construction projects with respect to time and cost
- To provide an insight on how construction projects are administered with respect to contract structures and issues

Course Outcome

CO1: Apply knowledge of network scheduling techniques to identify critical activities
CO2: Apply knowledge of construction procedures in assessing different contract options
CO3: Assess quality and safety aspects in project environment
CO4: Take decisions on inventory and transportation of construction materials.
CO5: Select appropriate equipment for various construction activities

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Syllabus

Unit 1

Unit 2

Unit 3

Demonstration and Hands on exercises: Project Scheduling using project management softwares. (Enterprise, WBS, Calender, Scheduling, Critical Path, and Report generation)
Text Book(s)

Reference(s)
Course Objectives

- To provide students with theoretical and practical base to enable them to measure, cost and specify construction resources
- To develop the skill to assess the monetary value of a facility/property.
- To make the students understand the types of roles they are expected to play in the society as practitioners.

Course Outcome
CO1: Understand the ethics governing the profession and recognize the roles of stakeholders in professional practice.
CO2: Quantify the items of work and estimate material requirement for construction
CO3: Derive the cost rates and build up the overall cost of the structure.
CO4: Apply the technical specifications for various works to be performed for a project.
CO5: Understand and apply the basic principles for valuation of properties.

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Syllabus

Unit 1
Professional Practice – Respective roles of various stakeholders: Government; Standardization Bodies; professional bodies; Clients/owners; Developers; Consultants; Contractors; Manufacturers/Vendors/Service agencies.
Ethics – Definition, Professional Ethics, Business Ethics, Corporate Ethics, Engineering Ethics, Personal Ethics; Professional Responsibility, Conflict of Interest, Environmental breaches, Negligence.

Unit 2
Estimation - Measurements for various items- Introduction to the process of Estimation; Use of relevant Indian Standard Specifications for the same, taking out quantities from the given requirements of the work, comparison of different alternatives, Bar bending schedules, Mass haul Diagrams, Estimating Earthwork and Foundations, Estimating Concrete and Masonry, Finishes, Interiors, MEP works; Material survey-Thumb rules for computation of materials requirement for different materials for buildings, Use of Computers in quantity surveying; BIM and quantity take-offs.

Unit 3
Specifications - Types, requirements and importance. Detailed specifications for common building materials and items of work as per I.S specifications - Preparation of conveyance statement - Calculation of quantities of materials for items of work - Analysis of rate for items of works required for civil engineering works. - Preparation of abstract of estimate of civil engineering works. Percentage breakup of the cost, cost sensitive index.
Exercises / Term Work Assignments:
- Types of estimate - plinth area method - cubic rate method - unit rate method - bay method - approximate quantity from bill method - comparison method - cost from materials and labour - preparation of detailed estimate
- Preparation of detailed estimate using Centre line method
- Preparation of detailed estimate using Long wall - short wall method
- Preparation of detailed estimate for R.C.C Structures.
- Preparation of detailed estimate for Steel Structures.
- Preparation of detailed estimate for roads
- Preparation of detailed estimate for sanitary and water supply works
- Preparation of valuation report.
- Assignments on:
  - market survey of basic materials
  - rate analysis
  - specifications
  - simple estimates.

Text Book(s)

Reference(s)
7. Engineering Ethics, National Institute for Engineering Ethics, USA www.ieindia.org
8. Engineering ethics: concepts and cases – C. E. Harris, M.S. Pritchard, M.J. Rabins
Course Objectives
- To equip the students with basic understanding of detailing of structural steel elements
- Understand the implication of detailing in the behaviour of building

Course Outcome
CO1: Apply the knowledge of design to detail connections
CO2: Apply the knowledge of design to detail axial members, beams, and columns
CO3: Analyze, design and detail structural elements in a steel warehouse using a commercially available software

CO-PO Mapping

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Syllabus

Unit 1
Draughting practice - Key Plan and General Arrangement – Basic Detailing Conventions - Shop drawings - Erection Drawings - Detailing Quality Control and Assurance

Unit 2
Detailing Bolts and bolted joints – Detailing Welds and Welded joints - Detailing of beams – columns – panel zones – braces-roof system - Steel buildings—case studies

Unit 3
Computer aided analysis, design and detailing: warehouse building with roof truss.

Text Book(s)

Reference(s)
2. “Joints in Steel Construction: Moment Resisting Joints to Eurocode 3”, SCI Assessment
Course Objectives
- To impart knowledge in measuring the different physical water quality parameters
- To impart knowledge in measuring the different chemical water quality parameters
- To impart knowledge in measuring the optimum coagulant dose, Dissolved oxygen and Biochemical oxygen demand

Course Outcome
CO 1: Conduct experiments to understand, analyze and report the different physical water quality parameters
CO 2: Conduct experiments to understand, analyze and report the different chemical water quality parameters
CO 3: Conduct experiments to understand, analyze and report the optimum coagulant dose, Dissolved oxygen and Biochemical oxygen demand

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List of Experiments
1. Physical characterization of water: Turbidity, Electrical Conductivity, pH
2. Analysis of solids content of water: Dissolved, Settleable, suspended, total, volatile, inorganic etc.
3. Alkalinity and acidity, Hardness: total hardness, calcium and magnesium hardness
4. Analysis of ions: chloride, sulphate, sulphide, iron and manganese
5. Optimum coagulant dose
6. Dissolved Oxygen (D.O) and Biochemical Oxygen Demand (BOD)

Reference(s)

1. *Standard method for the examination of water and waste water, APHA, AWWA, WPCF Publication.*
Pre-requisite: Willingness to learn, communication skills, basic English language skills, knowledge of high school level mathematics.

Course Objectives
- Help students understand corporate culture, develop leadership qualities and become good team players
- Assist them in improving group discussion skills
- Help students to sharpen their problem solving and reasoning skills
- Empower students to communicate effectively

Course Outcomes
CO1 - Soft Skills: To improve the inter-personal communication and leadership skills, vital for arriving at win-win situations in Group Discussions and other team activities.
CO2 - Soft Skills: To develop the ability to create better impact in a Group Discussions through examination, participation, perspective-sharing, ideation, listening, brainstorming and consensus.
CO3 - Aptitude: To identify, investigate and arrive at appropriate strategies to solve questions on geometry, statistics, probability and combinatorics.
CO4 - Aptitude: To analyze, understand and apply suitable methods to solve questions on logical reasoning.
CO5 - Verbal: To be able to use diction that is more refined and appropriate and to be competent in spotting grammatical errors and correcting them.
CO6 - Verbal: To be able to logically connect words, phrases, sentences and thereby communicate their perspectives/ideas convincingly.

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Syllabus
Soft Skills

Group Discussions: Advantages of group discussions, Types of group discussion and Roles played in a group discussion. Personality traits evaluated in a group discussion. Initiation techniques and maintaining the flow of the discussion, how to perform well in a group discussion. Summarization/conclusion.

Aptitude
Problem Solving III
Geometry: 2D, 3D, Coordinate Geometry, and Heights & Distance.
Statistics: Mean, Median, Mode, Range, Variance, Quartile Deviation and Standard Deviation.
Logical Reasoning: Blood Relations, Direction Test, Syllogisms, Series, Odd man out, Coding & Decoding, Cryptarithmetic Problems and Input - Output Reasoning.

Verbal
Vocabulary: Create an awareness of using refined language through idioms and phrasal verbs.
Grammar (Upper Intermediate-Advanced): Train Students to comprehend the nuances of Grammar and empower them to spot errors in sentences and correct them.
Reasoning: Enable students to connect words, phrases and sentences logically.
Oral Communication Skills: Aid students in using the gift of the gab to interpret images, do a video synthesis, try a song interpretation or elaborate on a literary quote.

Writing Skills: Practice closet tests that assess basic knowledge and skills in usage and mechanics of writing such as punctuation, basic grammar and usage, sentence structure and rhetorical skills such as writing strategy, organization, and style.

References:
5. The hard truth about Soft Skills, by Amazon Publication.
6. Verbal Skills Activity Book, CIR, AVVP
7. English Grammar & Composition, Wren & Martin
8. Public Sector – Engineer Management Trainee Recruitment Exam (General English)
9. Nova’s GRE Prep Course, Jeff Kolby, Scott Thornburg & Kathleen Pierce
11. Quantitative Aptitude for All Competitive Examinations, Abhijit Guha.
13. How to Prepare for Data Interpretation for the CAT, Arun Sharma.
15. Quantitative Aptitude for Competitive Examinations, R S Aggarwal.

Evaluation Pattern

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*CA - Can be presentations, speaking activities and tests.

Course Outcomes:

CO # 1 - Soft Skills: At the end of the course, the students will have the ability to prepare a suitable resume (including video resume). They would also have acquired the necessary skills, abilities and knowledge to present themselves confidently. They would be sure-footed in introducing themselves and facing interviews.

CO # 2 - Soft Skills: At the end of the course, the students will have the ability to analyse every question asked by the interviewer, compose correct responses and respond in the right manner to justify and convince the interviewer of one’s right candidature through displaying etiquette, positive attitude and courteous communication.

CO # 3 - Aptitude: At the end of the course, students will be able to interpret, critically analyze and solve logical reasoning questions. They will have acquired the skills to manage time while applying methods to solve questions on arithmetic, algebra, logical reasoning, and statistics and data analysis and arrive at appropriate conclusions.

CO # 4 – Verbal: At the end of the course, the students will have the ability to understand and use words, idioms and phrases, interpret the meaning of standard expressions and compose sentences using the same.

CO # 5 - Verbal: At the end of the course, the students will have the ability to decide, conclude, identify and choose the right grammatical construction.

CO # 6 – Verbal: At the end of the course, the students will have the ability to examine, interpret and investigate arguments, use inductive and deductive reasoning to support, defend, prove or disprove them. They will also have the ability to create, generate and relate facts / ideas / opinions and share / express the same convincingly to the audience / recipient using their communication skills in English.

Team work: Value of team work in organisations, definition of a team, why team, elements of leadership, disadvantages of a team, stages of team formation. Group development activities: Orientation, internal problem
solving, growth and productivity, evaluation and control. Effective team building: Basics of team building, teamwork parameters, roles, empowerment, communication, effective team working, team effectiveness criteria, common characteristics of effective teams, factors affecting team effectiveness, personal characteristics of members, team structure, team process, team outcomes.

Facing an interview: Foundation in core subject, industry orientation / knowledge about the company, professional personality, communication skills, activities before interview, upon entering interview room, during the interview and at the end. Mock interviews.

Advanced grammar: Topics like parallel construction, dangling modifiers, active and passive voices, etc.

Syllogisms, critical reasoning: A course on verbal reasoning. Listening comprehension advanced: An exercise on improving listening skills.

Reading comprehension advanced: A course on how to approach advanced level of reading, comprehension passages. Exercises on competitive exam questions.

Problem solving level IV: Geometry; Trigonometry; Heights and distances; Co-ordinate geometry; Mensuration.

Specific training: Solving campus recruitment papers, national level and state level competitive examination papers; Speed mathematics; Tackling aptitude problems asked in interview; Techniques to remember (in mathematics). Lateral thinking problems. Quick checking of answers techniques; Techniques on elimination of options, estimating and predicting correct answer; Time management in aptitude tests; Test taking strategies.

TEXTBOOK(S)

5. The Hard Truth about Soft Skills, by Amazon Publication.
6. Data Interpretation by R. S. Aggarwal, S. Chand
7. Logical Reasoning and Data Interpretation – Niskit K
8. SinkhaPuzzles – Shakuntala Devi

REFERENCE(S)

2. The BBC and British Council online resources Owl Purdue University online teaching resources
3. www.grammarbook.com - online teaching resources www.englishpage.com- online teaching resources and other useful websites.
Course Objectives

To provide an awareness on the types and impacts of disasters and concepts of disaster management

Course Outcome

CO1: Analyze relationship between Development and Disasters.
CO2: Understand impact of Disasters and realization of societal responsibilities
CO3: Apply Disaster management principles

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Syllabus

Unit 1
Introduction - Concepts and definitions. Disasters - Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); man-made disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc.)

Unit 2
Hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility. Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, land use changes, urbanization etc.)
Disaster Impacts - Disaster impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.

Unit 3
Disaster Risk Reduction (DRR) - Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post disaster environmental response (water, sanitation, food safety, waste management, disease control, security, communications); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

Text Book(s)

Reference(s)
Course Objectives

- Proposal writing in order to bring in a detailed project planning, enlist the materials required and propose budget requirement.
- Use the concept of CoDesign to ensure User Participation in the Design Process in order to rightly capture user needs/requirements.
- Building and testing a prototype to ensure that the final design implementation is satisfies the user needs, feasible, affordable, sustainable and efficient.
- Real time project implementation in the village followed by awareness generation and skill training of the users (villagers)

Course Outcome

CO1: Learn co-design methodologies and engage participatorily to finalise a solution
CO2: Understand sustainable social change models and identify change agents in a community.
CO3: Learn Project Management to effectively manage the resources
CO4: Lab scale implementation and validation
CO5. Prototype implementation of the solution

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Syllabus

The students shall visit villages or rural sites during the vacations (after 6th semester) and if they identify a worthwhile project, they shall register for a 3-credit Live-in-Lab project, in the fifth semester.

Thematic Areas

- Agriculture & Risk Management
- Education & Gender Equality
- Energy & Environment
- Livelihood & Skill Development
- Water & Sanitation
- Health & Hygiene
- Waste Management & Infrastructure
Course Objectives

- To explain the relevance of various components of hydrologic cycle, which impacts the spatial and temporal distribution of water resources.
- To provide an insight on the groundwater resources under different hydro-geological conditions and movement of groundwater.
- To impart the knowledge about design of various water resources infrastructure.

Course Outcome

CO1: Understand and quantify the hydrological processes
CO2: Apply basics of storm hydrology to estimate the catchment rainfall and runoff for various hydrological applications.
CO3: Understand and apply the reservoir planning characteristics and operational practices for various purposes.
CO4: Comprehend the channel flow theories and apply in design of irrigation water distribution systems.

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Syllabus

Unit 1

Unit 2
Groundwater and well hydrology – types of aquifers - aquifer properties – Darcy’s law –
Unit 3

Introduction to Hydrologic Modelling System (using HEC-HMS) - River Analysis System (using HEC-RAS)

Text Book(s)

Reference(s)
Course Objectives
- Improve the design capability of the student to handle practical problems through proper guidance and ensure students are industry ready after graduation.

Course Outcome
CO1: Apply the engineering knowledge acquired to make preliminary investigations and do functional and/or structural design of a facility.
CO2: Estimate the material and/or cost requirement involved in a project.
CO3: Present the project with clarity, following ethical norms in oral and written mode
CO4: Develop a team and effectively participate in the team to execute the project
CO5: Address environmental / social / engineering problems through the project

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Students are required to conceive a design problem in any one of the disciplines of Civil Engineering such as, Design of an RC structure, Design of a wastewater treatment plant, Design of a foundation system, and Design of traffic intersection. Group of students comprising of not more than four are allowed to form a team and work on the project. At the end of the course, each group should submit a complete report on the design problem consisting of the data given, the design calculations, specifications if any and complete set of drawings, which follow the design.
Course Objectives

- To provide overview of all Civil Engineering topics covered in the curriculum
- To assess the overall knowledge level of Civil Engineering topics and guide them to take corrective measures wherever deficiencies are identified.

Course Outcome

CO1: Review and apply the engineering knowledge acquired to different situations.

**CO-PO Mapping**

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Syllabus

Review of the following topics of civil engineering:
- Characteristics of various engineering materials.
- Various classical methods in analysis of structures.
- Matrix methods of analysis of structures.
- Overview of Design of RCC and Steel Structures.
- Overview on Fluid Mechanics and Machinery.
- Overview of Elements of Irrigation and Hydraulic Structures.
- Overview on Surveying.
- Overview on Water Supply and Sewerage.
- Overview of Transportation Engineering covering Roads, Railway, Docks and Airport Engineering.
- Overview of Aspects of Geotechnical Engineering.
- Principles of Construction Engg. & Management

Students need to submit a complete report on the any construction related project starting from site clearing till the completion of the project.

Reference(s)

Course Objectives

• To know about Indian constitution
• To know about central and state government functionalities in India
• To know about Indian society

Syllabus

Unit 1

Unit 2
Union Government – Structures of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India – Judicial Review.

Unit 3

Text Book(s)

Reference(s)
Course Objectives

- To expose students to the industry working environment and get acquainted with the organization structure, business operations and administrative functions.
- To have hands-on experience so that they can relate and reinforce the teaching-learning process.
- To promote cooperation and to develop synergetic collaboration between industry and the institution. To set the stage for future recruitment by potential employers.

Course Outcome

CO1: Work in actual working environment.
CO2: Utilize technical resources
CO3: Prepare technical documents and give oral presentations related to the work completed.

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Students have to undergo minimum of two-week practical training in Civil Engineering related organizations of their choice but with the approval of the department. At the end of the training student will submit a report as per the prescribed format to the department.
Course Objectives

- To work on a topic in the field of Civil Engineering which could involve theoretical and/or fabrication and/or experimental and/or computational work.

Course Outcome

CO1: Apply the engineering knowledge acquired to do literature survey and make preliminary studies to investigate an engineering problem.
CO2: Present the project with clarity, following ethical norms in oral and written mode
CO3: Develop a team and effectively participate in the team to execute the project
CO4: Address environmental / social / engineering problems through the project

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The student is expected to start the initial planning and preparation for the final semester project. They have to identify their team, project advisor and, plan the objectives, scope, methodology and the work schedule. A detailed literature review is also expected in this phase.
Course Objectives

- To work on a topic in the field of Civil Engineering which could involve theoretical and/or fabrication and/or experimental and/or computational work or as a capstone design.

Course Outcome

CO1: Create a set up through proper design and investigate the system using the engineering knowledge acquired
CO2: Estimate and manage the time, material and cost aspects of the project
CO3: Present the project with clarity, following ethical norms in oral and written mode
CO4: Develop a team and effectively participate in the team to execute the project
CO5: Address environmental / social / engineering problems through the project

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Depending on the satisfactory performance of students in ‘Minor project’, they can continue the work for the ‘Project’. Students eligible for distinction and those who are aiming higher studies will be encouraged to continue with the research oriented works. Instead of research oriented projects, students will also have the option of doing Capstone designs as the requirement for ‘Project’, preferably with guidance from an industry mentor.
PROFESSIONAL ELECTIVE COURSES (With Prerequisites)

23CIE331  ADVANCED CONCRETE DESIGN  L-T-P-C 2-1-0-3

Prerequisite(s): 23CIE303 Behaviour & Design of Reinforced Concrete Structures

Course Objectives
- The course focuses on understanding the behavior, design and detailing of reinforced concrete retaining walls, storage structures and Bridge components according to the Indian standard building code requirements and on par with current Industry practices

Course Outcome
CO1: Design the structural elements in a building
CO2: Analysis Design of earth retaining and liquid retaining systems
CO3: Design Bridge super structure

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Syllabus

Unit 1

Unit 2
Earth Retaining structures - Retaining walls- types - cantilever and counterfort - Analysis of earth retaining structures using commercially available software - design of retaining wall - drainage and construction details. Liquid Retaining structure - Water tanks - types - square, rectangular, circular - Analysis of water retaining structures using commercially available software- Design of underground and elevated tanks - design of staging. Design of circular silo using Jansen's theory - Preparation of design sheets for earth and water retaining structures

Unit 3
Introduction to bridge and its components - Analysis of bridge deck using commercially available software- Bridges - Slab Bridge - Design of single span slab bridge - Tee Beam Bridge with cross girders.

Term Project

Text Book(s)

Reference(s)
Prerequisite(s): 23CIE312 Behaviour & Design of Steel Structures

Course Objectives
- To understand the behavior and analysis of steel structures subjected to combined loads.
- To understand the design and detailing of steel structures according to the INDIAN STANDARD building code requirements and on par with current Industry practices.

Course Outcome
CO1: Design the eccentrically loaded compression members and their base plates.
CO2: Analyze and design the plate girder, gantry girder and its components
CO3: Evaluate, analyze and design the PEB and its components.

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Syllabus

Unit 1
Introduction to beam-column - behavior - strength interaction - design of beam column - beam column subjected to combined forces - column bases - slab base - gusseted base -moment resistant base plate - Seismic Requirement for framed buildings - Design of members in braced frames - Design of members in un-braced frames - Introduction to Composite Construction – Shear Connectors – Composite beams – Introduction to fatigue behaviour of members.

Unit 2

Unit 3
Analysis and design of Pre-engineered Building design of purlins and wall girts using Channel and Angle sections; cold formed steel purlin– Design of wind bracings. Screws and rivets in cold formed steel construction. Types of connections, Behaviour of local elements, Analysis, Design and Detailing. Cold Formed Steel Members: Effective width and Direct Strength Design methods.

Text Book(s)

Reference(s)
4. BIS codes (IS800-2007, IS875-1987-Parts I, II, IS875-2016-PartsIII, SP-6–Part 1 to 6)
Prerequisite(s): 23CIE303 Behaviour & Design of Reinforced Concrete Structures

Course Objectives

- The objective is to equip the students with basic understanding of theory and application of analysis and design of prestressed concrete structures. The course focuses on understanding the behavior and design of reinforced concrete components and systems subjected to gravity loads according to the Indian standard code requirements and on par with current Industry practices.

Course outcomes

CO1: Understand the concept of prestressing and apply it suitably in construction.
CO2: Analyse and design the prestressed concrete members for ULS and SLS of flexure, shear and torsion
CO3: Design the pre-stressed concrete pipes and tanks

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Syllabus

Unit 1
Historical developments – Basic principles of prestressing – Classification and types – Advantages over ordinary reinforced concrete – Materials – High strength concrete and high tensile steel – Methods of prestressing – Analysis of sections of stresses by stress concept, strength concept and load balancing concept – Location of pressure line - Losses of prestress in post-tensioned and pre-tensioned members.

Unit 2
Basic assumptions for calculating flexural stresses – Permissible stresses in steel and concrete as per IS 1343 – Design of sections of Type I and Type II pre tensioned and post-tensioned beams –Factors influencing deflections – Short term deflections of uncracked members – Prediction of long term deflections due to creep and shrinkage – Check for serviceability limit state of deflection. Determination of anchorage zone stresses in pre tensioned and post-tensioned beams by IS 1343 – design of anchorage zone reinforcement – Check for strength limit based on IS 1343 – Layout of cables in pre tensioned post-tensioned beams – Design for shear based on IS 1343.

Unit 3
Analysis and design of composite beams - Shrinkage strain and its importance.
Partial prestressing – Definition, methods of achieving partial prestressing, merits and demerits of partial prestressing.
Circular prestressing- Design of Prestressed Concrete Pipes and water tanks

Text Book(s)

Reference(s)
8. ACI 318-14 Building Code Requirements for Structural Concrete and Commentary, 2014
Prerequisite(s): 23CIE305 Structural Analysis II, 23CIE303 Behaviour & Design of Reinforced Concrete Structures

Course Objectives
- To explain basic concepts related to dynamics of single degree of freedom systems
- To explain basic concepts related to dynamics of multiple degree of freedom systems
- To introduce code provisions to estimate seismic demand as per relevant code
- To explain provisions related to seismic design of buildings as per relevant code

Course Outcome
CO1: Explain the importance of structural dynamics with basic terminology
CO2: Assess and analyse the single DOF and 2 DOF structures and its responses
CO3: Understand the development of seismic design and engineering seismology
CO4: Understand the concept of analysis and design of earthquake resistant simple framed structures.

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Syllabus

Unit1 Structural Dynamics

Unit2 Earthquake Engineering

Unit3 Code Provisions

Textbook(s)
Pankaj Agarwal and Manish Shrikhande, “Earthquake Resistant Design of Structures”, PHI Learning, 2009

Reference book(s)
3. IS1893(1) 2016, Criteria for Earthquake Resistant structures General Provisions and Buildings
4. IS13988 (2013), Seismic Evaluation and Strengthening of Existing Reinforced Concrete Buildings — Guidelines
5. IS 13920 (2016), Ductile Design and Detailing of RC Structures subject to Seismic Forces —Code of Practice
Prerequisite(s): 23CIE303 Behaviour & Design of Reinforced Concrete Structures, 23CIE333 Prestressed Concrete - Analyses, Design And Construction and 23CIE312 Behaviour & Design of Steel Structures

Course Objectives

- The course focuses on understanding the behavior and design of various bridge components according to the Specification of Indian Road Congress code requirements and on par with current Industry practices

Course Outcome

CO1: Understand the need and importance of preliminary investigation on bridge construction site.
CO2: Familiarize the specification of road bridges and loads to be considered.
CO3: Design components of different types of bridges and assess load carrying capacity of bridges.

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Syllabus

Unit 1
Components of bridges - Classification of bridges – Importance and investigation for bridges – Hydrology - design flood discharge, linear waterway and scour depth – Choice of Bridge Type, subsoil exploration, location of piers and abutments. Specification of road bridges – width of carriage way, IRC loads to be considered, calculation of live load by effective width method.

Unit 2
General Design Consideration – design of pipe culvert, design of Slab Bridge, design of T-beam Bridge, design of box culverts – Components and design principles of RC balanced cantilever bridge and Prestress concrete bridges.
Type of sub structures – Forces acting on substructures – Design of abutments, piers – Types of Foundations

Unit 3

Text book(s)

Reference book(s)

23CIE336  FINITE ELEMENT METHODS  L-T-P-C: 3-0-0-3

Prerequisite(s): 23CIE305 Structural Analysis II

Course objectives

- Explain the fundamental concepts of finite element method and solve structural problems by selecting a suitable element, developing stiffness & force matrices and incorporating boundary conditions.
- Use mathematical and approximate methods to solve the boundary value problems

Course Outcome

CO1: Solve boundary value problems using various approximate methods
CO2: Develop mathematical formulations for structural systems
CO3: Analyse the structural elements like truss, beam etc by formulating stiffness matrix

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Syllabus

Unit 1
Boundary value problems and the need for numerical discretisation: Introduction, examples of continuum problems, history of finite element method.
Weighted residual methods: Approximation by trial functions, weighted residual forms, piecewise trial functions, weak formulation, Galerkin method, examples of one-, two- and three-dimensional problems.
Variational methods: Variational principles, establishment of natural variational principles, approximate solution of differential equations by Rayleigh-Ritz method, the use of Lagrange multipliers, general variational principles, penalty functions, least-square method.

Unit 2
Isoparametric formulation: The concept of mapping, isoparametric formulation, numerical integration, mapping and its use in mesh generation.
Higher order finite element approximation: Degree of polynomial in trial functions and rate of convergence, the patch test, shape functions for C0 and C1 continuity, one-, two- and three-dimensional shape functions.

Unit 3
Coordinate Transformation: Transformation of vectors and tensors, transformation of stiffness matrices, degree of freedom within elements, condensation, condensation and recovery algorithm, substructuring, structural symmetry.
Formulation of stiffness matrix, member approach for truss and beam element, node numbering, assembly of element equations, formation of overall banded matrix equation, boundary conditions and solution for primary unknowns, Equilibrium and compatibility in solution- applications to truss and beam.

Text book(s)
Reference book(s)
Prerequisite(s): 19CIE211 Geology and Soil Mechanics and 19CIE 301 Geotechnical Engineering

Course Objective
Introduction to the necessity, identification, and process of ground improvement
Finding alternative methods and suggesting recommendations for improving strength and drainage conditions.

Course Outcome
CO1: Evaluate the various ground improvement techniques using mechanical methods such as compaction, Vibro-flotation, preloading etc.
CO2: Analyze the various types of drainage techniques like incorporation of geosynthetics, pre-compression methods
CO3: Examining the effectiveness of chemical additives and reinforcing materials in ground improvement.

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Syllabus

Unit 1
Objective of ground improvement, in-situ ground improvement methods, Introduction to soil improvement without admixtures- mechanical methods like Surface compaction, Compaction methods: moisture density relations – compactive efforts – field methods – surface compaction, deep compactions- vibro-probes, Stone columns. Introduction to soil improvement with addition of admixtures, soil reinforcement - geosynthetics

Unit 2

Unit 3
Stabilization methods: mechanical, use of admixtures- cement, lime, chemical methods of stabilization of soils – Reinforcing materials, reinforced earth retaining walls, reinforced embankments, soil nailing, Geosynthetics- types, general applications, types of geotextiles and geogrids, physical and strength properties of geotextiles and geogrids, Behavior of soils on reinforcing with geotextiles and geogrids, design aspects with geotextiles and geogrids.

Text book(s)

Reference(s)


Prerequisite(s): 23CIE211 Geology and Soil Mechanics & 23CIE301 Geotechnical Engineering

Course Objectives

- The student should be able to conduct a site investigation by himself.
- After site investigation one should be able to finalize the footing and propose the safe bearing capacity
- To understand the mechanism of load transfer mechanism in deep foundations
- To have basic idea of machine foundations

Course Outcome

CO1: Become confident to propose the safe bearing capacity (SBC) for any soil in any situations.
CO2: To be able to design and analyse SBC of Shallow foundation
CO3: To be able to design and analyse SBC of deep foundation
CO4: To be able to analyse retaining wall, sheet pile and brace cut
CO5: To be able to design and analyse machine foundations

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Syllabus

Unit 1
Subsurface Exploration: Boring, Sampling, SPT, CPT, Geophysical methods, Bore log and soil report. Shallow Foundations: Bearing capacity theories-Terzaghi, Meyerhoff, Hansen; SBC based on SPT, layered soils, eccentric and inclined loads. Bearing capacity on slopes, Foundation settlements

Unit 2

Unit 3

Text book(s)
Reference(s)
Prerequisite(s): 23CIE211 Geology & Soil Mechanics

Course Objectives

- To explain the effects of pollution on soil and its impact on soil properties.
- Introduce to the mechanisms of groundwater contamination
- Give an exposure to rules and regulations on waste handling and management
- Introduction to design of landfill and soil remediation methods.

Course Outcome

CO1: Understand the effect of pollution on the various properties of soil and analyze the problems posed by them.
CO2: Analyze the different types of wastes, their generation and effects
CO3: Understand the general principles of groundwater contamination management
CO4: Apply the knowledge of engineering judgement to analyze and design engineering landfill.

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Syllabus

Unit 1
Environmental cycles- Soil and water- Environmental interaction relating to geotechnical problems- Effect of pollution on soil-water behaviour
Origin, nature and distribution of soil - Soil fabric and structure- Basic structural units of clay minerals- Isomorphous substitution- Kaolinite mineral- Montmorillonite mineral- Illite mineral- Electric charges on clay minerals- Ion exchange capacity- Diffused double layer- Adsorbed water- Soil structure- Methods for the identification of minerals (introduction only)
Effect of drying on Atterberg limits- Shrinkage, swelling and cracking characteristics of soil - Electrochemical characteristics of soil-water System - Sensitivity of soil to environment - Soil-water-air interaction - Activity, sensitivity, causes of sensitivity- Influence of exchangeable cations, pH and organic matter on properties of soils- Permeability of soils- Hydraulic conductivity of different types of soils- Darcy’s law and its validity- Factors affecting permeability

Unit 2
Sources, types and composition of different wastes - Characteristics and classification of hazardous wastes- Generation rates- Potential problems in soils due to contaminants
Ground water flow - Sources of ground water contamination- Contaminant transport - Pollution of aquifers by mining and liquid wastes- Ground water pollution downstream of landfills - Transport mechanisms
CPCB rules and regulations on waste handling and management- Criteria for selection of sites for waste disposal- Disposal techniques-Disposal systems for typical wastes
Ground modification and waste modification techniques in waste management- Ground modification- Mechanical modification, hydraulic modification, chemical modification

Unit 3
Liners and covers for waste disposal- rigid and flexible liners- Leachate and gas collection system - Engineered
landfills (including basal liner and cover liner systems) - components - design criteria
Hydrological design for ground water pollution control
Soil contamination and remediation technology for both ground and aquifers

Reference(s)
Prerequisite(s): 23CIE211 Geology and Soil Mechanics

Course Objective
- To acquire knowledge about the types and functions of various geosynthetics and their manufacturing process.
- To understand the design principles of reinforced soil structures.

Course Outcome
CO1: Testing and valuation of various properties of geosynthetics used in soil structures
CO2: Principle of soil reinforcement and design of reinforced soil retaining structures
CO3: Design of drains for consolidation

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Syllabus

Unit 1
Background of reinforced earth, mechanism and concepts- Basis of reinforced earth wall design- Geosynthetics classifications- functions- applications- raw materials used. Different types of Geosynthetics- manufacturing, system- Design and sustainability. Various properties of Geosynthetics, physical properties, mechanical properties, hydraulic properties & endurance properties- Mechanism of filtration and drainage functions & their applications

Unit 2

Unit 3
Consolidation techniques, Development of design chart for prefabricated vertical drains, ground instrumentation and monitoring, Design of encased stone columns, geocell/geofoam systems. Bearing capacity of Geosynthetics reinforced soil system, geocell reinforced sand overlaying soft clay- Applications, advantage, function of geofoam, physical, mechanical and thermal properties of geofoam, design of embankment using geofoam, geofoam reinforced soil walls.

Text book(s)

Reference(s)
## Evaluation Pattern

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*CA - Can be Quizzes, Assignment, Projects and Reports
Prerequisite(s): 23CIE211 Geology and Soil Mechanics

Course Objective
- Understand the importance of geosynthetics in Civil Infrastructure development.
- Design of reinforced geo-structures

Course Outcome
CO1: Understand different types of geosynthetics.
CO2: Design of geosynthetics for geotechnical challenges
CO3: understand the usage of geosynthetics for drainage functions.

CO-PO Mapping

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Syllabus

Unit 1

Unit 2
Slope stability analysis: Finite and infinite slopes- Modes of failures- In-situ slope stabilization- Design of reinforced slopes- Embankments on soft soils
Facing elements: Construction procedure, design of Geosynthetics wrap around faced wall, geogrid reinforced soil walls, geocell wall, gabion wall

Unit 3

Text book(s)

Reference(s)
Evaluation Pattern

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*CA - Can be Quizzes, Assignment, Projects and Reports
ENVIRONMENTAL ENGINEERING

23CIE351 ADVANCED ENVIRONMENTAL ENGINEERING L-T-P-C: 3-0-0-3

Prerequisite(s): 23CIE302 Environmental Engineering I, 23CIE311 Environmental Engineering II

Course Objectives

- To discuss the various air pollutants and their control strategies
- To discuss the waste water treatment options for removal of nitrogen and phosphorus
- To discuss the waste water treatment options for removal of emerging contaminants

Course Outcome

CO1: Analyze the air pollutants and select the most appropriate technique for the treatment of air pollutants
CO2: Analyze the waste water quality and design the treatment unit for removal of nitrogen and phosphorus
CO3: Analyze the quality of water and design the treatment unit for removal of emerging contaminants

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Syllabus

Unit 1
Instrumental methods for analysis of contaminants in air, water and soil - colorimetry, Chromatography, spectroscopy, electrochemical probes
Indoor and outdoor air pollution – meteorology-influence of solar radiation and wind fields - lapse rate and stability conditions - characteristics of stack plumes - effective stack height.
Characteristics and health effects of various air pollutant particulates (PM2.5, PM10) and gaseous pollutants (CO, NOx, SOx, etc)- their behaviour in atmosphere – monitoring.
Photochemical reactions - secondary pollutants.
Control devices for Particulate and Gaseous pollutants – applications.

Unit 2
Aerobic attached growth Process – Rotating biological contactor, Activated Biofilter – Fluidized bed bioreactor (FBBR) design criteria.
Anaerobic suspended and attached growth process - Up flow anaerobic sludge blanket reactor.

Unit 3
Text book(s)

Reference(s)
Prerequisite(s): 23CIE302 Environmental Engineering I, 23CIE311 Environmental Engineering II

Course Objectives

- To discuss the characteristics of Industrial wastes and pollution prevention strategies
- To discuss the Preliminary treatment of industrial waste water from different industries
- To discuss the Effluent generation and treatment for textile, paper, dairy and fertilizer industry,

Course Outcome

CO1: Understand the characteristics of Industrial wastes and develop a holistic view on pollution prevention strategies
CO2: Analyze and design the Preliminary treatment unit for industrial waste waters.
CO3: Analyze and design the treatment scheme for textile, paper, dairy and fertilizer industry

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Syllabus

Unit 1

Unit 2

Unit 3

Reference(s)


CONSTRUCTION TECHNOLOGY & MANAGEMENT

23CIE361 CONCRETE TECHNOLOGY  L-T-P-C: 3-0-0-3

Prerequisite(s): 23CIE204 Construction Engineering - Materials & Methods

Course Objectives

1. To highlight the fundamental concepts and behavioural aspects of various materials in concrete, types of concrete and their manufacture and applications.
2. To introduce concrete mix proportioning for various conditions using Indian standards and ACI standards

Course Outcome

CO1: Select the suitable ingredients for concrete and suggest suitable laboratory test to check its property.
CO2: Evaluate the properties of ordinary concrete and special concrete based on the destructive and non-destructive tests.
CO3: Evaluate durability related issues in concrete and suggest preventive measures.
CO4: Apply the modern methods in concrete manufacturing
CO5: Proportion the concrete mixtures to meet performance requirements.

CO-PO Mapping

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Syllabus

Unit 1
Materials: cement - different types - chemical composition and physical properties - tests on cement - I.S. specifications - aggregates - classification - mechanical properties and tests as per I.S. - alkali aggregate reaction - grading requirements - heavy weight - light weight - normal weight - aggregate - sampling of aggregate - water quality of water - admixtures - accelerators - retarders - water reducing agents - super plasticizers - use of silica fumes
Properties of fresh concrete - workability - factors affecting workability - tests for workability - segregation and bleeding.

Unit 2
Unit 3
Introduction to Non-destructive test methods.

Text book(s)

Reference(s)
Prerequisite(s): 23CIE204 Construction Engineering - Materials & Methods

Course Objectives

- To explain the mechanisms of degradation of structures
- To introduce field monitoring and non-destructive evaluation of structures.
- To give an exposure on the materials and techniques for strengthening or upgrading existing structural systems.

Course Outcome

CO1: Apply the knowledge of construction materials and techniques to analyze building durability problems
CO2: Evaluate the common defects and distress in construction through diagnostic procedures
CO3: Select suitable materials and methods for protection and repair.
CO4: Apply maintenance and strengthening approaches to situations
CO5: Analyze and develop report for simple maintenance and repair problems.

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Syllabus

Unit 1
Durability: Life expectancy of different types of buildings – influence of environmental elements such as heat, moisture, precipitation and frost on buildings- Effect of biological agents like fungus, moss, plants, trees, algae - termite control and prevention - chemical attack and impact of pollution on building materials and components- Aspects of fire damage and assessment.

Unit 2
Common defects in buildings and control measures - maintenance philosophy - phases of maintenance.
Materials for repair - special mortar and concretes, concrete chemicals, admixtures, special cements and high grade concrete.

Unit 3
Waterproofing methods.
Strengthening measures- flexural strengthening, beam shear capacity strengthening, column strengthening, shoring, under pinning and jacketing
Conservation of historic buildings -materials and methods - examples.
Text book(s)

Reference(s)
Prerequisite(s): 23CIE204 Construction Engineering - Materials & Methods

Course Objectives

- To highlight the basic concepts of architectural composition in the development of built environment.
- To expose the students to the concepts of functional design of buildings in tropical climates.
- Assessing comprehension of the course through case studies given as project work.

Course Outcome

CO1: Apply knowledge of architectural design principles to critically evaluate building form and space
CO2: Apply knowledge of thermo-physical properties of materials in evaluating heat flow through buildings
CO3: Evaluate quality of indoor climate based on thermal comfort indices and suggest control methods
CO4: Evaluate the natural and artificial lighting of indoor spaces
CO5: Apply knowledge of behavior sound in free field and enclosures to analyze acoustical features.

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Syllabus

Unit 1

Principles of architectural design: Factors influencing architectural development-examples. Primary elements – Form and Space.
Organizing principles in architecture – symmetry – hierarchy – axis, linear, concentric, radial – asymmetric grouping-
Role of colour, texture, shapes/forms in architecture. Forms related to materials and structural systems. Architecture as part of the environment.

Unit 2


Unit 3

Potential case studies
1. Critical review based on architectural design principles - ancient/monumental/modern buildings
2. Case study on thermal or visual comfort audit for a commercial/office building
3. Exposure to Energy simulation tools

Text book(s)

Reference(s)
Course Objective

- Promote an approach to project conception and evaluation that is based on an appreciation of the needs of society, with orientation towards industry and standard practices.

Course Outcome

CO1: Analyse the influence of climate on comfort levels in built environment
CO2: Assess building energy issues and suggest design options
CO3: Propose strategies for water conservation and waste recycling
CO4: Apply green project management concepts in building construction

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Syllabus

Unit 1
Introduction to Sustainability: Overview of Sustainability and Green buildings, Selection of site –preservation and planning.


Heat transfer in buildings: Conduction/Convection/radiation heat transfer


Sustainable building materials: Features of sustainable building materials and sustainable alternatives.

Unit 2
Resource and waste management in buildings:

Water Efficiency –Planning and design of water management system, Rain water harvesting, Water efficient design and fixtures, Treatment and reuse, Water efficient landscape system.


Unit 3
Green project management and Life Cycle Assessment of Buildings:
Green building evolution and Different phases of Green building project management. Life cycle assessment and its types –Modelling and Analysis, Greenhouse gas emission

Sustainability rating systems: Green building rating systems-LEED, BREEAM and others, Indian Green building rating systems –IGBC & GRIHA, IGBC criteria for certification.

Potential case studies
1. Case study on thermal comfort audit for a commercial building
2. Energy audit for commercial building
3. Exposure to Energy simulation tools

143
Text Book

Reference(s)
Prerequisite(s): 23CIE313 Construction Management

Course Objective

• To expose the students to the concepts of construction finance such as comparing alternatives proposals, evaluating alternative investments, cost estimating and management of accounting.

Course Outcome

CO1: Apply time-value of money concept to compare alternatives
CO2: Analyse equipment cost and replacement alternatives.
CO3: Prepare different types of cost estimates
CO4: Understand the financial management procedures and estimate the financial ratios

CO-PO Mapping

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Syllabus

Unit 1
Engineering economics: Basic principles – Time value of money, Quantifying alternatives for decision making, Cash flow diagrams, Equivalence - Single payment in the future (P/F, F/P), Present payment compared to uniform series payments (P/A, A/P), Future payment compared to uniform series payments (F/A, A/F), Arithmetic gradient, Geometric gradient. Funds: cash flow, sources of funds; Histograms and S-Curves. Earned Value.

Unit 2
Comparison of alternatives: Present, future and annual worth method of comparing alternatives, Rate of return, Incremental rate of return, Break-even comparisons, Capitalized cost analysis, Benefit-cost analysis. Depreciation, Inflation and Taxes
Equipment economics: Equipment costs, Ownership and operating costs, Buy/Rent/Lease options, Replacement analysis.

Unit 3
Cost estimating: Types of Estimates, Approximate estimates – Unit estimate, Factor estimate, Cost indexes, Parametric estimate, Life cycle cost.

Text book(s)

Reference(s)
Course Objectives

- To provide an overview of the fundamentals of workplace occupational safety and health, covering numerous workplace risks and risk mitigation strategies.
- To develop a grasp of national and international safety and health rules and standards.
- To understand the importance of safe work systems as well as key parts of various incident investigation approaches and emergency response processes.

Course Outcomes

- CO1: Understand and interpret the significance of occupational health and safety. CO2: Assess safety metrics and safety performances.
- CO2: Understand the need for safety regulations and legislation at the national level and infer their importance.
- CO3: Evaluate workplace hazards and incidents using various analysis and investigation techniques.
- CO4: Understand the Safety and health management system and identify its fundamental requirements.

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Syllabus

Unit 1
Significance of occupational safety and health at workplace - Classification of incidents - Calculation of safety metrics - Safety legislation in India - Safety in design.

Unit 2
Workplace hazards and control - Role of the working environment in safety - Safe systems of work - Hazardous material handling - Hazard analysis techniques.

Unit 3
Process safety management - Occupational health and hygiene - Incident investigation procedures — Safety and health management systems.

Textbooks/Reference books:

Course Objectives

- To highlight the use of BIM models based on real-world construction projects
- To explain the modelling and analysis using BIM software.
- To give an overview of clash detection and avoidance using BIM
- To give an exposure on BIM 4D and 5 D models.

Course Outcome

CO1: Create BIM model for effective coordination during planning, design and execution.
CO2: Identify clash and avoid it’s occurrence.
CO3: Apply the concept of BIM 4D for project scheduling
CO4: Apply the concept of 5D BIM for quantity takeoff and estimation

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Syllabus

Unit 1


Unit 2

CDE, Level of Development (LOD)- Level of Detail & Level of Information, LOD - for all elements- Chart & Matrix

Unit 3

5D BIM and Quantity Take off with UOM, Exercise & Demo, Quantity Take Off, 5D – Estimation and Analysis, Cost Control, Asset Information Model, COBie and Deliverables, Space Attributes, Asset Attributes and Asset requirement, Infrastructure System, Information Exchange with Facility Management.

Industrialization of Construction through BIM – DfMA, IoT in BIM, Data analytics using AI and ML, Smart Infrastructure, Digital Twin –Connected Infrastructure.
TEXT BOOKS / REFERENCES:

4. ISO 19650 – 2018 Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM)
Course Objectives

- To provide insight into functions and operations of different construction equipment.
- To provide exposure to the maintenance and safety of equipment during construction.

Course Outcome

CO1: Explain the working principles of construction equipment.
CO2: Ability to select appropriate equipment for earth moving, tunneling, concreting, mining and quarrying
CO3: Assess equipment performance and implement maintenance practices.
CO4: Apply safety norms during equipment utilization

CO-PO Mapping

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Syllabus

Unit 1
Basics and Hydraulics of Construction Equipment:

Unit 2
Concreting, Earth Moving, Road Making Equipment:
Classification and uses of different types of cranes- hoists and vertical access equipment.
Tunnelling Equipment / Piling Equipment:
Introduction to Tunnel Boring Machines- Hydraulic Grabs- Piling Rig.

Unit 3
Equipment Life Cycle Management:
Mechanization and Digitalisation in Construction and Safety in Construction Equipment:
Importance of Digital Analytics- Digital Solution in Construction Projects- Importance of Mechanisation - Rebar Processing Machine- Operation of Mechanised Equipment- Introduction to 3D Concrete Printer- Importance of Safety- Various PPE & Purpose- Safety of Men & Machines at Work- Safety During Construction Activities- Safety with Tools & Tackles.
TEXT BOOKS/ REFERENCES


Course Objectives

- To give an exposure on the basic concepts, types and parameters to be considered for the selection of formwork.
- To give an overview on recent advancements in formwork.
- To explain the special formworks and its selection criteria.

Course Outcome

CO1: Understand different types of formwork and prepare the configurations.
CO2: Design formwork and do the quantity take off
CO3: Identify special formwork for various applications.
CO4: Understand basics of scaffolding and apply in field conditions

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Syllabus

Unit 1
Formwork Planning and Monitoring- Configuration, Scope, Strategy & Costing of Formwork, Productivity.

Unit 2
Design Concepts in Formwork - Design Loads, Pressures on Concrete, Design Methods & Assumptions.
Modular Formwork – Introduction, Advantages and Limitations, Vertical and Horizontal Application, Shuttering & De-shuttering, Application, Aluminum formwork - Drawings & Components, Activities.

Unit 3
Special Formwork and Various Applications - Tunnel formwork, 3D design Details, High rise construction, Various climbing system, Table lifting system, Bridge construction systems, Project Application.
Building and Erecting Using the Formwork and Formwork Failures - Formwork Assembly for Wall & Column Panels, Stop end & Box outs., Equipment and Layout, Formwork Erection and Safety, Inspection and Corrections, Plant and Machinery, Codal and Contractual Requirements.

Basics of Scaffolding- 'Modular scaffold Installation sequence, Tie and material specification, 'Ladder safety, Loading Classification, application, 'Components of LTMS, 'Access scaffold Do's and Don’ts. Innovation and Global practices.
TEXT BOOKS/ REFERENCES:

3. Hurd, M.K., Formwork for Concrete, Special Publication No.4, American Concrete Institute, Detroit, 2005.
4. Concrete Formwork Systems – Awad, Hanna- University of Wisconsin – Copy right Marcel Dekkel Inc.
TRANSPORTATION ENGINEERING

23CIE431 PAVEMENT DESIGN L-T-P-C: 2-1-0-3

Prerequisite(s): 23CIE214 Highway Engineering

Course Objectives

- Introduce to the quality assessment procedures for pavement materials
- To explain the stress analyses and design methods of flexible and rigid pavements
- To explain the role of various joints in a rigid pavement and its design

Course Outcome

CO1: Evaluate the constituents of flexible and rigid pavements
CO2: Analyse the stresses in flexible pavement
CO3: Design the structure of a flexible pavement
CO4: Analyse the stresses in rigid pavement
CO5: Design the structure of a rigid pavement

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Syllabus

Unit 1
Introduction - Types and component parts of pavements, factors affecting design and performance of pavements, functions and significance of different layers of a pavement. Test conducted to assess the properties of subgrade soil, aggregate and bitumen. Design of bituminous mixes by Marshall method.

Unit 2
Stress analyses and methods of flexible pavement design - stresses and deflections in homogeneous masses. Burmister’s 2-layer, 3-layer and multi-layer theories. Wheel load stresses - ESWL of multiple wheels, repeated loads and EWL factors - empirical, semi-empirical and theoretical approaches for flexible pavement design. Design of flexible pavements as per IRC. Softwares for pavement design

Unit 3
Stresses analysis and methods of rigid pavement design - types of stresses and causes, factors influencing stresses, general conditions in rigid pavement analysis. Types of stresses - wheel load stresses, warping stresses, friction stresses, combined stresses. Functions of various types of joints in cement concrete pavements – design of longitudinal, contraction and expansion joints as per IRC recommendations. Pavement evaluation and rehabilitation.

Text book(s)

Reference(s)

Prerequisite(s): 23CIE214 Highway Engineering

Course Objectives

- To explain the urban travel characteristics and concept of travel demand
- To explain the different methods adopted for estimating the number of trips generated
- Introducing to forecasting the probable zones to which the generated trips are being distributed
- To explain methods for proportioning of trips shared across public and private modes
- To discuss the various methods to forecast the number of trips distributed across alternate routes

Course Outcome

CO1: Evaluate urban transport problems using the travel demand concept
CO2: Develop trip distribution and trip generation models
CO3: Estimate mode choice and develop traffic assignment models

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Syllabus

Unit 1
Urban Transportation Planning Process & Concepts - Transportation problems, urban travel characteristics, evolution of transportation planning process, concept of travel demand. Demand function - Independent variables, travel attributes, assumptions in demand estimation. Sequential, recursive and simultaneous processes. Transportation Survey and Analysis - Definition of study area, zoning, types and sources of data. Type of surveys • Road side interviews, Home interview surveys.

Unit 2
Trip Generation Analysis - Trip classification, factors influencing productions and attractions, trip rate analysis, multiple regression models, category analysis. Trip Distribution Analysis - Trip distribution models, Growth factor models, Gravity models, Opportunity models.

Unit 3

Text book(s)
Reference(s)

**23CIE433  TRAFFIC ENGINEERING AND MANAGEMENT  L-T-P-C: 3-0-0-3**

Prerequisite(s): 23CIE214 Highway Engineering

**Course Objectives**

- The components of a traffic stream
- Data collection through traffic surveys
- The fundamental relationships of traffic flow
- Capacity estimation of different types of intersections
- The contributory factors and analyses of accidents
- The traffic flow at a microscopic level

**Course Outcome**

**CO1:** Understand the road traffic components and their characteristics in traffic engineering  
**CO2:** Conduct different types of traffic engineering studies and perform basic statistical analysis of traffic data  
**CO3:** Use speed-flow relationships and analyse the capacity of different kinds of intersections  
**CO4:** Understand elements of road safety and approaches to accident studies  
**CO5:** Use different distribution models and analyse traffic flow characteristics

**CO-PO Mapping**

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**Syllabus**

**Unit 1**
Introduction - Objectives and scope of traffic engineering - Components of road traffic: vehicle, driver and road. Road user and vehicle characteristics and their effect on road traffic. Traffic manoeuvre. Traffic Surveys - Objectives, methods, equipment’s used for data collection, analysis and interpretation. Traffic Forecast: General travel forecasting principles, different methods of traffic forecast, Softwares for statistical analysis

**Unit 2**
Concept of Design vehicle units and determination of PCU under mixed traffic conditions. Traffic Stream Characteristics - Relationship between Speed, Flow and Density. Determination of design hourly volume. Highway Capacity: Factors affecting capacity, level of service; Capacity studies - Capacity of different highway facilities including unsignalised and signalised intersections

**Unit 3**
Accident Analysis - Analysis of individual accidents and statistical data, Methods of representing accident rate. Factors in traffic accidents - influence of roadway and traffic conditions on traffic safety. Shock waves, Queuing theory and applications. Probabilistic Aspects of Traffic Flow -Vehicle arrivals, distribution models, gaps and headway distribution models; gap acceptance merging parameters, delay models.
Text book(s)

Reference(s)
Course Objectives

- To explain different types of intersections and traffic control devices
- To elucidate the concept of Transportation System Management
- To explain the need for traffic management and various strategies adopted for an effective traffic management

Course Outcome

CO1: Understand the need for channelization and compare the different forms of intersections.
CO2: Analyse and Design of signalized intersections
CO3: Compare the different methods for traffic demand management.
CO4: Suggest alternatives for effective traffic management

CO-PO Mapping

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Syllabus

Unit 1

Traffic Control Devices: Traffic Signs and Signals, Principle of Signal Design, Webster’s Method, Redesign of Existing Signals including Case Studies; Signal System Coordination.

Unit 2

Unit 3
Demand Management: Staggered Working hours, Flexible Work hours, High Peak Period Tolls, Shuttle Services, Circulation Services and Extended Routes.
Traffic Operations Improvements: On-Street, Parking ban, Freeway Ramp Control and Closure, Travel on Shoulders, One-way Streets, Reversible Lanes, Traffic Calming, Right Turn Phase, Right Turn Lanes, Reroute Turning Traffic.
Text book

Reference(s)
Course Objective
- Understand the importance of geosynthetics in Civil Infrastructure development.
- To be able to design reinforced geo-structures

Course Outcome
CO1: Understand different types of geosynthetics.
CO2: Design of geosynthetics for geotechnical challenges
CO3: understand usage of geosynthetics for drainage functions.

CO-PO Mapping

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Syllabus

Unit 1

Unit 2
Slope stability analysis: Finite and infinite slopes- Modes of failures- In-situ slope stabilization- Design of reinforced slopes- Embankments on soft soils
Facing elements: Construction procedure, design of Geosynthetics wrap around faced wall, geogrid reinforced soil walls, geocell wall, gabion wall

Unit 3

List of experiments:-
- Physical properties:- Density, Thickness & Specific gravity
- Tensile strength :- Trapezoidal tear strength
- Drop cone test
- Grab strength
- Direct shear
- Pullout test
- Permittivity and Transmittivity
- Interface friction between Geotextile and soil
- Water absorption capacity & swell
- Bursting strength test

Text book(s)

Reference(s)
HYDRAULICS & WATER RESOURCES ENGINEERING

23CIE441 GROUND WATER HYDROLOGY L-T-P-C: 3-0-0-3

Prerequisite(s): 23CIE 213 Hydraulic Engineering

Course Objectives

- Introduce to the groundwater system
- To explain the basic principles and movement of ground water
- To elaborate the use of groundwater flow properties in the well design

Course Outcome

CO1: Understand the basics of groundwater and analyse movement of groundwater in aquifer.
CO2: Estimate the aquifer parameters and groundwater resources for different hydro-geological boundary conditions
CO3: Comprehend the types, design principles and construction of wells.

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Syllabus

Unit 1

Unit 2
Unsteady flow - general equation - Cartesian and polar coordinate - unsteady radial flow in to a well - confined, unconfined and leaky aquifers - multiple well system - pumping tests - non equilibrium equation for pumping tests - Thies’ method - Jacob method - Chow’s method - characteristics well losses - step draw down test - well near aquifer boundaries - determination of boundaries from pumping test. Image wells for various boundary conditions - Cavity well and open well - yield tests - pumping and recuperation test.

Unit 3
Tube wells: design - screened wells - gravel packed wells - well loss - selection of screen size - yield of a well - test holes - well logs - methods of construction - dug wells - shallow tube wells - deep wells - gravity wells - drilling in rocks - screen installation - well completion - well development - testing wells for yield - collector - or radial wells - infiltration galleries - well point system - failure of tube wells

Ground water investigation methods.
Text book(s)

Reference(s)
Prerequisite(s): 23CIE 213 Hydraulic Engineering

Course Objectives

1. To impart the knowledge about planning, design, and operation of water resources systems using mathematical optimization methods and models.
2. Exposure to the basic economic analysis and operations research techniques to develop the solutions for various surface and groundwater resources allocation decision making.

Course Outcome

CO1: Understand the water resources systems and express it using mathematical models.
CO2: Formulate and solve various optimization models of water resources planning and management problems.
CO3: Identify the advantages and limitations of various modeling methods and algorithms used in water resources planning and management.
CO4: Use the simulation and optimization models for planning and management decision making

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Syllabus

Unit 1
Water systems engineering – scope and approach.
Issues and the systems planning approach - water system dynamics - water resource development alternatives –
Water systems planning objectives- Constraints and Criteria – Economic and Econometric principles
Hydrologic input analysis, Demand analysis, System elements & Subsystem planning - Stochastic planning and
management - Design and management issues.

Unit 2
Optimization methods and their application in Water resources systems. Linear programming and Dynamic
programming models. Problem formulation for water resources systems – Multi objective planning – Large scale
system analysis- Case studies.

Unit 3
Ground water system planning – Conjunctive surface and groundwater development- Hierarchical approach-
Water quality management planning- Regional planning- Policy issues.
Reference(s)

PROFESSIONAL ELECTIVE COURSES (Without Prerequisites/open to all)

23CIE451   ENVIRONMENTAL IMPACT ASSESSMENT   L-T-P-C: 3-0-0-3

Course Objectives

- To highlight the evolution of Environmental impact assessment methods
- To introduce the Impact assessment methods for various projects
- To explain the various components for preparing the EIA document

Course Outcome

CO1: Understand the background of Environmental impact assessment in US and India

CO2: Analyze the factors and perform Impact assessment methods for various projects including water, power related projects

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Syllabus

Unit 1
Concept of environment, Concept of environmental impact, Environmental impact assessment (EIA) – definitions, terminology and overview, Evolution of EIA in the USA, Key features of the National Environmental Policy Act and its implementation and the Council on Environmental Quality (CEQ) guidelines, Role of the USEPA, Evolution of EIA in India, Sustainable development, Generalised EIA process flow chart, Screening, Initial environmental examination (IEE), Scoping, Public participation.

Unit 2
Environmental baseline, Impact assessment methods – checklists – matrices - quantitative methods – networks - overlay mapping. Introduction to impact prediction and evaluation, Factors to be considered while assessing the impacts of water related projects, power projects, waste water treatment facilities etc. Major features of the EIA notification in India, Present status and procedures of EIA in India.

Unit 3
Prediction and assessment of impacts of developmental activities on surface water, land and soil, groundwater, air, biological environment etc. Prediction and assessment of visual impacts, Socioeconomic impact analysis, Evaluation of alternatives, Preparing the EIA document, Environmental impact statement (EIS), Environmental monitoring, Environmental audit (EA). Case studies.

Reference(s)


8. Website of the Ministry of Environment and Forests, Govt. of India and the USEPA.
Course Objectives

- Explain the basic concepts of Remote Sensing and EM Spectra and the different types of satellite and sensors.
- Expose to the concepts of Photogrammetry and its applications
- Illustrate Energy interactions (with atmosphere and surface features) and Interpretation of satellite images
- Explain different components of GIS and its applications
- Develop knowledge on using GIS data and working with GIS software.

Course Outcome

**CO1:** Understand principles and identify the components of remote sensing and EMR.
**CO2:** Schematize the process of data acquisition of satellite images and their characteristics
**CO3:** Understand the principles and identify the components of Photogrammetry and Thematic maps
**CO4:** Visualize the Remote sensing digitally with digital image processing techniques.
**CO5:** Apply Remote sensing and GIS in different engineering contexts

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**Syllabus**

**Unit 1**
Introduction, Basic concepts and principles of remote sensing; Definition components of remote sensing- energy sensor, interacting body – active and passive remote sensing – platforms - EMR interaction with earth surface material, radiance, irradiance, incident, reflected, absorbed and transmitted energy – reflectance – specular and diffused reflection surfaces – spectral signature – spectral signature curves – EMR interaction with water, soil and earth surface. Application: Meteorology, land use, networking, hydrological studies, soil studies and coastal zone analysis.

**Unit 2**
Unit 3
Analysis using raster and vector data – retrieval, reclassification, overlaying, buffering - data output – printers and plotters. Open source software’s, GIS and remote sensing applications – urban applications – water resources – urban analysis – watershed management – resources information system – hazard mitigation.

Text book(s)

Reference(s)
**Verticals**

*Construction Engineering and Management*

1. Concrete technology  
2. Architectural science  
3. Formwork Engineering & practices  
4. Construction Equipment and Techniques  
5. Construction Economics and finance  
6. Quality control and safety management in construction  
7. BIM for Construction management

**Structure (As per 2023 B.Tech curriculum)**

| Semester 6 | 2 Electives | 3. Concrete Technology (Vertical Core)  
|           |             | 4. Sustainable Construction – Materials & Methods (Vertical Core) |
| Semester 7 | 3 Electives | 4. Architectural Science  
|           |             | 5. Formwork Engineering & Practices (Or) Construction Equipment and Techniques  
|           |             | 6. Construction Economics and Finances (Or) Quality Control And Safety Management in Construction |
| Semester 8 | 1 Elective  | 2. BIM for Construction Management (Project Oriented Course) |
Prerequisite(s): 23CIE204 Construction Engineering - Materials & Methods

Course Objectives

- To highlight the fundamental concepts and behavioural aspects of various materials in concrete, types of concrete and their manufacture and applications.
- To introduce concrete mix proportioning for various conditions using Indian standards and ACI standards

Course Outcome

CO1: Select the suitable ingredients for concrete and suggest suitable laboratory test to check its property.
CO2: Evaluate the properties of ordinary concrete and special concrete based on the destructive and non-destructive tests.
CO3: Evaluate durability related issues in concrete and suggest preventive measures.
CO4: Apply the modern methods in concrete manufacturing
CO5: Proportion the concrete mixtures to meet performance requirements.

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Syllabus

**Unit 1**

Materials: cement - different types - chemical composition and physical properties - tests on cement - I.S. specifications - aggregates - classification - mechanical properties and tests as per I.S. - alkali aggregate reaction - grading requirements - heavy weight - light weight - normal weight - aggregate - sampling of aggregate - water quality of water - admixtures - accelerators - retarders - water reducing agents - super plasticizers - use of silica fumes

Properties of fresh concrete - workability - factors affecting workability - tests for workability - segregation and bleeding.

**Unit 2**


Unit 3
Introduction to Non-destructive test methods.

Text book(s)

Reference(s)
Prerequisite(s): 23CIE204 Construction Engineering - Materials & Methods

Course Objective

- To expose the students to the concepts of sustainability in the context of building and engineered building materials
- Exposing the student to concepts of embodied and operational energy, minimizing energy consumption

Course Outcome

CO1: Apply the principles of sustainable design for site assessment and development
CO2: Analyze sustainable construction practices related to design decisions
CO3: Assess building energy issues and suggest design options
CO4: Propose strategies for water conservation and ensuring proper indoor air quality

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Syllabus

Unit 1
Impacts of built environment on natural environment. Site development- site selection, urban heat island, Public Transport, vegetation, development footprint, storm water runoff, solar reflectance index. Materials and Resources-segregation, recycling, reduction in waste, reuse of materials and building, renewability. Features of sustainable building materials and sustainable alternatives
Cement and carbon emissions, Alternative fuel for cements, alternative cements and cementitious material. Sustainable concrete construction - recycled materials, reducing cement content, improving production processes, designing for longevity, incorporating sustainable additives, water conservation techniques. Smart materials and technologies - Permeable concrete, cool concrete, UHPC, use of PCM

Unit 2
Building energy issues - building energy design strategy. Embodied energy, Operational energy in Building and Life cycle energy. Life cycle assessment- LCC, LCIA - Introduction to different Software packages.

Unit 3
Indoor air quality-Paints, Adhesive and sealants for use in building, Volatile organic content (VOC) emission issues and indoor air quality for Sustainability and Health hazard. Construction operations – site planning, air quality during construction
Built environment hydrologic cycle – water resources issues – strategies for conservation and recycling – waste water and storm water handling strategies.
Integrated design approach - Ecological design concepts. Green building evolution and Different phases of Green building
project management- Building assessment and eco labels – standards (LEED, GRIHA).

Text Book

Reference(s)
Prerequisite(s): 23CIE204 Construction Engineering - Materials & Methods

Course Objectives

- To highlight the basic concepts of architectural composition in the development of built environment.
- To expose the students to the concepts of functional design of buildings in tropical climates.
- To assess comprehension of the course through case studies

Course Outcome

CO1: Apply knowledge of architectural design principles to critically evaluate building form and space
CO2: Apply knowledge of thermo-physical properties of materials in evaluating heat flow through buildings
CO3: Evaluate quality of indoor climate based on thermal comfort indices and suggest control methods
CO4: Evaluate the natural and artificial lighting of indoor spaces
CO5: Apply knowledge of behavior sound in free field and enclosures to analyze acoustical features.

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Syllabus

Unit 1

Principles of architectural design: Factors influencing architectural development-examples. Primary elements – Form and Space.
Organizing principles in architecture – symmetry – hierarchy – axis, linear, concentric, radial – asymmetric grouping-
Role of colour, texture, shapes/forms in architecture. Forms related to materials and structural systems. Architecture as part of the environment.

Unit 2

Design criteria for control of climate – passive and active approaches.

Unit 3


Potential case studies

Critical review based on architectural design principles - ancient/monumental/modern buildings
Case study on thermal or visual comfort audit for a commercial/office building
Exposure to Energy simulation tools

Text book(s)


Reference(s)

Course Objectives

- To provide insight into functions and operations of different construction equipment.
- To provide exposure to the maintenance and safety of equipment during construction.

Course Outcome

CO1: Explain the working principles of construction equipment.
CO2: Ability to select appropriate equipment for earth moving, tunneling, concreting, mining and quarrying
CO3: Assess equipment performance and implement maintenance practices.
CO4: Apply safety norms during equipment utilization

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Syllabus

Unit 1

Basics and Hydraulics of Construction Equipment:

Unit 2

Concreting, Earth Moving, Road Making Equipment:
Classification and uses of different types of cranes- hoists and vertical access equipment.
Tunnelling Equipment / Piling Equipment:
Introduction to Tunnel Boring Machines- Hydraulic Grabs- Piling Rig.

Unit 3

Equipment Life Cycle Management:
Mechanization and Digitalisation in Construction and Safety in Construction Equipment:
Importance of Digital Analytics- Digital Solution in Construction Projects- Importance of Mechanisation - Rebar Processing Machine- Operation of Mechanised Equipment- Introduction to 3D Concrete Printer- Importance of
TEXT BOOKS/ REFERENCES
Course Objectives

- To give an exposure on the basic concepts, types and parameters to be considered for the selection of formwork
- To give an overview on recent advancements in formwork.
- To explain the special formworks and its selection criteria.

Course Outcome

CO1: Understand different types of formwork and prepare the configurations.
CO2: Design formwork and do the quantity take off
CO3: Identify special formwork for various applications.
CO4: Understand basics of scaffolding and apply in field conditions

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Syllabus

Unit 1


Unit 2


Unit 3

Special Formwork and Various Applications - Tunnel formwork, 3D design Details, High rise construction, Various climbing system, Table lifting system, Bridge construction systems, Project Application. Building and Erecting Using the Formwork and Formwork Failures - Formwork Assembly for Wall & Column Panels, Stop end & Box outs., Equipment and Layout, Formwork Erection and Safety, Inspection and Corrections, Plant and Machinery, Coidal and Contractual Requirements.

Basics of Scaffolding- 'Modular scaffold Installation sequence, Tie and material specification, 'Ladder safety, Loading Classification, application, 'Components of LTMS, 'Access scaffold Do's and Don’ts. Innovation and Global practices.
TEXT BOOKS/ REFERENCES:
3. Hurd, M.K., Formwork for Concrete, Special Publication No.4, American Concrete Institute, Detroit, 2005.
4. Concrete Formwork Systems – Awad, Hanna- University of Wisconsin –Copy right Marcel Dekkel Inc.
Prerequisite(s): 23CIE313 Construction Management

Course Objective

- To expose the students to the concepts of construction finance such as comparing alternatives proposals, evaluating alternative investments, cost estimating and management of accounting.

Course Outcome

CO1: Apply time-value of money concept to compare alternatives
CO2: Analyse equipment cost and replacement alternatives.
CO3: Prepare different types of cost estimates
CO4: Understand the financial management procedures and estimate the financial ratios

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Syllabus

Unit 1
Engineering economics: Basic principles – Time value of money, Quantifying alternatives for decision making, Cash flow diagrams, Equivalence- Single payment in the future (P/F, F/P), Present payment compared to uniform series payments (P/A, A/P), Future payment compared to uniform series payments (F/A, A/F), Arithmetic gradient, Geometric gradient. Funds: cash flow, sources of funds; Histograms and S-Curves. Earned Value.

Unit 2

Unit 3

Text book(s)

Reference(s)
Course Objective

- To highlight the fundamental concepts of Quality control, Quality assurance, and Total quality management
- To introduce the tools used in Construction Quality management
- To highlight the fundamental concepts of Construction Safety management

Course Outcome

CO1: Recognise and examine the quality control management concepts
CO2: Maintain the records of quality assurance processes and audits
CO3: Recognise and examine the construction safety management.

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Unit 1
Introduction to quality; Importance of quality; Quality transition - quality control and inspection, quality assurance, total quality management; Evolution of quality management; Planning and control of quality during design of structures.

Unit 2
Tools and techniques for quality management; Inspection of materials and machinery; Quality assurance in construction; Systems quality management; Quality standards/codes in design and construction; (ISO:9000); Total quality management (TQM) - principles, tools and techniques.

Unit 3
Introduction to safety; Safety and health programs in construction industry; Planning for safety provisions; Analysis of construction hazards and accidents; Construction hazards and safety guidelines; Prevention techniques for construction accidents; Safety requirements for scaffolding; Site management with regard to safety recommendations; Training for safety awareness and implementation; Construction safety and health manual.

TEXT BOOKS/REFERENCES:

Course Objectives
- To highlight the use of BIM models based on real-world construction projects
- To explain the modelling and analysis using BIM software.
- To give an overview of clash detection and avoidance using BIM
- To give an exposure on BIM 4D and 5D models.

Course Outcome
CO1: Create BIM model for effective coordination during planning, design and execution.
CO2: Identify clash and avoid it’s occurrence.
CO3: Apply the concept of BIM 4D for project scheduling
CO4: Apply the concept of 5D BIM for quantity takeoff and estimation

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Syllabus

Unit 1

Unit 2

Unit 3

TEXT BOOKS / REFERENCES:
4. ISO 19650 – 2018 Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM)
Sustainability - Vertical

1. Introduction to Sustainability
2. Sustainable Material Management
3. Functional Efficiency in Buildings
4. Water Conservation and Sustainability
5. Sustainable Environmental Management
6. Sustainable Transportation
7. Socio-Economic Sustainability
8. Capstone Project on Sustainable Practices

| Semester 6 | 2 electives | 1. Introduction to sustainability (Compulsory)  
|           |            | 2. Sustainable material management (Compulsory) |
| Semester 7 | 3 electives | 3. Functional efficiency in buildings (Compulsory)  
|           |            | 4. Water Conservation and Sustainability (Elective)  
|           |            | 5. Sustainable Environmental Management (Compulsory)  
|           |            | 6. Sustainable Transportation (Elective)  
|           |            | 7. Socio-economic Sustainability (Elective)  
| Semester 8 | 1 elective  | 8. Capstone project on sustainable practices (Compulsory)  

Course Objectives:

- To build a foundation on the concept of sustainable development and to gain an empirical understanding of the emerging global challenges for sustainable environmental and societal governance systems.

Course Outcome

CO1 To build basic understanding of sustainability and its needs
CO2 To understand the global efforts for sustainable development
CO3 To be aware of different laws pertaining to sustainability
CO4 Introduction to building design aspects from sustainability point of view

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Unit 1


Unit 2


Unit 3

Textbooks


References

Prerequisite(s): 23CIE204 Construction Engineering - Materials and Methods

Course Objectives:

- To expose the students to the concepts of sustainability in the context of building and conventional engineered building materials, such as Concrete, Bricks, and achieving the same through lower Carbon cements, Superior brick kilns and Recycled aggregate minimizing consumption of natural resources including water. VOC and indoor air quality.

- Exposing the student to concepts of embodied, Operational and Life Cycle Energy, Minimizing Energy consumption by optimal design, use of BIPV. The course also intend to make student aware of ECBC, LEED, GRIHA etc

Course Outcome

CO1 To be able to design by reducing usage of Cement portion in different activities
CO2 To have general understanding of impacts of constructional materials and their energy consumption in production
CO3 To be aware different management perspective for sustainable construction
CO4 To conduct LCA and have knowhow of Green certification

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Unit 1

Materials and Resources- segregation, recycling, reduction in waste, reuse of materials and building, renewability-

Unit 2

Clay Bricks, Types kilns, Comparative energy performance emission performance and financial performance-
Unit 3


Textbooks


References

Course Objectives:

- The course is intended to enhance the students knowledge for designing buildings from perspective of four
  comforts namely, Thermal, Acoustics, Visual comforts, and Indoor air quality.

Course Outcome

CO1  Understand basics of Thermodynamics and Design for Thermal Comfort
CO2  Understand basics of Acoustics and Design for Acoustic comfort
CO3  Understand basics of Visual comforts and Design for visual comfort
CO4  To be able to design different buildings with proper ventilations

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Unit 1

Thermal comfort- Basics of Thermodynamics, Conduction, Convection or radiation heat transfer, Heat gain through
various elements of a building – Design considerations from IGBC, ECBC & SP41 - COMSOL introduction Acoustics –
Building acoustics, measures, defects and prevention of sound transmission

Unit 2

Visual comfort -Enhancement strategies for Daylighting and Artificial lighting- Glazing materials- Daylight apertures –
intelligent building. Design considerations from IGBC, ECBC & SP41

Unit 3

Ventilation and Air Quality – Effects, design consideration- flow rate needed -Design of HVAC systems. Design of
Insulation materials - low energy cooling. Design considerations from IGBC, ECBC & SP41

Textbooks


**References**
Prerequisite(s): 23CIE213 Hydraulic Engineering

Course Objectives:

- This course provides ways to manage and sustain water systems for built environment and ecosystems.

Course Outcome

**CO1** To manage the water for human and natural uses.

**CO2** To design and evaluate sustainable water systems

**CO3** To employ modelling, demand-supply management and water accounting to evaluate case studies

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**Unit 1:** Introduction - Principles of Ecology - Ecosystems - Overview of water resources, concepts and principles of sustainability for freshwater systems, issues and challenges in water resources management, humans and water, sustainable development and water

**Unit 2:** Balancing the diverse needs for water - Cities and towns, urban environment – water supply, sanitation, sustainable development goals, water-wise cities, sustainable urban water systems- Resource crisis - Water, Energy, Food and other resources - Case studies.

**Unit 3** - Designing water systems - Sustainable water infrastructure planning, trade-offs, Integrated water resources management, water governance, partnership for sustainable water management - case studies

Textbooks


References

Prerequisite(s): 23CIE302 & 23CIE311 Environmental Engineering I and II

Course Objectives:

- To create general awareness of the current status of Environmental problems.
- Students will be getting broad perspective of the sustainable concepts, technologies and practices related to Environmental problems.
- The students will be capable of understand and conduct Environmental impact assessment (EIA) with case studies.

Course Outcome

CO1 Understand the impact of humans on environment and related Environmental problems
CO2 To analyze the sustainable concepts, technologies and practices related to Environmental problems
CO3 To understand and perform the Environmental Impact Assessment (EIA)

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Unit 1

Introduction to Sustainable Engineering - Ecosystem - Biodiversity – Natural design philosophies. Current environmental problems and practices of pollution abatement Major Environmental Issues - Climate change, Ozone depletion, Resource crisis – case studies

Unit 2

Sustainable resource management - Water and Wastewater treatment and reuse - Emerging contaminants, impact, and adaptation/mitigation solutions • Land contamination and remediation - Resource conservation and recovery Ecological - Carbon and Ecological Footprint analysis- Open loop - closed loop systems - case studies. Sustainable concepts, technologies and practices - Climate mitigation and adaptation strategies - way forward green technologies.

Unit 3

Environmental Regulations- Life cycle analysis (LCA) - Design for Environment - Industrial Ecology - Symbiosis - case studies- Environmental impact assessment (EIA) - Environmental impact assessment (EIA) – Role of the USEPA, Evolution of EIA in India, Sustainable development, Generalised EIA process flow chart, Screening, Initial environmental examination (IEE), Scoping, Public participation. - Environmental baseline, Impact assessment methods- Introduction to impact prediction and evaluation, Major features of the EIA notification in India, Environmental Impact Statement (EIS), Environmental monitoring, Environmental Audit (EA) - LCA -case studies
Textbook:


References:

5. R. Rajagopalan “Environmental Studies-From Crisis to Cure”, Oxford University Press.
Prerequisite(s): 23CIE462 Sustainable Materials Management

Course Objectives:

- To impart knowledge and skills of environmental issues related to transportation systems, sustainability, and related issues. The course includes the various environmental aspects of mass rapid transportation systems, air quality management through transportation planning in mega cities and current case studies regarding the same.

Course Outcome

CO1  To impart knowledge and skills of environmental issues related to transportation systems, concept of sustainability and related issues

CO2  To understand the mass rapid transportation systems, air quality management through transportation planning

CO3  To gain knowledge on pavement life cycle assessment

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Unit 1
Land-use plans, zoning schemes and provisions- Urban and regional transport planning- Impacts on humans, flora and fauna, soil, water, air, climate and landscape- Establishment of baseline conditions w.r.t soil, water and air quality

Unit 2
Modelling of impacts and scenario-based analysis - Assessment of potential project impacts including indirect, cumulative and synergistic impacts - Decision support systems for EIA of transport infrastructures - Abatement measures

Unit 3
Sustainable transportation systems - Pavements- Sustainable construction of roads using geotextiles- Design – Construction – Use – Pavement Life Cycle Assessment- Case studies of highway, railway and airport projects, OpenLCA tool for life Cycle Assessment, STAN for material flow analysis Reclaimed asphalt pavements- Pervious pavement

Textbooks
2. Preston L Schiller, Jeffrey R Kenworthy, “An Introduction to Sustainable Transportation: Policy, Planning and Implementation”, Routledge Publisher, 2010

References
2. Fengxiang Qiao, Yong Bai, Pei-Sung Lin, Steven I Jy Chien, Yongping Zhang, Lin Zhu, “Resilience and Sustainable Transportation Systems”, ASCE Book theories,2020
3.
Course Objectives:
- Two of the three pillars of sustainability are Social and economic prosperity. Sustainable Development Goals (SDGs) highlight the importance of poverty reduction, and call for policy implementation that leads to the socio-economic development of impoverished people. This course provides different aspects for the betterment of society.

Course Outcome

CO1 To understand social responsibility for sustainable future
CO2 To understand the public administration policies for sustainability
CO3 To gain knowledge on Sustainable Economic Development

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Unit 1

Unit 2
Introduction to Public Administration and Policy:-The distinctive characteristics of public organizations - The traditional public administration model - The New Public Management model - Public sector reforms - Ethics and accountability in the public sector - Crisis management - The policy cycle - The politics of public policy - Theories of policy learning - Public policy analysis - Comparative public policy

Unit 3
Introduction to Law & Economics; The Big Picture Case for Sustainability- Introduction to Law & Economics; Introduction to US Legal System and Environmental Laws- Introduction to EU Legal System and Environmental Laws- Environmental Crimes and Criminal Enforcement- Economics of Sustainability and Environmental Protection- ASEAN Legal Frameworks, Sustainable Development, and Environmental Protection- Introduction to Corporate Governance and CSR- Sustainability and Sustainable Economic Development; Prosperity within Global and Ecological Limits- Sustainable Cities and Urbanization- Law & Economics Approach to Property Law- Valuation, Environmental Services, and Internalizing All Costs of Pollution- Law & Economics Approach to Tort Law- Law & Economics Approach to Contract Law-

Textbooks

References
Prerequisite(s): Minimum of 5 Course from Sustainability

Course Objectives:

- To improve the understanding on the sustainability approach in the selected domain by handling relevant practical problems through proper guidance and make them confident after the completion of the course.

Course Outcome

CO1: Apply the acquired knowledge in sustainability to make preliminary investigations and do functional and/or design of the facility.

CO2: Estimate the material and/or cost requirement involved in a project.

CO3: Address the relevant sustainable goal, environmental / social / economic aspect through the project.

CO4: Present the project with clarity, following ethical norms in oral and written mode.

CO-PO Mapping

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Students are required to conceive a problem related to sustainability in their interested domain. At the end of the course, each student should submit a complete report on the selected project consisting of the data given, the design calculations, specifications if any and complete set of drawings, which follow the design.

Project based on all the topics studied in previous subjects.
Courses offered under the framework of
Amrita Values Programmes I and II

22AVP201 Message from Amma’s Life for the Modern World

Amma’s messages can be put to action in our life through pragmatism and attuning of our thought process in a positive and creative manner. Every single word Amma speaks and the guidance received in on matters which we consider as trivial are rich in content and touches the very inner being of our personality. Life gets enriched by Amma’s guidance and She teaches us the art of exemplary life skills where we become witness to all the happenings around us still keeping the balance of the mind.

22ADM211 Leadership from the Ramayana

Introduction to Ramayana, the first Epic in the world – Influence of Ramayana on Indian values and culture – Storyline of Ramayana – Study of leading characters in Ramayana – Influence of Ramayana outside India – Relevance of Ramayana for modern times.

22ADM201 Strategic Lessons from the Mahabharata

Introduction to Mahabharata, the largest Epic in the world – Influence of Mahabharata on Indian values and culture – Storyline of Mahabharata – Study of leading characters in Mahabharata – Kurukshetra War and its significance - Relevance of Mahabharata for modern times.

22AVP204 Lessons from the Upanishads

Introduction to the Upanishads: Sruti versus Smrti - Overview of the four Vedas and the ten Principal Upanishads - The central problems of the Upanishads – The Upanishads and Indian Culture – Relevance of Upanishads for modern times – A few Upanishad Personalities: Nachiketas, SatyakamaJabala, Aruni, Shvetaketu.

22AVP205 Message of the Bhagavad Gita


22AVP206 Life and Message of Swami Vivekananda

Brief Sketch of Swami Vivekananda’s Life – Meeting with Guru – Disciplining of Narendra - Travel across India - Inspiring Life incidents – Address at the Parliament of Religions – Travel in United States and Europe – Return and reception India – Message from Swamiji’s life.

22AVP207 Life and Teachings of Spiritual Masters India

Sri Rama, Sri Krishna, Sri Buddha, AdiShankaracharya, Sri Ramakrishna Paramahamsa, Swami Vivekananda, Sri RamanaMaharshi, Mata Amritanandamayi Devi.

22AVP208 Insights into Indian Arts and Literature

The aim of this course is to present the rich literature and culture of Ancient India and help students appreciate their deep influence on Indian Life - Vedic culture, primary source of Indian Culture – Brief introduction and appreciation of a few of the art forms of India - Arts, Music, Dance, Theatre.

22AVP209 Yoga and Meditation

The objective of the course is to provide practical training in YOGA ASANAS with a sound theoretical base and theory classes on selected verses of Patanjali’s Yoga Sutra and Ashtanga Yoga. The coverage also includes the effect of yoga on integrated personality development.

22AVP210 Kerala Mural Art and Painting

Mural painting is an offshoot of the devotional tradition of Kerala. A mural is any piece of artwork painted or applied directly on a wall, ceiling or other large permanent surface. In the contemporary scenario Mural painting is not restricted to the permanent structures and are being done even on canvas. Kerala mural paintings are the frescos depicting mythology and legends, which are drawn on the walls of temples and churches in South India, principally in Kerala. Ancient temples, churches and places in Kerala, South India, display an abounding tradition of mural paintings mostly dating back between the 9th to 12th centuries when this form of art enjoyed Royal patronage. Learning Mural painting
through the theory and practice workshop is the objective of this course.

**22AVP213 Traditional Fine Arts of India**

India is home to one of the most diverse Art forms world over. The underlying philosophy of Indian life is ‘Unity in Diversity’ and it has led to the most diverse expressions of culture in India. Most art forms of India are an expression of devotion by the devotee towards the Lord and its influence in Indian life is very pervasive. This course will introduce students to the deeper philosophical basis of Indian Art forms and attempt to provide a practical demonstration of the continuing relevance of the Art.

**22AVP214 Principles of Worship in India**

Indian mode of worship is unique among the world civilizations. Nowhere in the world has the philosophical idea of reverence and worshipfulness for everything in this universe found universal acceptance as it in India. Indian religious life even today is a practical demonstration of the potential for realization of this profound truth. To see the all-pervading consciousness in everything, including animate and inanimate, and constituting society to realise this truth can be seen as the epitome of civilizational excellence. This course will discuss the principles and rationale behind different modes of worship prevalent in India.

**22AVP215 Temple Mural Arts in Kerala**

The traditional percussion ensembles in the Temples of Kerala have enthralled millions over the years. The splendor of our temples makes art enthusiast spellbound, warmth and grandeur of color combination sumptuousness of the outline, crowding of space by divine or heroic figures often with in vigorous movement are the characteristics of murals.

The mural painting specially area visual counterpart of myth, legend, gods, diries, and demons of the theatrical world, Identical myths are popular the birth of Rama, the story of Bhīma and Hanuman, Shiva, as Kirata, and the Jealousy of Uma and ganga the mural painting in Kerala appear to be closely related to, and influenced by this theatrical activity the art historians on temple planes, wood carving and painting the architectural plane of the Kerala temples are built largely on the pan-Indians almost universal model of the Vasthupurusha.

**22AVP218 Insights into Indian Classical Music**

The course introduces the students into the various terminologies used in Indian musicology and their explanations, like Nadam, Sruti, Svaram – svara nomenclature, Stayi, Graha, Nyasa, Amsa, Thala,- Saptatalas and their angas, Shadangas, Vadi, Samavadi, Anuvadi. The course takes the students through Carnatic as well as Hindustani classical styles.

**22AVP219 Insights into Traditional Indian Painting**

The course introduces traditional Indian paintings in the light of ancient Indian wisdom in the fields of aesthetics, the Shadanga (Sixs limbs of Indian paintings) and the contextual stories from ancient texts from where the paintings originated. The course introduces the painting styles such as Madhubani, Kerala Mural, Pahari, Cheriyal, Rajput, Tanjore etc.

**22AVP220 Insights into Indian Classical Dance**

The course takes the students through the ancient Indian text on aesthetics the Natyasastra and its commentary the AbhinavaBharati. The course introduces various styles of Indian classical dance such as Bharatanatyam, Mohiniyatton, Kuchipudi, Odissy, Katak etc. The course takes the students through both contextual theory as well as practice time.

**22AVP221 Indian Martial Arts and Self Defense**

The course introduces the students to the ancient Indian system of self-defense and the combat through various martial art forms and focuses more on traditional Kerala’s traditional KalariPayattu. The course introduces the various exercise technique to make the body supple and flexible before going into the steps and techniques of the martial art. The advanced level of this course introduces the technique of weaponry.
PROFESSIONAL ELECTIVES UNDER SCIENCE STREAM

CHEMISTRY

23CHY240 COMPUTATIONAL CHEMISTRY AND MOLECULAR MODELLING L-T-P-C: 3-0-0-3

Course Outcomes:

CO1: Get to understand the structure of molecules using symmetry.
CO2: Understanding Quantum mechanical approach to calculate the energy of a system.
CO3: Applying mathematical knowledge and quantum mechanical approach in finding out the characteristics-reactivity, stability, etc., of the molecule.
CO4: To get a brief idea about molecular mechanics based chemical calculations.
CO5: To get an idea about general methodology of molecular modeling.

Syllabus

Unit 1
Introduction: Stability, symmetry, homogeneity and quantization as the requirements of natural changes - Born - Haber cycle – Energetic – kinetics - Principles of spectra.

Computational techniques: Introduction to molecular descriptors, computational chemistry problems involving iterative methods, matrix algebra, Curve fitting.


Introduction to Quantum mechanics - Schrodinger equation - Position and momentum MO formation - Operators and the Hamiltonian operator - The quantum oscillator Oscillator Eigen value problems - Quantum numbers - labeling of atomic electrons.

Unit 2
Molecular Symmetry: Elements of symmetry - Point groups - Determination of point groups of molecules.

Huckel’s MO theory: Approximate and exact solution of Schrodinger equation - Expectation value of energy - Huckel’s theory and the LCAO approximation - Homogeneous simultaneous equations - Secular matrix - Jacobi method - Eigen vectors: Matrix as operator - Huckel’s coefficient matrix - Wheeland’s method - Hoffmann’s EHT method - Chemical applications such as bond length, bond energy, charge density, dipole moment, Resonance energy.

Unit 3
Self consistent fields: Elements of secular matrix - Variational calculations - Semi empirical methods - PPP self consistent field calculation - Slater determinants - Hartree equation - Fock equation – Roothaan - Hall equation - Semi empirical models and approximations.

Ab-initio calculations: Gaussian implementations – Gamess - Thermodynamic functions - Koopman’s theorem - Isodesmic reactions, DFT for larger molecules - Computer aided assignments/mini projects with softwares - Introduction to HPC in Chemical calculations.

Molecular modelling software engineering - Modeling of molecules and processes
Signals and signal processing in Chemistry - QSAR studies and generation of molecular descriptors - Applications of chemical data mining - Familiarization with open source softwares useful for molecular modeling - Introduction to molecular simulation - M.D. simulation.
TEXTBOOKS:


REFERENCES:

Course Outcomes:

CO1: Understand the fundamental concepts of electrochemistry through electrode potential and reaction kinetics
CO2: Learn the application of the electrochemical principles for the functioning and fabrication of industrial batteries and fuel cells
CO3: Acquire knowledge in solving numerical problems on applied electrochemistry
CO4: Analysis and practical problem solving in fabrication of batteries and fuel cells
CO5: Application of concepts and principle in industrial electrochemical processes
CO6: Evaluation of comprehensive knowledge through problem solving

Syllabus

Unit 1
Background Theory: Origin of potential - electrical double layer - reversible electrode potential - standard hydrogen electrode - emf series - measurement of potential - reference electrodes (calomel and silver/silver chloride) indicator and ion selective electrodes - Nernst equation - irreversible processes - kinetic treatment - Butler- Volmer equation - Overpotential, activation, concentration and IR overpotential - its practical significance - Tafel equation and Tafel plots - exchange current density and transfer coefficients.

Unit 2
Batteries: Primary batteries: The chemistry, fabrication and performance aspects, packing classification and rating of the following batteries: (The materials taken their function and significance, reactions with equations, their performance in terms of discharge, capacity, and energy density to be dealt with). Zinc-carbon (Leclanche type), zinc alkaline (Duracell), zinc/air, zinc-silver oxide batteries; lithium primary cells - liquid cathode, solid cathode and polymer electrolyte types and lithium-ferrous sulphide cells (comparative account).

Secondary batteries: ARM (alkaline rechargeable manganese) cells, Lead acid and VRLA (valve regulated (sealed) lead acid), nickel-cadmium, nickel-zinc, nickel- metal hydride batteries, lithium ion batteries, ultra thin lithium polymer cells (comparative account). Advanced Batteries for electric vehicles, requirements of the battery - sodium- beta and redox batteries.

Unit 3

Electrochemical Processes: Principle, process description, operating conditions, process sequence and applications of Electroforming – production of waveguide and plated through hole (PTH) printed circuit boards by electrodeposition; Electroless plating of nickel, copper and gold; Electropolishing of metals; Anodizing of aluminium; Electrochemical machining of metals and alloys.

TEXTBOOKS:

REFERENCES:

Course Objectives:

- To provide the basic knowledge about fuels, rocket propellants and explosives.

Course Outcomes:

CO1: Understand the types of fuels and variation in their properties
CO2: Able to analyze the fuel content
CO3: Obtain knowledge in identifying a proper fuel as per the requirement
CO4: Ability to know the preparation and working of propellants and explosives

Syllabus

Unit 1
Fuels - Solid fuels - Classification, preparation, cleaning, analysis, ranking and properties - action of heat, oxidation, hydrogenation, carbonization, liquefaction and gasification.

Liquid fuels – Petroleum - origin, production, composition, classification, petroleum processing, properties, testing - flow test, smoke points, storage and handling.


Unit 2
Gaseous fuels - Types, natural gas, methane from coal mine, water gas, carrier gas, producer gas, flue gas, blast furnace gas, biomass gas, refinery gas, LPG - manufacture, cleaning, purification and analysis. Fuels for spark ignition engines, knocking and octane number, anti knock additives, fuels for compression engines, octane number, fuels for jet engines and rockets.

Flue gas analysis by chromatography and sensor techniques.

Unit 3

Rocket propellants and Explosives - classification, brief methods of preparation, characteristics; storage and handling.

TEXTBOOK:

REFERENCES:
Course Objectives:

- Understand the principles of green chemistry and its contribution to the development of sustainable products
- Possess knowledge of the migration from a hydrocarbon-based economy to carbohydrate-based economy
- Evaluate the deficiencies of traditional process and acknowledge the invention of new processes
- Distinctly map the culmination of academic research to industrial chemistry

Course Outcomes:

CO1: Understand the evolving concept of Green Chemistry and its application to the manufacture of sustainable products
CO2: Appreciate the need for Renewable energy and Feed stock along with carbon sequestration through the fundamentals of Green Chemistry Techniques
CO3: Develop a coherence to evaluate systematic deficiencies in traditional Chemical science process and products
CO4: Undertake a purposeful Journey through the microscopic domain of academic research to the macroscopic domain of Industrial chemistry

Syllabus

Unit 1
Our environment and its protection, chemical pollution and environmental regulations, environmental chemistry, pollution prevention strategies, challenges to the sustainability of chemical industry, Pollution Prevention Act 1990, USA, Green Chemistry and its 12 principles, toxicity of chemicals, material safety data sheet (MSDS), concept of zero pollution technologies, atom economy, functional toxicity vs non-functional toxicity, alternative solvents, energy minimization, microwave and sonochemical reactions, renewable feed stock, carbon dioxide as a feed stock.

Unit 2
Greener strategies of the synthesis of ibuprofen synthesis, terephthalic acid etc. phase behaviour and solvent attributes of supercritical CO2, use of supercritical carbon dioxide as a medium chemical industry, use of ionic liquids as a synthetic medium, gas expanded solvents, superheated water, etc. Synthesis of various chemicals from bio mass, polycarbonate synthesis and CO2 fixation, green plastics, green oxidations, etc.

Unit 3
Processes involving solid catalysts – zeolites, ion exchange resins, Nafion/silica nano composites and enhanced activity. Polymer supported reagents, green oxidations using TAML catalyst, membrane reactors. Green chemistry in material science, synthesis of porous polymers, green nanotechnology.

REFERENCES:

1. Hand Book of Green Chemistry and Technology; by James Clarke and Duncan Macquarrie; Blakwell Publishing.
Course Outcomes:

CO1: To develop an understanding of principle and working of the range of instrumental methods in analytical chemistry.
CO2: To provide an understanding and skills in contemporary methods of separation and appropriate selection of instruments for the successful analysis of chemical compounds.
CO3: To impart skills in the scientific method of planning, conducting, reviewing, reporting experiments and problem solving in chemical analysis.

Syllabus

Unit 1

Separation Techniques: Brief outline of column, paper and thin layer chromatography - Ion exchange methods - principle and application – HPLC.

Unit 2
Gas chromatography - principle and applications – gel chromatography.


Unit 3

Thermal and Diffraction techniques: Principles and applications of DTG - DTA DSC - X-ray - Electron Diffraction Studies - SEM, TEM.

TEXTBOOKS:


REFERENCES:

Course Objective:

- To provide sound knowledge on the application of electrochemistry in energy storage systems.

Course Outcome

CO1: Understand the fundamental concepts of electrochemistry through electrode potential and reaction kinetics

CO2: Learn the application of the electrochemical principles for the functioning and fabrication industrial batteries and fuel cells

CO3: Analysis of practical problem solving in fabricating batteries and fuel cells

CO4: Evaluation of comprehensive knowledge through problem solving

Syllabus

Unit 1
Background Theory: Origin of potential - electrical double layer - reversible electrode potential - standard hydrogen electrode - emf series - measurement of potential - reference electrodes (calomel and silver/silver chloride) indicator and ion selective electrodes - Nernst equation - irreversible processes - kinetic treatment - Butler- Volmer equation - Overpotential, activation, concentration and IR overpotential - its practical significance - Tafel equation and Tafel plots - exchange current density and transfer coefficients.

Unit 2
Batteries: Primary batteries: The chemistry, fabrication and performance aspects, packing classification and rating of the following batteries: (The materials taken their function and significance, reactions with equations, their performance in terms of discharge, capacity, and energy density to be dealt with). Zinc-carbon (Leclanche type), zinc alkaline (Duracell), zinc/air batteries; Lithium primary cells - liquid cathode, solid cathode and lithium-ferrous sulphide cells (comparative account).

Secondary batteries: Lead acid and VRLA (valve regulated (sealed) lead acid), nickel-cadmium, nickel-zinc, nickel-metal hydride batteries, lithium ion batteries, ultrathin lithium polymer cells (comparative account). Advanced Batteries for electric vehicles, requirements of the battery - sodium-beta and redox batteries.

Unit 3
Fuel Cells: Description, working principle, anodic, cathodic and cell reactions, fabrication of electrodes and other components, advantages, disadvantages and environmental aspects of the following types of fuel cells: Proton Exchange Membrane Fuel Cells, alkaline fuel cells, phosphoric acid, solid oxide, molten carbonate, direct methanol fuel cells.

Membranes for fuel cells: Nafion – Polymer blends and composite membranes; assessment of performance – recent developments.


TEXTBOOKS:

REFERENCES:

Course Outcome:

CO1: Development of skill in identifying the nature and type of corrosion
CO2: Understanding the mechanism of various types of corrosion
CO3: Analysing the problem and find out a solution to combat corrosion in any sort of environment.

CO-PO Mapping

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Unit 1
Basic principles: Free energy concept of corrosion - different forms of corrosion - Thermodynamic & Kinetic aspects of corrosion: The free energy criterion of corrosion possibility - Mechanism of Electrochemical corrosion - Galvanic and Electrochemical series and their significance.

Corrosion Control: Materials selection - metals and alloys - metal purification - non metallic - changing medium.

Unit 2
Anodic and cathodic protection methods - Coatings - metallic and other inorganic coatings - organic coatings - stray current corrosion - cost of corrosion control methods.

Corrosion protection by surface treatment: CVD and PVD processes - Arc spray - Plasma spray - Flame spray.

Corrosion Inhibitors: Passivators - Vapour phase inhibitor.

Unit 3
Stress and fatigue corrosion at the design and in service condition - control of bacterial corrosion.


TEXTBOOKS:

REFERENCES:
Course Outcomes:

CO1: Able to use the Lagrangian formalism to solve simple dynamical systems
CO2: Able to understand Hamiltonian formalism and apply this in solving dynamical systems
CO3: Able to apply Lagrangian formalism in bound and scattered states with specific reference to Kepler’s laws and scattering states
CO4: Able to solve problems in the Centre of Mass frame and connect it to Laboratory Frame of Reference
CO5: Understand and solve problems in rigid body rotations applying of Euler’s equations.

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Syllabus

Unit 1
Introduction to Lagrangian dynamics
Survey of principles, mechanics of particles, mechanics of system of particles, constraints, D’Alembert's principle and Lagrange's equation, simple applications of the Lagrangian formulation, variational principles and Lagrange's equations, Hamilton's principles, derivation of Lagrange's equations from Hamilton's principle, conservation theorems and symmetry properties.

Unit 2
Central field problem
Two body central force problem, reduction to the equivalent one body problem, Kepler problem, inverse square law of force, motion in time in Kepler's problem, scattering in central force field, transformation of the scattering to laboratory system, Rutherford scattering, the three body problem.

Rotational kinematics and dynamics
Kinematics of rigid body motion, orthogonal transformation, Euler's theorem on the motion of a rigid body.

Unit 3
Angular momentum and kinetic energy of motion about a point, Euler equations of motion, force free motion of rigid body.
Practical rigid body problems
Heavy symmetrical spinning top, satellite dynamics, torque-free motion, stability of torque-free motion - dual-spin spacecraft, satellite manoeuvring and attitude control - coning maneuver - Yo-yo despin mechanism - gyroscopic attitude control, gravity- gradient stabilization.

TEXTBOOKS:

**REFERENCE BOOKS:**

Course Outcomes

CO1: To understand the nature of interaction between atoms in crystalline solid materials that determines their dielectric, magnetic and electrical properties.

CO2: Analyze the relation between the macroscopic dielectric constant and the atomic structure of an insulator.

CO3: Fundamental concepts of magnetic fields required to illustrate the magnetic dipoles. This forms the basis to understand the magnetic properties of dia, para, ferro, antiferro and ferri magnetic materials.

CO4: Fundamentals concerned with conduction mechanism in metals and superconductors.

CO5: Understand the basics for classification of materials based on its conductivity, nature of chemical bonds in Si and Ge, carrier density, energy band structure and conduction mechanism in intrinsic and extrinsic semiconductors.

CO-PO Mapping

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Syllabus

Unit 1
Conducting materials: The nature of chemical bond, crystal structure Ohm’s law and the relaxation time, collision time, electron scattering and resistivity of metals, heat developed in a current carrying conductor, thermal conductivity of metals, superconductivity.

Semiconducting materials: Classifying materials as semiconductors, chemical bonds in Si and Ge and it’s consequences, density of carriers in intrinsic semiconductors, conductivity of intrinsic semiconductors, carrier densities in n type semiconductors, n type semiconductors, Hall effect and carrier density.

Unit 2
Magnetic materials: Classification of magnetic materials, diamagnetism, origin of permanent, magnetic dipoles in matter, paramagnetic spin systems, spontaneous magnetization and Curie Weiss law, ferromagnetic domains and coercive force, anti ferromagnetic materials, ferrites and it’s applications.

Unit 3
Dielectric materials: Static dielectric constant, polarization and dielectric constant, internal field in solids and liquids, spontaneous polarization, piezoelectricity.

PN junction: Drift currents and diffusion currents, continuity equation for minority carriers, quantitative treatment of the p-n junction rectifier, the n-p-n transistor.
TEXTBOOK:

REFERENCES:
Unit 1

Review of some basic concepts and principle of laser.


Unit 2

Properties of LASERS

Gain mechanism, threshold condition for PI (derivation), emission broadening - line width, derivation of FWHM natural emission line width as deduced by quantum mechanics - additional broadening process: collision broadening, broadening due to dephasing collision, amorphous crystal broadening, Doppler broadening in laser and broadening in gases due to isotope shifts. Saturation intensity of laser, condition to attain saturation intensity.

Properties – coherency, intensity, directionality, monochromaticity and focussibility. LASER transition – role of electrons in LASER transition, levels of LASER action: 2 level, 3 level and 4 level laser system.

Unit 3

Types of LASERS


Liquid chemical and dye LASERS. Semiconductor LASER: Principle, characteristics, semiconductor diode LASERS, homo-junction and hetero-junction LASERS, high power semi conductor diode LASERS.

Applications in Communication field:

LASER communications: Principle, construction, types, modes of propagation, degradation of signal, analogue communication system, digital transmission, fiber optic communication.

Applications of LASERS in other fields:


REFERENCES:


Course Outcomes

CO1: Understand, Comprehend and acquaint with concepts of NanoPhysics
CO2: To familiarize the material’s property changes with respect to the dimensional confinements.
CO3: Acquire knowledge on the modern preparation process and analysis involved in the nanomaterial’s research
CO4: To learn about the technological advancements of the nano-structural materials and devices in the engineering applications

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Syllabus

Unit 1

Introduction

Introduction to nanotechnology, comparison of bulk and nanomaterials – change in band gap and large surface to volume ratio, classification of nanostructured materials. Synthesis of nanomaterials - classification of fabrication methods – top down and bottom up methods.

Concept of quantum confinement and phonon confinement


Unit 2

Tools for characterization:


Nanoscale materials – properties and applications:

Carbon nanostructures – structure, electrical, vibration and mechanical properties. Applications of carbon nanotubes

Unit 3

Nanoelectronics and nanodevices:

Impact of nanotechnology on conventional electronics. Nanoelectromechanical systems (NEMSs) – fabrication (lithography) and applications. Nanodevices - resonant tunneling diode, quantum cascade lasers, single electron transistors – operating principles and applications.

**TEXTBOOKS:**

Course Outcomes:

CO1: Understand, comprehend and acquaint with the basics working principles and governing equations of electronic devices like diodes, Bipolar junction transistors, Mosfet and heterojunction transistors.

CO2: Analyze and Solve physics problems pertaining to various process like charge conduction across semiconductor device.

CO3: Apply the knowledge for the development and design of new methods to determine semiconductor parameters and devices.

Syllabus

Unit 1

Introduction: Unit cell, Bravais lattices, crystal systems, crystal planes and Miller indices, symmetry elements. Defects and imperfections – point defects, line defects, surface defects and volume defects.


Unit 2


Theory of p-n junctions – diode and transistor: p-n junction under thermal equilibrium, forward bias, reverse bias, carrier density, current, electric field, barrier potential. V-I characteristics, junction capacitance and voltage breakdown.

Unit 3


Modern semiconducting devices: CCD - introduction to nano devices, fundamentals of tunneling devices, design considerations, physics of tunneling devices.

TEXTBOOKS:


REFERENCES:

**Course Outcomes:**

After completion of the course students should be able to

- **CO1:** Get a broad knowledge of scientific and technical methods in astronomy and astrophysics
- **CO2:** Apply mathematical methods to solve problems in astrophysics.
- **CO3:** Develop critical/logical thinking, scientific reasoning and skills in the area of modern astrophysics.

**CO-PO Mapping:**

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**Syllabus**

**Unit 1**


Practical astronomy - telescopes and observations & techniques – constellations, celestial coordinates, ephemeris.

Celestial mechanics - Kepler’s laws - and derivations from Newton’s laws.

Sun: Structure and various layers, sunspots, flares, faculae, granules, limb darkening, solar wind and climate.

**Unit 2**


Variable stars: Cepheid, RR Lyrae and Mira type variables - Novae and Super novae. Binary and multiple star system - measurement of relative masses and velocities. Interstellar clouds - Nebulae.

**Unit 3**

Galactic astronomy: Distance measurement - red shifts and Hubble’s law – age of the universe, galaxies – morphology - Hubble’s classification - gravitational lens, active galactic nuclei (AGNs), pulsars, quasars.


Cosmology: Comic principles, big bang and big crunch – cosmic background radiation - Nucleo-synthesis - plank length and time, different cosmic models - inflationary, steady state. Variation of G. anthropic principle.

**REFERENCES:**

Publishing Company, 1996

5. 'Stellar Astronomy' by K. D Abhayankar.
MATHEMATICS

23MAT240 STATISTICAL INFERENCE L-T-P-C: 3-0-0-3

Syllabus

Unit 1

Unit 2

Unit 3
Regression: Introduction, Least Squares Estimators of the Regression Parameters, Distribution of the Estimators, Statistical Inferences about the Regression Parameters, the Coefficient of Determination and the Sample Correlation Coefficient, Analysis of Residuals, transforming to Linearity, Weighted Least Squares, Polynomial Regression, Multiple Linear Regression, Predicting Future Responses, Logistic Regression Models for Binary Output Data.

TEXTBOOK:


REFERENCES:

Syllabus

Unit 1
Elements of Game theory, examples, Strategic Games, 2 Player Strategy Games, payoffs, Minimax, Weak and Strong Domination, Saddle Points, Nash Equilibrium, Prisoner’s Dilemma, Stag Hunt, Matching pennies, BOS, Multi NE, Cooperative and Competitive Games, Strict and Non Strict NE, Best response functions for NE.

Unit 2
Combinatorial games, Winning and losing positions, Subtraction Game, 3-Pile and K-Pile Games, Proof of Correctness, Variations of K-Pile Games, Graph Games, Construction, Proof of finiteness, SG theorem for sum of games.

Unit 3
Cournot’s Oligopoly, Bertrand’s Oligopoly, Electoral Competition, Median Voter Theorem, Auctions, role of knowledge, Decision making and Utility Theory, Mixed Strategy Equilibrium, Extensive Games with Perfect Information, Stackelberg’s model of Duopoly, Buying Votes, Committee Decision making, Repeated Games, Prisoner’s Dilemma, Supermodular Game and Potential games

TEXTBOOK:
1. Martin Osborne, An Introduction to Game Theory, Oxford University Press.

REFERENCES:
Syllabus

09 (a) Roots finding methods:
Roots of Transcendental and Polynomial Equations: Bisection method, Iteration methods based on first degree equation, Rate of convergence, system of nonlinear equations.

09 (b) Interpolations:
Interpolation and Approximation: Lagrange, Newton’s Divided Difference, Newton’s Forward and Backward interpolations.

07 (b) Multivariable optimization (2 Credits)

TEXTBOOK:

REFERENCES:
FREE ELECTIVES OFFERED UNDER MANAGEMENT STREAM
COMMON TO ALL PROGRAMS

| 23MNG331 | FINANCIAL MANAGEMENT | L-T-P-C: 3-0-0-3 |

Course Objectives

- Understand the overview of financial management
- Inculcate methods and concepts on valuation
- Familiarize with working capital management, financial analysis and planning

Course Outcomes

CO1: Understand and apply time value concept of money and use this for investment criteria decisions.
CO2: Evaluate the risk and return for various alternatives of investment.
CO3: Apply the capital budgeting techniques and evaluate the investment decisions.
CO4: Understand working capital management, cash and liquidity management and financial statements.

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Syllabus

Unit 1

Unit 2

Unit 3


TEXT BOOKS

REFERENCE BOOKS
Course Objectives

- Understand the complexity and key issues in supply chain management.
- Describe logistics networks, distribution planning, routing design and scheduling models.
- Familiarize dynamics of supply chain and the role of information in supply chain.
- Understand the issues related to strategic alliances, global supply chain management, procurement and outsourcing strategies.

Course Outcomes

CO1: Analyze the complexity and key issues in supply chain management
CO2: Evaluate single and multiple facility location problems, logistics network configuration, vehicle routing and scheduling models
CO3: Analyze inventory management models and dynamics of the supply chain
CO4: Develop the appropriate supply chain through distribution requirement planning and strategic alliances
CO5: Identify the issues in global supply chain management, procurement and outsourcing strategies

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Syllabus

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Introduction: Introduction to SCM-the complexity and key issues in SCM – Location strategy – facility location decisions – single facility and multiple location models.

Unit 2
Inventory: Inventory Management and risk pooling-managing inventory in the SC. Value of Information-bullwhip effect-lead time reduction.

Unit 3

TEXT BOOK
REFERENCE BOOKS

Course Objective

- To educate the students to apply concepts and techniques in marketing so that they become acquainted with the duties of a marketing manager with an emphasis to make the students exposed to the development, evaluation, and implementation of marketing management in a variety of business environments.

Course Outcomes

On successful completion of the Course students will be able to:

CO1: Illustrate key marketing concepts, theories and techniques for analysing a variety of marketing situations
CO2: Identify and demonstrate the dynamic nature of the environment in which marketing decisions are taken and appreciate the implication for marketing strategy determination and implementation
CO3: Develop the ability to carry out a research project that explores marketing planning and strategies for a specific marketing situation
CO4: Understand the need and importance of sales promotions and make use of advertising
CO5: Manage a new product development process from concept to commercialization.
CO6: Illustrate the importance of modern trends in retailing and marketing logistics

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Syllabus

Unit 1
Marketing Process: Definition, Marketing process, dynamics, needs, wants and demands, value and satisfaction, marketing concepts, environment, mix. Philosophies, selling versus marketing, organizations, industrial versus consumer marketing, consumer goods, industrial goods, product hierarchy.

Buying Behaviour and Market Segmentation: Major factors influencing buying behaviour, buying decision process, business buying behaviour. Segmenting consumer and business markets, market targeting.

UNIT 2
Product Pricing and Marketing Research: Objectives, pricing, decisions and pricing methods, pricing management. Introduction, uses, process of marketing research.

UNIT 3
Advertising Sales Promotion and Distribution: Characteristics, impact, goals, types, and sales promotions- point of
purchase- unique selling proposition. Characteristics, wholesaling, retailing, channel design, logistics, and modern trends in retailing.

TEXT BOOKS

REFERENCE BOOKS
Course Objectives

- To discuss the project life cycle and build a successful project from pre-implementation to completion.
- To introduce different project management tools and techniques

Course Outcomes

CO1: Appraise the selection and initiation of individual projects and its portfolios in an enterprise.
CO2: Analyze the project planning activities that will predict project costs, time schedule, and quality.
CO3: Develop processes for successful resource allocation, communication, and risk management.
CO4: Evaluate effective project execution and control techniques that results in successful project completion

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Syllabus

Unit 1

Overview of Project Management: Verities of project, Project Features, Project Life Cycle – S-Curve, J-C
Project Selection: Project Identification and Screening – New ideas, Vision, Long-term objectives, SWOT Analysis (Strength, Weakness, Opportunities, Threats).
Project Selection – Decision Matrix, Technique for Order Preference using Similarity to Ideal Solution (TOPSIS), Simple Additive Weighting (SAW).

Unit 2

Project Scheduling: Gantt Chart, Critical Path Method (CPM), Project Evaluation & Review Technique (PERT). (6hrs)
Linear time cost trade-offs in project - Direct cost, indirect cost, Project crashing
Resource Consideration - Profiling, Allocation, Levelling.
Introduction to project management software: Primavera/ Microsoft project

Unit 3

Project Execution: Monitoring control cycle, Earned Value Analysis (EVA), Project Control – Physical control, Human control, financial control.
Organizational and Behavioral Issues: Organizational Structure, Selection-Project Manager, Leadership Motivation, Communication, Risk Management.
Project Termination: Extinction, Addition, Integration, Starvation.

TEXT BOOKS

REFERENCE BOOKS

Course Objectives

- To impart knowledge on the fundamentals of costing, pricing methods and strategies.
- To give an overview of production operations planning.
- To summarize various quantitative methods of plant location, layout and lean manufacturing.
- To familiarize the concepts of e-commerce, e-purchasing, MRP and ERP in business

Course Outcomes

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

- **CO1:** Understand the concepts of cost and pricing of goods and appraise project proposals
- **CO2:** Design and analyze manufacturing and service processes and to measure the work performed.
- **CO3:** Understand and analyze the key issues of supply chain Management
- **CO4:** Understand the application of lean manufacturing tools and six sigma concepts
- **CO5:** Select appropriate plant location and their layout methods
- **CO6:** Create capacity plan, aggregate plan, schedule, ERP & MRP systems

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Syllabus

### Unit 1


### Unit 2


### Unit 3

TEXT BOOKS


REFERENCE BOOKS

Course Objectives

- Familiarizing the students with quantitative tools and techniques, which are frequently applied in operational decisions

Course Outcomes

CO1: Formulate operations research models to optimize resources.
CO2: Solve transportation and assignment problems using suitable techniques.
CO3: Apply appropriate technique to analyze a project with an objective to optimize resources.
CO4: Solve operational problems using decision theory approaches.
CO5: Select suitable inventory model for effective utilisation of resources.
CO6: Solve Operations Research problems using software package

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Syllabus

Unit 1
Linear Programming: Formulations - graphical solutions - Simplex Method - Duality, Dual simplex method.
Transportation model: Assignment model – Travelling Salesman Problem.

Unit 2
Decision Theory: Decision Trees. Game theory - 2 person zero sum; mixed strategies; 2 x n and m x 2 games.
Network Models- Project Networks- CPM / PERT- Project Scheduling – crashing networks and cost considerations-
Resource leveling and smoothing - shortest route problem, minimal spanning tree problem, maximal flow problem.

Unit 3
Sequencing model – 2 machines ‘n’ jobs, ‘m’ machines ‘n’ jobs – n jobs 2 machines.
Inventory models: deterministic & probabilistic models. Quantity discounts. Selective Inventory Management
Queuing models: Poisson arrival and exponential service times. Single server, multi-server. Queues -infinite and finite
capacity queues.
Simulation –Monte Carlo simulation: simple problems

Lab session: Practicing case problems with excel solver/MatLab/LINGO package

TEXT BOOK

REFERENCE BOOKS
Course Objectives

- To inculcate the concepts of work study and its application to industrial practice
- Impart skills to design, develop, implement, and improve manufacturing/service systems

Course Outcomes

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

**CO1:** Create value to organizations through the analysis, evaluation, and improvement of work systems using work study and method study

**CO2:** Develop work systems through motion economy principles

**CO3:** Apply work measurement techniques to improve productivity, fix wages and incentives

**CO4:** Apply systematic layout planning techniques and work station design principles based on ergonomics and material handling.

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Syllabus

**Unit 1**

Work System: Elements of work, maintenance of machines, interaction, effect of working conditions and environment, physical and mental fatigue.

Productivity: Productivity, factors affecting production, Measurement of productivity.

Work Study: Definition and scope of work study; Areas of application of work study in industry; Human aspects of work study.

Method Study: Information collection, recording techniques, and processing aids; critical examination; development, installation and maintenance of improved methods.

**Unit 2**

Motion Economy and Analysis: Principles of motion economy; Motion analysis; Micromotion and Memomotion study; Therbligs and SIMO charts; Normal work area and design of work places; Basic parameters and principles of work design.

Work Measurement: Work measurement techniques; Calculation of standard time, work sampling and predetermined Motion time systems.

Wages and Incentive Schemes: Introduction, wage payment of direct and indirect labour, wage payment plans and incentives, various incentive plans, incentives for indirect labour.

**Unit 3**

Plant Layout: Concept of plant layout, types of layout; factors affecting plant layout.

Ergonomics: Ergonomic Design of equipment and work place. work station design, factors considered in designing a work station, ergonomic design standards - Study of development of stress in human body and their consequences.

Case Studies: Production planning and scheduling.

Material Handling: Introduction and functions of material handling equipment, selection of material handling equipment for different requirements, safety requirements.
Recent advances in Industrial Engineering.

**TEXT BOOKS**

**REFERENCE BOOKS**
Course Objective

- To impart the knowledge of basic statistical tools for analysis and interpretation of qualitative and quantitatively data for decision making

Course Outcomes

CO1: Apply basic probability and statistics concepts for various business problems
CO2: Perform test of hypothesis
CO3: Compute and interpret the result of regression and correlation analysis for forecasting
CO4: Solve real time problems by applying different decision making methods.

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Syllabus

Unit 1
Quantitative methods: Basic terminology in probability, probability rules, conditions of statistical dependence and independence, Bayes Theorem, Discrete Random Variables review of probability distributions, measure of central tendency.
Sampling and sampling distributions: Introduction to sampling, random sampling, design of experiments, introduction to sampling distributions
Estimation: point estimates, interval estimates and confidence intervals, calculating interval estimates of mean from large samples, using t test, sample size estimation.

Unit 2
Testing hypothesis: Introduction, basic concepts, testing hypothesis, testing when population standard deviation is known and not known, two sample tests.
Chi-square and analysis of variance: introduction, goodness of fit, analysis of variance, inferences about a population variation

Unit 3
Regression and correlation: Estimation using regression line, correlation analysis, finding multiple regression equation, modelling techniques,
Non parametric methods and time series and forecasting: Sign test for paired data, rank sum test, rank correlation, Kolmogrov – smirnov test, variations in time series, trend analysis, cyclic variation, seasonal variation and irregular variation. Decision theory: Decision tree analysis

TEXT BOOKS


REFERENCE BOOKS

Course Objective

- To impart knowledge on quality management principles, tools, techniques and quality standards for real life applications.

Course Outcomes

CO1: Evaluate the principles of quality management and to explain how these principles can be applied within quality management systems.
CO2: Evaluate the performance measures using various quality and management tools.
CO3: Apply the Quality Function Deployment, Taguchi principles, Total Productive Maintenance and Failure Mode and Effect Analysis concepts to solve industrial problems.
CO4: Practice the various quality system in industry.

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Syllabus

Unit 1
Definition of quality - dimensions of quality. Quality planning - quality costs. Total Quality Management: historical review and principles –leadership - quality council - quality statements - strategic planning - Deming philosophy. Barriers to TQM implementation

Unit 2
Customer satisfaction – Customer retention - Employee involvement - Performance appraisal - Continuous process improvement - Supplier partnership - Performance measures. Seven tools of quality. Statistical fundamentals - Control Charts for variables and attributes - Process capability - Concept of six sigma - New seven management tools - Benchmarking.

Unit 3

TEXT BOOK

REFERENCE BOOKS
Course Objectives

- Understand Lean manufacturing principles and tools
- Inculcate the concepts of value stream mapping
- Familiarize lean implementation practices

Course Outcomes

CO1: Identify key requirements and concepts in lean manufacturing.
CO2: Initiate a continuous improvement change program in a manufacturing organization
CO3: Analyze and improve a manufacturing system by applying lean manufacturing tools
CO4: Build value stream map for improving the productivity
CO5: Improve productivity through lean practices

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Syllabus

**Unit 1**
Introduction to Lean and Factory Simulation: History of Lean and comparison to other methods - The 7 Wastes, their causes and the effects - An overview of Lean Principles / concepts / tools - Stockless Production.
Ford production systems – FPS gear model

**Unit 2**
Value Stream Mapping – Current state: Preparation for building a Current State Value Stream Map – Building a Current State Map (principles, concepts, loops, and methodology) – Application to the factory Simulation scenario.

**Unit 3**
Value Stream Mapping – Future State: Key issues in building the Future State Map – Process tips in building the map and analysis of the customer loop, supplier loop, manufacturing loop and information loop – Example of completed Future State Maps – Application to factory simulation

TEXT BOOKS


REFERENCES BOOKS

Course Objectives

- This course describes the key aspects of a software project.
- It introduces the basic principles of Engineering Software Projects. Most, if not all, students' complete projects as part of assignments in various courses undertaken. These projects range in size, subject and complexity but there are basic project essentials that need to be understood and practiced for successful team project outcomes.
- The course provides an understanding of the purpose, methods and benefits of process management by exposing the student to the concepts, practices, processes, tools and techniques used in process management for software development.

Course Outcomes

CO 1: To understand the basic concepts, terminologies and issues of software project management.
CO 2: To apply appropriate methods and models for the development of solutions.
CO 3: To analyze the cost-benefits of calculations so as to optimize the selection strategy
CO 4: To evaluate methods, models and technologies towards achieving project success
CO 5: To design and evaluate network planning models with criticality

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Syllabus

Unit 1

Unit 2

Unit 3
Monitoring and control – Visualizing Progress, Earned value analysis, managing people and organizing teams- organizational structures- Planning for small projects. Case Study: PMBOK, Agile Development

TEXT BOOK(S)

REFERENCE(S)
Pre-Requisite(s): 23MAT128 Linear Algebra, 23MAT209 Differential Equations and Numerical Methods

Course Objectives

- This course serves as an introduction to financial engineering including cash flows, financial decision making etc
- It gives a thorough yet highly accessible mathematical coverage of standard and recent topics of introductory investments: fixed-income securities, modern portfolio theory, optimal portfolio growth and valuation of multi-period risky investments.

Course Outcomes

CO1: Apply basic concepts to understand and evaluate cash flows
CO2: Evaluate and arrive at a financial investment decision employing the underlying knowledge of stocks and derivatives
CO3: Analyse and design Portfolio selection methods
CO4: Understand capital market theory for stock performance evaluation

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Syllabus

Unit 1

Unit 2

Unit 3

TEXT BOOK(S)

REFERENCE(S)

Course Objectives

- Prepare engineering students to analyze and understand the business, impact of economic environment on business decisions

Course Outcomes

CO1: Understand and evaluate the economic theories, cost concepts and pricing policies and draw inferences for the investment decisions for appraisal and profitability
CO2: Appraise the dynamics of the market and market structures and portray implication for profit and revenue maximization
CO3: Employ operations research and allied techniques in managerial economics for an enhanced analysis and decision making

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Syllabus

Unit 1

Unit 2

Unit 3

TEXT BOOK(S)

REFERENCE(S)
Course Objectives

- This course is to expose the students to the managerial issues relating to information systems and also understand the role of Business Process Reengineering technique in an organization.
- The course also focuses on the management of information technology to provide efficiency and effectiveness or strategy decision making.

Course Outcomes

CO1: Understand the fundamental concepts of Information Systems in business.
CO2: Understand and analyze the strategic role played by Information Systems in e-commerce.
CO3: Analyze management challenges in Global Businesses predominantly dependent on IS functions.

CO-PO Mapping

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Syllabus

Unit 1

Unit 2

Unit 3
TEXT BOOK(S)


REFERENCE(S)

1. Laudon K, Laudon JP. Management Information Systems;2010
Course Objectives:

- The course offers to explore the seminal thoughts that influenced the Indian Mind on the study of human possibilities for manifesting excellence in life. This course presents to the students, an opportunity to study the Indian perspective of Personality Enrichment through pragmatic approach of self-analysis and application.

Syllabus

Unit 1
Goals of Life – Purusharthas
What are Purusharthas (Dharma, Artha, Kama, Moksha); Their relevance to Personal life; Family life; Social life & Professional life; Followed by a Goal setting workshop;
Yogic way of Achieving Life Goals – (Stress Free & Focused Life)
Introduction to Yoga and main schools of Yoga; Yogic style of Life & Time Management (Workshop);
Experiencing life through its Various Stages
Ashrama Dharma; Attitude towards life through its various stages (Teachings of Amma);

Unit 2
Personality Development
What is Personality – Five Dimensions – Pancha Kosas (Physical / Energy / Mental / Intellectual / Bliss); Stress Management & Personality; Self Control & personality; Fundamental Indian Values & Personality;
Learning Skills (Teachings of Amma)
Art of Relaxed Learning; Art of Listening; Developing ‘Shraddha’ – a basic qualification for obtaining Knowledge;
Communication Skills - An Indian Perspective;

Unit 3
Developing Positive Attitude & Friendliness - (Vedic Perspective);
Achieving Work Excellence (Karma Yoga by Swami Vivekananda & teachings based on Amma);
Leadership Qualities – (A few Indian Role models & Indian Philosophy of Leadership);

REFERENCE BOOKS:
1. Awaken Children (Dialogues with Sri Mata Amritanandamayi) Volumes 1 to 9
2. Complete works of Swami Vivekananda (Volumes 1 to 9)
3. Mahabharata by M. N Dutt published by Parimal publications – New Delhi (Volumes 1 to 9)
4. Universal message of Bhagavad-Gita (An exposition of Gita in the light of modern thought and Modern needs) by Swami Ranganathananda. (Vols. 1 to 3)
7. Art of Man Making - Swami Chinmayananda published by Chinmaya Mission, Bombay
10. Yoga In Daily Life - Swami Sivananda – published by Divine Life Society
12. All about Hinduism – Swami Sivananda - Published by Divine Life Society
15. Valmiki Ramayana – Four volumes- published by Parimal Publications, Delhi
17. Mind Sound Resonance Technique (MSRT) Published by Swami Vivekananda Yoga Prakashana, Bangalore.
18. Yoga & Memory - Dr H R Nagendra & Dr. Shirley Telles, published by Swami Vivekananda Yoga Prakashana, Bangalore.
Syllabus

Unit 1

1. The anatomy of ‘Excellence’. What is ‘excellence’? Is it judged by external factors like wealth?
2. The Great Flaw. The subject-object relationship between individual and world. Promote subject enhancement.
3. To work towards excellence, one must know where he is. Our present state... An introspective analysis. Our faculties within.

Unit 2

4. The play of the mind. Emotions – convert weakness into strength.
5. The indispensable role of the intellect. How to achieve and apply clear thinking?

Unit 3

8. The art of right contact with the world. Assessment, expectations.
9. Myths and Realities on key issues like richness, wisdom, spirituality.
10. Collect yourself, there is no time to waste. The blue-print of perfect action.

REFERENCES:

1. The Bhaja Govindam and the Bhagavad Gita.
OBJECTIVES:

- This course offers a journey of exploration through the early developments in India of astronomy, mathematics, technologies and perspectives of the physical world. With the help of many case studies, the students will be equipped to understand concepts as well as actual techniques.

Syllabus

Unit 1
1. General introduction: principles followed and sources;
2. Astronomy & mathematics from the Neolithic to the Indus civilization;
3. Astronomy & mathematics in Vedic literature;
4. Vedanga Jyotisha and the first Indian calendars;
5. Shulba Sutras and the foundations of Indian geometry;

Unit 2
1. Astronomy & mathematics in Jain and Buddhist literature;
2. The transition to the Siddhantic period; Aryabhata and his time;
3. The Aryabhatiya: concepts, content, commentaries;
4. Brahma-gupta and his advances;
5. Other great Siddhantic savants;
6. Bhaskara II and his advances;

Unit 3
1. The Kerala school of mathematics;
2. The Kerala school of astronomy;
3. Did Indian science die out?,
4. Overview of recent Indian scientists, from S. Ramanujan onward;
5. Conclusion: assessment and discussion;

TEXTBOOK:
1. Indian Mathematics and Astronomy: Some Landmarks, by S. Balachandra Rao

REFERENCE:
1. IFIH’s interactive multimedia DVD on Science & Technology in Ancient India.
OBJECTIVES:

- This course offers the foundation necessary to understand Eastern approaches to psychology and spirituality. The course includes experiential components centering on meditation and spiritual practice.

Syllabus

Unit 1
Introduction
Introduction to Modern Psychology
A short history of Modern Psychology - Major Schools of Modern Psychology - The three major forces in Western Psychology - Freudian Psychoanalysis; Behaviourism; Humanistic Psychology.

Introduction to Indian Psychology
What is Yoga? - Rise of Yoga Psychology tradition - Various schools of Yoga Psychology - Universal Goal of all Yoga-schools.

Patanjali Yoga Sutra – 1

Patanjali Yoga Sutra – 2

Unit 2
Patanjali Yoga Sutra – 3
Two formulae - Necessity of Abhyasah and Vairagyah - Foundation of Abhyasah - Foundation of Vairagyah.

Patanjali Yoga Sutra – 4

Patanjali Yoga Sutra – 5
Main obstacles in the path of Yoga - other obstructions - removal of obstacles by one – pointedness; by controlling Prana - by observing sense experience - by inner illumination - by detachment from matter - by knowledge of dream and sleep - by meditation as desired.

Patanjali Yoga Sutra – 6

Patanjali Yoga Sutra – 7

Unit 3
Patanjali Yoga Sutra – 8

Patanjali Yoga Sutra – 9
Patanjali Yoga Sutra – 10
Asanam – Pranayamah - various kinds of Pranayamah - Pratyaharah - Mastery over the senses.

REFERENCES:
1. The course book will be “The four chapters of Freedom” written by Swami Satyananda Saraswati of Bihar School of Yoga, Munger, India.
3. Eight Upanishads with the commentary of Sankaracharya, Translated by Swami Gambhirananda, Published by Advaita Ashram, Uttaranjal.
4. ‘Hatha Yoga Pradipika’ Swami Muktibodhananda, Yoga Publications Trust, Munger, Bihar, India
OBJECTIVES:

- To introduce business vocabulary; to introduce business style in writing and speaking; to expose students to the cross-cultural aspects in a globalised world; to introduce the students to the art of persuasion and negotiation in business contexts.

Course Outcomes

CO1: Familiarize and use appropriate business vocabulary and etiquettes in verbal communication in the professional context
CO2: Understand organizational structures, pay structures and performance assessments
CO3: Apply language skills in drafting various business documents and other necessary communications in the business context
CO4: Understand and address cross cultural differences in the corporate environment
CO5: Participate in planned and extemporaneous enactments of various business situations

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Syllabus

Unit 1

Unit 2
Writing: Style and vocabulary - Business Memorandum, letters, Press Releases, reports – proposals – Speaking: Conversational practice, telephonic conversations, addressing a gathering, conducting meetings.

Unit 3
Active Listening: Pronunciation – information gathering and reporting - Speaking: Cross-Cultural Issues, Group Dynamics, negotiation & persuasion techniques.

Activities
Case studies & role-plays.

BOOKS RECOMMENDED:

OBJECTIVES:

- To expose the students to the greatness of Indian Thought in English; to develop a sense of appreciation for the lofty Indian Thought; to develop an understanding of the eclectic Indian psyche; to develop an understanding about the societal changes in the recent past.

Syllabus

Unit 1 Poems
Rabindranath Tagore’s Gitanjali (1-10); Nizzim Ezekiel’s Enterprise; A.K. Ramanujam’s Small-Scale Reflections on a Great House.

Unit 2 Prose
Khushwant Singh’s The Portrait of a Lady; Jhumpa Lahiri’s Short Story - Interpreter of Maladies.

Unit 3
Drama and Speech
Vijay Tendulkar’s Silence, the Court is in Session; Motivational speeches by Jawaharlal Nehru/ S. Radhakrishnan/ A. P. J. Abdul Kalam’s My Vision for India etc. (any speech).

REFERENCES:

OBJECTIVES:

- To expose the students to different genres of Literature; to hone reading skills; to provide deeper critical and literary insights; to enhance creative thinking; to promote aesthetic sense.

Syllabus

Unit 1 Poems

Unit 2

Short Stories

Unit 3 Prose

Practicals:

Role plays: The Proposal, Chekov / Remember Caesar, Gordon Daviot / Final Solutions, Mahesh Dattani, Book reviews, Movie reviews.

SUGGESTED READING:
1. *The Old Man and the Sea*, Hemingway / Any one of the novels of R.K. Narayan, etc.
OBJECTIVES:

- To introduce the students to the elements of technical style; to introduce the basic elements of formal correspondence; to introduce technical paper writing skills and methods of documentation; to improve oral presentation skills in formal contexts.

Course Outcomes:

After the completion of the course the student will be able to:

CO1: Understand and use the basic elements of formal correspondence and methods of documentation
CO2: Learn to edit technical content for grammatical accuracy and appropriate tone and style
CO3: Use the library and internet resources for research purposes
CO4: Demonstrate the ability to communicate effectively through group mock-technical presentations and other activities

Mapping of course outcomes with program outcomes:

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Syllabus:

Unit 1

Unit 2
Different kinds of written documents: Definitions – descriptions – instructions – recommendations - manuals - reports – proposals; Formal Correspondence: Letter Writing including job applications with Resume.

Unit 3

Practice in oral communication and Technical presentations

REFERENCES:

OBJECTIVES:

- To help the students learn the fine art of story writing; to help them learn the techniques of storytelling; to help them study fiction relating it to the socio-cultural aspects of the age; to familiarize them with different strategies of reading short stories; to make them familiar with the morals and values held in high esteem by the ideals of Indianness.

Syllabus

Unit 1

Unit 2

Unit 3
Masti Venkatesha Iyengar: The Curds-Seller; Manohar Malgonkar: Upper Division Love; Romila Thapar: The Spell; Premchand: The Voice of God.

TEXT:

REFERENCE:
Syllabus

Unit 1

Population - Identity
How to introduce yourself (name, age, address, profession, nationality); Numbers; How to ask questions;
Grammar – Pronouns - subjects; Regular verbs of 1st group (er) in the present; Être (to be) and avoir (to have) in
the present; Interrogative sentence; Gender of adjectives.

Unit 2

The suburbs - At the train station
Introduce someone; Buy a train ticket or a cinema ticket; Ask for information; Official time; Ask for a price; The
city (church, town hall, post office…)
Grammar – Pronouns - subjects (continuation); Gender of adjectives (continuation); Plural of nouns and adjectives;
Definite and indefinite articles; Interrogative adjectives; I would like (Je voudrais).

Unit 3

Paris and the districts - Looking for a room
Locate a room and indicate the way; Make an appointment; Give a price; Ordinal numbers; Usual time; Ask for the
time.
Grammar - Imperative mode; Contracted articles (au, du, des); negation.

TEXTBOOK:

1. Metro St Michel - Publisher: CLE international
Syllabus

Unit 1

The first room of a student
A party to celebrate the 1st room; Description of a room; furniture; Locate objects: prepositions (devant, derrière, dans…), Read advertisement; Appreciation (I like, I prefer,).

Grammar - Perfect past tense with avoir; Possessive adjectives (mon, ton, son…); Demonstrative adjectives (ce, cet, cette); Yes (oui, si).

Unit 2 Small

jobs
Conversation on the phone; Give Time indications; Answer a job offer; Describe a job; Suggest a meeting time.
Grammar - Perfect past tense with être and avoir (continuation); Possessive adjectives (notre, votre, leur); Prepositions (à, pour, avec …); Pronoun as direct object (le, la, l’, les).

Unit 3

University Restaurant
Inquiry; Express an opinion; Ask questions (continuation); Food, meals, taste, preferences; Nutrition, diet, choose a menu or diet, Expression of quantities (beaucoup, peu).

Grammar - Partitif (expressing quantity) (du, de la, pas de…); Comparison (plus…que, moins….que, autant …que); Interrogation (continuation), inversion, Est-ce que, qu’est-ce que?.

TEXTBOOK:
1. Metro St Michel - Publisher: CLE International
Syllabus

Unit 1
Greetings; Introducing oneself (formal and informal context), saying their name, origin, living place, occupation. Numbers 1-100; Saying the telephone number. Countries and Languages. Grammar: Structure – W - Questions and Yes/No questions and statements, personal pronouns, verb conjugations. Articles. Vocabulary: Professions.

Unit 2
Giving the personal details. Name, age, marital status, year of birth, place of birth, etc. Numbers till 1000. Saying a year. Alphabets – spelling a word. Filling up an application form; In the restaurant – making an order. Grammar: Definite, indefinite and negative article in nominative. Accusative: indefinite and negative Article Vocabulary: Food items

Unit 3
Syllabus

Unit 1
Shopping and orientation in supermarket; Conversation between the customer and salesman; Where one finds what in supermarket; Asking for requests and suggestions.

Grammar: Dative of personal pronouns. Imperative form. Vocabulary: Consumables and measurements;

Unit 2
Appointments; Work and leisure time activities; Time, weekdays, months and seasons; saying the date; fixing up an appointment.

Grammar: Model verbs; Prepositions with time and place; Ordinal numbers. Vocabulary: Leisure activities, weekdays, months and seasons.

Unit 3
Family and household; Family and relations; household and daily routine. Grammar: Possessive articles; Divisible and indivisible verbs.
Vocabulary: Family circle; Household articles.
Syllabus

To have an elementary exposure to German language; specifically

1. to have some ability to understand simple spoken German, and to be able to speak it so as to be able to carry on life in Germany without much difficulty (to be able to do shopping, etc.);
2. to be able to understand simple texts, and simple forms of written communication;
3. to have a basic knowledge of German grammar;
4. to acquire a basic vocabulary of 500 words;
5. to be able to translate simple letters with the use of a dictionary; and
6. to have some familiarity with the German life and culture.

(This will not be covered as part of the regular classroom teaching; this is to be acquired by self-study.)

Some useful websites will be given.
Syllabus

The basic vocabulary and grammar learned in the earlier course is mostly still passive knowledge. The endeavour of this course is to activate this knowledge and develop the skill of communication.

Topics are: Airport, railway station, travelling; shopping; invitations, meals, meeting people; around the house; the human body; colours; professions.

Past and future tenses will be introduced. Applying genitive, dative and accusative. Some German culture. Films.
OBJECTIVES:

- To teach Hindi for effective communication in different spheres of life - Social context, Education, governance, Media, Business, Profession and Mass communication.

Course Outcomes:

After the completion of the course the student will be able to:

CO1: Gain knowledge about the nature and culture of Hindi language
CO2: Understand the structural aspects of Hindi language
CO3: Apply the knowledge of the grammatical structures to communicate in Hindi
CO4: Analyse the social significance of modern literature.
CO5: Develop the ability to translate a given text to Hindi

CO-PO Mapping:

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Syllabus

Unit 1
Introduction to Hindi Language, National Language, Official Language, link Language etc. Introduction to Hindi language, Devanagari script and Hindi alphabet.


Unit 2
Common errors and error corrections in Parts of Speech with emphasis on use of pronouns, Adjective and verb in different tenses – Special usage of adverbs, changing voice and conjunctions in sentences, gender& number - General vocabulary for conversations in given context –understanding proper pronunciation - Conversations, Interviews, Short speeches.

Unit 3
Poems – Kabir 1st 8 Dohas, Surdas 1st 1 Pada; Tulsidas 1st 1 Pada; Meera 1st 1 Pada

Unit 4

Unit 5
Kahani – Premchand: Kafan, Abhilasha, Vidroh, Poos ki rath, Juloos.
BOOKS:

1. Prem Chand Ki Sravashrestha Kahaniyam: Prem Chand; Diamond Pub Ltd. New Delhi
2. Vyavaharik Hindi Vyakaran, Anuvad thaha Rachana: Dr. H. Parameswaran, Radhakrishna publishing House, New Delhi
OBJECTIVES:

- Appreciation and assimilation of Hindi Literature both drisya & shravya using the best specimens provided as an anthology.

Course Outcomes:

After the completion of the course the student will be able to:

CO1: Understand the grammatical structures of Hindi
CO2: Understand the post modern trends of literature
CO3: Enhance critical thinking and writing skills
CO4: Identify and analyse different literary and audio-visual material
CO5: Apply fundamental knowledge of Hindi in formal and informal writing

CO-PO Mapping:

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Syllabus:

Unit 1

Unit 2
Communicative Hindi - Moukhi Abhivyakti

Unit 3
Audio-Visual Media in Hindi – Movies like Tare Zameen par, Paa, Black etc., appreciation and evaluation. News reading and presentations in Radio and TV channels in Hindi.

Unit 4
Gadya Manjusha – Budhapa, Kheesa, Sadachar ka Thavis

Unit 5

BOOKS:
2. Gadya Manjusha: Editor: Govind, Jawahar Pustakalay, Mathura
Syllabus

Unit 1
Emotional Intelligence: Concept of Emotional Intelligence, Understanding the history and origin of Emotional Intelligence, Contributors to Emotional Intelligence, Science of Emotional Intelligence, EQ and IQ, Scope of Emotional Intelligence.

Unit 2

Unit 3
Emotional Intelligence at Work place: Importance of Emotional Intelligence at Work place? Cost–savings of Emotional Intelligence, Emotionally Intelligent Leaders, Case Studies Measuring Emotional Intelligence: Emotionally Intelligence Tests, Research on Emotional Intelligence, Developing Emotional Intelligence.

REFERENCES:
Syllabus

Unit 1

Unit 2
Selected writings / selections from the complete works of the following authors will be taken up for study in a chronological order:
Raja Ram Mohan Roy; Dayananda Saraswati; Bal Gangadhar Tilak; Rabindranath Tagore;

Unit 3
Selected writings / selections from the complete works of the following authors will be taken up for study in a chronological order:
Swami Vivekananda; Sri Aurobindo; Ananda K. Coomaraswamy; Sister Nivedita; Mahatma Gandhi; Jawaharlal Nehru; B.R. Ambedkar; Sri Chandrasekharendra Saraswati, the Paramacharya of Kanchi; Dharampal; Raja Rao; V.S. Naipaul.

Conclusion.

REFERENCES:
1. Tilak, Bal Gangadhar. The Orion / Arctic Home in the Vedas.
2. Tagore, Rabindranath. The History of Bharatavarsha / On Nationalism / Greater India.
Syllabus

Unit 1
Introduction
A peep into India’s glorious past
Ancient India – the vedas, the vedic society and the Sanatana Dharma – rajamandala and the Cakravartins – Ramarajya – Yudhisthira’s ramarajya; Sarasvati - Sindhu Civilization and the myth of the Aryan Invasion; Classical India – Dharma as the bedrock of Indian society – Vaidika Brahmanya Dharma and the rise of Jainism and Buddhism – the sixteen Mahajanapadas and the beginning of Magadhian paramountcy - Kautilya and his Arthasastra – Chandragupta Maurya and the rise of the Mauryan empire – Gupta dynasty Indian art and architecture – classical sanskrit literature – Harsavardhana; Trade and commerce in classical and medieval India and the story of Indian supremacy in the Indian ocean region; The coming of Islam – dismantling of the traditional Indian polity – the Mughal empire – Vijayanagara samrajya and days of Maratha supremacy.

Unit 2
India’s contribution to the world: spirituality, philosophy and sciences
Indian Philosophy – the orthodox (Vaidika) and the heterodox (atheistic) schools; Ramayana and Mahabharata; Bhagavad Gita; Saints and sages of India; Ancient Indian medicine: towards an unbiased perspective; Ancient Indian mathematics; Ancient Indian astronomy; Ancient Indian science and technology.

The arrival of Europeans, British paramountcy and colonization
What attracted the rest of the world to India?; India on the eve of the arrival of European merchants; The story of colonization and the havoc it wrought on Indian culture and civilization; Macaulay and the start of the distortion of Indian education and history; Indian economy – before and after colonization: a brief survey; The emergence of modern India.

Unit 3
Women in Indian society
The role and position of women in Hindu civilization; Gleanings from the Vedas, Brihadarnyaka Upanishad, Saptasati Devi Mahatmyam, Ramayana, Mahabharata, Manusmriti, Kautilya’s Arthasastra and Mrichchhakatikam of Sudraka; The role and position of Indian women vis-a-vis Islam and European cultures; The great women of India.

Modern India
The national movement for freedom and social emancipation; Swami Vivekananda, Sri Aurobindo, Rabindranath Tagore; Understanding Mahatma Gandhi; A new nation is born as a republic – the pangs of birth and growth; India since Independence – the saga of socio-political movements; Problems facing the nation today; Globalization and Indian Economy; Bharatavarsha today and the way ahead: Regeneration of Indian National Resources.

Conclusion
The Wonder that was India; The ‘politics’ and ‘purpose’ of studying India.

REFERENCES:
17. Aurobindo, Sri. The Indian Renaissance / India’s Rebirth / On Nationalism.
25. Danino, Michel. The Invasion That Never Was.
34. Dharampal. Archival Compilations (unpublished)
Syllabus

Unit 1
Introduction
General Introduction; Primitive man and his modes of exchange – barter system; Prehistoric and proto-historic polity and social organization.
Ancient India – up to 600 B.C.
Early India – the vedic society – the varnashramadharma – socio-political structure of the various institutions based on the four purusartha; The structure of ancient Indian polity – Rajamandala and Cakravartins – Prajamandala; Socio-economic elements from the two great Epics – Ramayana and Mahabharata – the concept of the ideal King (Sri Rama) and the ideal state (Ramaraja) – Yudhisthira’s ramaraja; Sarasvati - Sindhu civilization and India’s trade links with other ancient civilizations; Towards chiefdoms and kingdoms – transformation of the polity: kingship – from gopati to bhupati; The mahajanapadas and the emergence of the srenis – states and cities of the Indo-Gangetic plain.

Unit 2
Classical India: 600B.C. – 1200 A.D.
The rise of Magadha, emergence of new religions – Buddhism and Jainism – and the resultant socio-economic impact; The emergence of the empire – the Mauryan Economy and Kautilya’s Arthasastra; of Politics and trade – the rise of the Mercantile Community; Elements from the age of the Kushanas and the Great Guptas; India’s maritime trade; Dharma at the bedrock of Indian polity – the concept of Digvijaya: dharma-vijaya, lobha-vijaya and asura-vijaya; Glimpses into the south Indian economies: political economies of the peninsula – Chalukyas, Rashtrakutas and Cholas

Medieval India: 1200 A.D. – 1720 A.D.
Advent of Islam – changes in the social institutions; Medieval India – agrarian economy, non-agricultural production and urban economy, currency system; Vijayanagara samrajya and maritime trade – the story of Indian supremacy in the Indian Ocean region; Aspects of Mughal administration and economy; The Maratha and other provincial economies.

Unit 3
Modern India: 1720 - 1947
the Indian market and economy before the arrival of the European traders; Colonisation and British supremacy (dismantling of everything that was ‘traditional’ or ‘Indian’) – British attitude towards Indian trade, commerce and economy and the resultant ruining of Indian economy and business – man-made famines – the signs of renaissance: banking and other business undertakings by the natives (the members of the early Tagore family, the merchants of Surat and Porbander, businessmen of Bombay, etc. may be referred to here) – the evolution of the modern banking system; Glimpses into British administration of India and administrative models; The National movement and nationalist undertakings in business and industry: the Tatas and the Birlas; Modern India: the growth of large- scale industry – irrigation and railways – money and credit – foreign trade; Towards partition – birth of two new nations – division of property; The writing of the Indian Constitution – India becomes a democratic republic – a new polity is in place.

Independent India – from 1947
India since Independence – the saga of socio-political movements; Indian economy since Independence – the fiscal system – the five year plans – liberalisation – the GATT and after; Globalisation and Indian economy; Impact of science and (new/ emerging) technology on Indian economy; Histories of select Indian business houses and business entrepreneurship.
Conclusion

REFERENCES:
4. **Dutt, R. C. The Economic History of India. London, 1902.**
5. **Dharampal. Collected Works (Volumes IV & V).**
6. **Dharampal. Archival Compilations (unpublished).**
7. **Bajaj, Jitendra & M. D. Srinivas. Indian Economy and Polity. Chennai: Centre for Policy Studies.**
8. **Bajaj, Jitendra & M. D. Srinivas. Timeless India, Resurgent India. Chennai: Centre for Policy Studies.**
20. **Majumdar, R. C., et. al. An Advanced History of India. Macmillan.**
Syllabus

Unit 1

Introduction to Health
Health is wealth; Role of lifestyle habits on health; Importance of adolescence; Stages, Characteristics and changes during adolescence; Nutritional needs during adolescence why healthy lifestyle is important for adolescence. Eating Habits - eating disorders, skipping breakfast, junk food consumption.

Practicals - Therapeutic Diets

Unit 2

Food and Nutritional Requirements during Adolescence
Fluid intake; nutrition related problems; lifestyle related problems, Role of physical activity; resting pattern and postures, Personal habits – alcoholism, and other tobacco products, electronic addiction etc

Practicals - Ethnic Foods

Unit 3

Need for a Positive Life Style Change
Peer pressure & procrastination, Stress, depression, suicidal tendency, Mini project review and viva, Whole portions revision.

Practical - Cooking without Fire or Wire-healthy Snacks

TEXTBOOKS:

REFERENCE BOOKS:
2. WHO Report on Adolescent Health: 2010
**Syllabus**

**Unit 1**  
Introductory study of the Bhagavad Gita and the Upanishads.

**Unit 2**  
The relevance of these classics in a modern age.

**Unit 3**  
Goals of human life - existential problems and their solutions in the light of these classics etc.

**REFERENCE:**

1. *The Bhagavad Gita, Commentary by Swami Chinmayananda*
PREAMBLE:

This paper will introduce the students to the multiple dimensions of the contribution of India to the fields of philosophy, art, literature, physical and social sciences. The paper intends to give an insight to the students about the far-reaching contributions of India to world culture and thought during the course of its long journey from the hoary antiquity to the present times. Every nation takes pride in its achievements and it is this sense of pride and reverence towards the achievements that lays the foundation for its all-round progress.

Syllabus

Unit 1
A brief outline of Indian history from prehistoric times to the present times.
Contributions of India to world culture and civilization: Indian Philosophy and Religion; Art and Literature; Physical and Social Sciences.

Unit 2
Modern India: Challenges and Possibilities.
Scientific and technological progress in post-independence era; Socio-cultural and political movements after independence; Challenges before the nation today - unemployment – corruption – degradation of cultural and moral values - creation of a new system of education; Creation of a modern and vibrant society rooted in traditional values.

Unit 3
Modern Indian Writing in English: Trends in Contemporary Indian Literature in English.

TEXTBOOK:
Material given by the Faculty

BACKGROUND LITERATURE:
1. Selections from The Cultural Heritage of India, 6 volumes, Ramakrishna Mission Institute of Culture (Kolkata) publication.
2. Selections from the Complete Works of Swami Vivekananda, Advaita Ashrama publication.
3. Invitations to Indian Philosophy, T. M. P. Mahadevan, University of Madras, Chennai.
4. Outlines of Indian Philosophy, M. Hiriyanna, MLBD.
5. An Advanced History of India, R. C. Majumdar et al, Macmillan.
6. India Since 1526, V. D. Mahajan, S. Chand & Company
7. The Indian Renaissance, Sri Aurobindo.
8. India’s Rebirth, Sri Aurobindo.
13. Awaken Children: Conversations with Mata Amritanandamayi
15. Indian Philosophy of Beauty, T. P. Ramachandran, University of Madras, Chennai.
16. Web of Indian Thought, Sister Nivedita
17. Essays on Indian Nationalism, Anand Kumaraswamy
18. Comparative Aesthetics, Volume 2, Kanti Chandra Pandey, Chowkhamba, Varanasi
19. The Invasion That Never Was, Michel Danino
20. Sanskara, U. R. Ananthamurthy, OUP.
21. Hayavadana, Girish Karnard, OUP.
22. Naga-Mandala, Girish Karnard, OUP.
OBJECTIVES:

- To familiarize students with Sanskrit language; to introduce students to various knowledge traditions in Sanskrit; to help students appreciate and imbibe India’s ancient culture and values.

Syllabus

Unit 1

Unit 2
Language Studies - Role of Sanskrit in Indian & World Languages.

Unit 3

Unit 4

Unit 5
Indology Studies – Perspectives and Innovations.

TEXTBOOKS AND REFERENCE BOOKS:

1. Vakya Vyavahara - Prof. Vempaty Kutumba Sastri, Rashtriya Sanskrit Sansthan, New Delhi
2. The Wonder that is Sanskrit - Dr. Sampadananda Mishra, New Delhi
Syllabus

Unit 1
Introduction to Basic Concepts of NSS: History, philosophy, aims and objectives of NSS, Emblem, flag, motto, song, badge etc., Organisational structure, roles and responsibilities of various NSS functionaries.
NSS Programmes and Activities: Concept of regular activities, special campaigning, Day Camps, Basis of adoption of village / slums, methodology of conducting survey, financial pattern of the scheme, other youth programme/schemes of GOI, Coordination with different agencies, Maintenance of the Diary.

Unit 2
Volunteerism and Shramdan: Indian Tradition of volunteerism, Needs and importance of volunteerism, Motivation and Constraints of volunteerism, Shramdan as part of volunteerism, Amalabharatam Campaign, Swatch Bharath.

Unit 3
Understanding youth: Definition, profile and categories of youth, Issues, challenges and opportunities for youth, Youth as an agent of social change.
Youth and Yoga: History, philosophy and concept of Yoga, Myths and misconceptions about Yoga, Different Yoga traditions and their impacts, Yoga as a preventive and curative method, Yoga as a tool for healthy life style

Unit 4
Youth Development Programmes in India: National Youth Policy, Youth development programmes at the national level, state level and voluntary sector, youth-focused and youth-led organizations.

Unit 5
Environmental Issues: Environment conservation, enrichment and sustainability, climate change, waste management, rain water harvesting, energy conservation, waste land development.

Project Work / Practical
Course Objectives

- To help students acquire the basic knowledge of behavior and effective living
- To create an awareness of the hazards of health compromising behaviours
- To develop and strengthen the tools required to handle the adversities of life

Course Outcome

CO 1: Understand the basic concepts of Behavioral Psychology
CO 2: Demonstrate self reflective skills through activities
CO 3: Apply the knowledge of psychology to relieve stress
CO 4: Analyse the adverse effects of health compromising behaviours.
CO 5: Evaluate and use guided techniques to overcome and cope with stress related problems.

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Syllabus

Unit 1

Self-Awareness & Self-Motivation
Self analysis through SWOT, Johari Window, Maslow’s hierarchy of motivation, importance of self esteem and enhancement of self esteem.

Unit 2

The Nature and Coping of Stress

Unit 3

Application of Health Psychology
Health compromising behaviours, substance abuse and addiction.

TEXTBOOKS:
1. V. D. Swaminathan & K. V. Kaliappan “Psychology for effective living - An introduction to Health
REFERENCE BOOKS:
Course Objectives:
- To strengthen the fundamental knowledge of human behavior
- To strengthen the ability to understand the basic nature and behavior of humans in organizations as a whole
- To connect the concepts of psychology to personal and professional life

Course Outcome
CO 1: Understand the fundamental processes underlying human behavior such as learning, motivation, individual differences, intelligence and personality.
CO 2: Apply the principles of psychology in day-to-day life for a better understanding of oneself and others.
CO 3: Apply the knowledge of Psychology to improve study skills and learning methods
CO 4: Apply the concepts of defense mechanisms to safeguard against abusive relationships and to nurture healthy relationships.

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Syllabus

Unit 1
Psychology of Adolescents: Adolescence and its characteristics.

Unit 2
Learning, Memory & Study Skills: Definitions, types, principles of reinforcement, techniques for improving study skills, Mnemonics.

Unit 3
Attention & Perception: Definition, types of attention, perception.

TEXTBOOKS:

REFERENCE BOOKS:
Syllabus

Unit 1
Introduction
Western and Indian views of science and technology
Introduction; Francis Bacon: the first philosopher of modern science; The Indian tradition in science and technology: an overview.

Unit 2
Indian sciences
Introduction; Ancient Indian medicine: towards an unbiased perspective; Indian approach to logic; The methodology of Indian mathematics; Revision of the traditional Indian planetary model by Nilakantha Somasutvan in circa 1500 AD

Science and technology under the British rule
Introduction; Indian agriculture before modernization; The story of modern forestry in India; The building of New Delhi

Unit 3
Science and technology in Independent India
Introduction; An assessment of traditional and modern energy resources; Green revolution: a historical perspective; Impact of modernisation on milk and oilseeds economy; Planning without the spirit and the determination.

Building upon the Indian tradition
Introduction; Regeneration of Indian national resources; Annamahatmyam and Annam Bahu Kurvita: recollecting the classical Indian discipline of growing and sharing food in plenty and regeneration of Indian agriculture to ensure food for all in plenty.

Conclusion

REFERENCES:

18. The Cultural Heritage of India. Kolkata: Ramakrishna Mission Institute of Culture.

*The syllabus and the study material in use herein has been developed out of a ‘summer programme’ offered by the Centre for Policy Studies (CPS), Chennai at the Indian Institute of Advanced Study (IIAS), Rashtrapati Nivas, Shimla, sometime ago. The same has been very kindly made available to us by Professors Dr M.D. Srinivas (Chairman) and Dr J.K. Bajaj (Director) of the CPS.*
Syllabus

Unit 1
Introduction: Relevance of Bhagavad Gita today – Background of Mahabharatha.

ArjunaVishada Yoga: Arjuna’s Anguish and Confusion – Symbolism of Arjuna’s Chariot.


Unit 2
Karma Yoga: Yoga of Action – Living in the Present – Dedicated Action without Anxiety over Results - Concept of Swadharma.

Dhyana Yoga: Tuning the Mind – Quantity, Quality and Direction of Thoughts – Reaching Inner Silence.

Unit 3


TEXTBOOKS / REFERENCES:
OBJECTIVES:

- To give students an introduction to the basic ideas contained in the Upanishads; and explores how their message can be applied in daily life for achieving excellence.

Syllabus

Unit 1
An Introduction to the Principal Upanishads and the Bhagavad Gita - Inquiry into the mystery of nature - Sruti versus Smrti - Sanatana Dharma: its uniqueness - The Upanishads and Indian Culture - Upanishads and Modern Science.

Unit 2
The challenge of human experience & problems discussed in the Upanishads — the True nature of Man – the Moving power of the Spirit – The Message of Fearlessness – Universal Man - The central problems of the Upanishads – Ultimate reality – the nature of Atman - the different manifestations of consciousness.

Unit 3
Upanishad Personalities - episodes from their lives and essential teachings: Yajnavalkya, Aruni, Uddalaka, Pippalada, Satyakama Jabala, Svetaketu, Nachiketas, Upakosala, Chakrayana Ushasti, Raikva, Kapila and Janaka. Important verses from Upanishads - Discussion of Sage Pippalada’s answers to the six questions in Prasnopanishad.

REFERENCES:

1. The Message of the Upanishads by Swami Ranganathananda, Bharatiya Vidya Bhavan
2. Eight Upanishads with the commentary of Sankaracharya, Advaita Ashrama
3. Indian Philosophy by Dr. S. Radhakrishnan, Oxford University Press
4. Essentials of Upanishads by R L Kashyap, SAKSI, Bangalore
5. Upanishads in Daily Life, Sri Ramakrishna Math, Mylapore.
7. Upanishad Ganga series – Chinmaya Creations
Course Objectives:
- To introduce the significance of food, nutrients, locally available food resources, synergetic food combinations, good cooking methods and importance of diversity in foods.
- To understand nutritional imbalances and chronic diseases associated with the quality of food.
- To gain awareness about the quality of food - Organic food, genetically modified food, adulterated food, allergic food, food poisoning and food safety.
- To understand food preservation processing, packaging and the use of additives.

Course Outcome:
CO1: Acquire knowledge about the various food and food groups
CO2: Understand nutritional imbalances and chronic diseases prevailing among different age groups.
CO3: Understand the significance of safe food and apply the food safety standards.
CO4: Demonstrate skills of food processing, preservation and packaging methods with or without additives.
CO5: Evaluate the quality of food based on the theoretical knowledge of Food and Nutrition.

CO-PO Mapping:

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Syllabus

**Unit 1**

**Food and Food Groups**
Introduction to foods, food groups, locally available foods, Nutrients, Cooking methods, Synergy between foods, Science behind foods, Food allergies, food poisoning, food safety standards.

*Cookery Practicals - Balanced Diet*

**Unit 2**

**Nutrients and Nutrition**
Nutrition through life cycle, RDA, Nutrition in disease, Adulteration of foods & Food additives, Packaging and labeling of foods.

*Practicals - Traditional Foods*

**Unit 3**

**Introduction to Food Biotechnology**
Future foods - Organic foods and genetically modified foods, Fortification of food value addition of foods, functional foods, Nutraceuticals, supplementary foods, Processing and preservation of foods, applications of food
technology in daily life, and your prospects associated with food industry – Nanoparticles, biosensors, advanced research.

Practicals - Value added foods

TEXTBOOKS:

REFERENCE BOOKS:
Syllabus

This paper will introduce the basics of Japanese language. Students will be taught the language through various activities like writing, reading, singing songs, showing Japanese movies etc. Moreover, this paper intends to give a thorough knowledge on Japanese scripts that is Hiragana and Katakana. Classes will be conducted throughout in Japanese class only. Students will be able to make conversations with each other in Japanese. Students can make self-introduction and will be able to write letters in Japanese. All the students will be given a text on Japanese verbs and tenses.

Students can know about the Japanese culture and the lifestyle. Calligraphy is also a part of this paper. Informal sessions will be conducted occasionally, in which students can sing Japanese songs, watch Japanese movies, do Origami – pattern making using paper.
Syllabus

Students will be taught the third and the most commonly used Japanese script, Kanji. Students will be taught to write as well as speak.

Students will be given detailed lectures on Calligraphy.

This version of the course includes a new project where the students should make a short movie in Japanese language selecting their own topics.

By the end of the semester they the students will master the subject in all means. They will be able to speak Japanese as fluently as they speak English. Students will be encouraged to write stories and songs in Japanese language themselves.
OBJECTIVES:

- To enable the students to acquire basic skills in functional language; to develop independent reading skills and reading for appreciating literary works; to analyse language in context to gain an understanding of vocabulary, spelling, punctuation and speech.

Syllabus

**Unit 1**
Adalitha Kannada: bhashe, swaroopa, belavanigeya kiru parichaya Paaribhaashika padagalu
Vocabulary Building

**Unit 2**
Prabhandha – Vyaaghra Geethe - A. N. Murthy Rao

**Unit 3**
Mochi – Bharateepriya
Mosarina Mangamma – Maasti Venkatesh iyengar Kamalaapurada Hotelnalli – Panje Mangesh Rao Kaanike – B. M. Shree
Geleyanobbanige bareda Kaagada – Dr. G. S. Shivarudrappa Moodala Mane – Da. Ra. Bendre
Swathantryada Hanate – K. S. Nissaar Ahmed

**Unit 4**
Letter Writing - Personal: Congratulation, thanks giving, invitation, condolence

**Unit 5**
Reading Comprehension; nudigattu, gaadegalu Speaking Skills: Prepared speech, pick and speak

REFERENCES:

1. H. S. Krishna Swami Iyangar – Adalitha Kannada – Chetana Publication, Mysuru
2. N. Murthy Rao – Aleyuva Mana – Kuvempu Kannada Adyayana Samste
3. Nemi Chandra – Badhuku Badalisabahudu – Navakarnataka Publication
4. Sanna Kathegalu - Prasaranga, Mysuru University , Mysuru
5. B. M. Shree – Kannadada Bavuta – Kannada Sahitya Parishattu
6. K. S. Nissar Ahmed – 75 Bhaavageetegalu – Sapna Book House (P) Ltd.
7. Dr. G. S. Shivarudrappa – Samagra Kavya – Kamadhenu Pustaka Bhavana
OBJECTIVES:

- To enable the students to acquire basic skills in functional language; to develop independent reading skills and reading for appreciating literary works; to develop functional and creative skills in language; to enable the students to plan, draft, edit & present a piece of writing.

Syllabus

Unit 1
Official Correspondence: Adhikrutha patra, prakatane, manavi patra, vanijya patra

Unit 2
Nanna Hanate - Dr. G. S. Shivarudrappa
Ella Marethiruvaga - K. S. Nissaar Ahmed Saviraru Nadigalu – S Siddalingayya

Unit 3

Unit 4
Sarva Sollegala turtu Maha Samelana - Beechi Swarthakkaagi Tyaga - Beechi

Unit 5
Essay writing: Argumentative & Analytical Précis writing

REFERENCES:

1. H. S. Krishnaswami Iyanger – Adalitha Kannada – Chetan Publication, Mysuru
2. Dr. G. S. Shivarudrappa – Samagra Kavya. - Kamadhenu Pustaka Bhavana
4. K. S. Nissar Ahmed – 75 Bhaavageetegalu – Sapna book house
5. Dr. Da. Ra. Bendre – Saayo Aata – Shri Maata Publication
Course Objectives:

- To appreciate the aesthetics & cultural implications; to enhance creative thinking in mother tongue; to learn our culture & values; to equip students read & write correct Malayalam; to correct the mistakes in pronunciation; to create awareness that good language is the sign of complete personality

Course Outcome:

After the completion of the course the student will be able to:

CO1: Understand and inculcate philosophical thoughts and practices
CO2: Understand and appreciate the post modern trends of literature.
CO3: Analyse the literary texts and comprehend the cultural diversity of Kerala
CO4: Distinguish the different genres in Malayalam literature
CO5: Demonstrate the ability to effectively communicate in Malayalam

CO-PO Mapping:

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Syllabus

Unit 1  
Ancient poet trio: Adhyatmaramayanam, Lakshmana Swanthanam (valsa soumitre… mungikidakayal), Ezhuthachan - Medieval period classics – Jnanappana (kalaminnu… vilasangalingane), Poonthanam

Unit 2  

Unit 3  
Short stories from period 1/2/3, Poovanpuzham - Vaikaom Muhammed Basheer - Literary & Cultural figures of Kerala and about their literary contributions.

Unit 4  
Literary Criticism: Ithihasa studies - Bharatha Paryadanam - Vyasaante Chiri - Kuttikrishna Mararu - Outline of literary Criticism in Malayalam Literature - Introduction to Kuttithira Mararu & his outlook towards literature & life.

Unit 5  
Error-free Malayalam: 1. Language; 2. Clarity of expression; 3. Punctuation – Thettillatha Malayalam
Writing - a. Expansion of ideas; b. Precis Writing; c. Essay Writing; d. Letter writing; e. Radio Speech; f. Script / Feature / Script Writing; g. News Editing; h. Advertising; i. Editing; j. Editorial Writing; k. Critical appreciation of literary works (Any one or two as an assignment).

REFERENCES:
OBJECTIVES:

- To appreciate the aesthetics & cultural implications; to enhance creative thinking in mother-tongue;
- To learn our culture & values; to equip students read & write correct Malayalam;
- To correct the mistakes in pronunciation; to create awareness that good language is the sign of complete personality.

Course Outcome:

After the completion of the course the student will be able to:

CO1: Understand the different cultural influences in linguistic translation
CO2: Identify and appreciate the Romantic elements of modern literature
CO3: Analyze the genre of autobiographical writing
CO4: Critically evaluate the significance of historical, political and socio cultural aspects in literature
CO5: Demonstrate good writing skills in Malayalam

CO-PO Mapping:

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Syllabus

Unit 1

Unit 2

Unit 3
Anthology of short stories from period 3/4/5: Ninte Ormmayku, M. T. Vasudevan Nair - literary contributions of his time

Unit 4
Part of an autobiography / travelogue: Kannerum Kinavum, V. T. Bhattathirippadu - Socio-cultural literature - historical importance.

Unit 5
Error-free Malayalam - 1. Language; 2. Clarity of expression; 3. Punctuation - Thettillatha Malayalam
Writing - a. Expansion of ideas; b. Précis Writing; c. Essay Writing; d. Letter writing; e. Radio Speech; f. Script / Feature / Script Writing; g. News Editing; h. Advertising; i. Editing; j. Editorial Writing; k. Critical appreciation of literary works (Any one or two as an assignment).

REFERENCES:
OBJECTIVES:

- To familiarize students with Sanskrit language and literature
- To enable them to read and understand Sanskrit verses and sentences
- To help them acquire expertise for self-study of Sanskrit texts and communication in Sanskrit
- To help the students imbibe values of life and Indian culture as propounded in scriptures.

Syllabus

Unit 1
Introduction to Sanskrit language, Devanagari script - Vowels and consonants, pronunciation, classification of consonants, conjunct consonants, words – nouns and verbs, cases – introduction, numbers, Pronouns, communicating time in Sanskrit. Practical classes in spoken Sanskrit

Unit 2
Verbs- Singular, Dual and plural – First person, Second person, Third person. Tenses – Past, Present and Future – Atmanepadi and Parasmaipadi-karthariprayoga

Unit 3
Words for communication, slokas, moral stories, subhashithas, riddles (from the books prescribed)

Unit 4
Selected slokas from Valmiki Ramayana, Kalidasa’s works and Bhagavad Gita. Ramayana – chapter VIII - verse 5, Mahabharata - chapter 174, verse -16, Bhagavad Gita – chapter - IV verse 8, Kalidasa’s Sakuntalam Act IV – verse 4

Unit 5
Translation of simple sentences from Sanskrit to English and vice versa.

ESSENTIAL READING:

1. Praveshaha; Publisher: Sanskrita bharati, Aksharam, 8th cross, 2nd phase, girinagar, Bangalore - 560085
2. Sanskrit Reader I, II and III, R. S. Vadhyar and Sons, Kalpathi, Palakkad
3. Prakriya Bhashyam written and published by Fr. John Kunnappally
4. Sanskrit Primer by Edward Delavan Perry, published by Ginn and Company Boston
5. Sabdamanjari, R. S. Vadhyar and Sons, Kalpathi, Palakkad
6. Namalinganusasanam by Amarasimha published by Travancore Sanskrit series
7. Subhashita Raina Bhandakara by Kashinath Sharma, published by Nirmayasagar press
OBJECTIVES:

- To familiarize students with Sanskrit language and literature
- To enable them to read and understand Sanskrit verses and sentences
- To help them acquire expertise for self-study of Sanskrit texts and communication in Sanskrit
- To help the students imbibe values of life and Indian culture as propounded in scriptures.

Syllabus

Unit 1
Seven cases, indeclinables, sentence making with indeclinables, Saptha karakas.

Unit 2

Unit 3
Words and sentences for advanced communication. Slokas, moral stories (Pancatantra) Subhashitas, riddles.

Unit 4
Introduction to classical literature, classification of Kavyas, classification of Dramas - The five Mahakavyas, selected slokas from devotional kavyas- Bhagavad Gita – chapter - II verse 47, chapter - IV verse 7, chapter - VI verse 5, chapter - VIII verse 6, chapter - XVI verse 21, Kalidasa’s Sakuntala act IV – verse 4, Isavasyopanishat 1st Mantra, Mahabharata chapter 149 verses 14 - 120, Neetisara chapter - III

Unit 5
Translation of paragraphs from Sanskrit to English and vice versa.

ESSENTIAL READING:

1. Pravesha; Publisher: Samskrita bharati, Aksharam, 8th cross, 2nd phase, girinagar, Bangalore -560085
2. Sanskrit Reader I, II and III, R.S. Vadhyar and Sons, Kalpathi, Palakkad
3. Prakriya Bhashyam written and published by Fr. John Kunnappally
4. Sanskrit Primer by Edward Delavan Perry, published by Ginn and Company Boston
5. Sabdamanjari, R. S. Vadyar and Sons, Kalpathi, Palakkad
6. Namalinganusasanam by Amarasimha published by Travancore Sanskrit series
Syllabus

Unit 1
Understanding CSR - Evolution, importance, relevance and justification. CSR in the Indian context, corporate strategy. CSR and Indian corporate. Structure of CSR - In the Companies Act 2013 (Section 135); Rules under Section 13; CSR activities, CSR committees, CSR policy, CSR expenditure CSR reporting.

Unit 2
CSR Practices & Policies - CSR practices in domestic and international area; Role and contributions of voluntary organizations to CSR initiatives. Policies; Preparation of CSR policy and process of policy formulation; Government expectations, roles and responsibilities. Role of implementation agency in Section 135 of the Companies Act, 2013. Effective CSR implementation.

Unit 3
Project Management in CSR initiatives - Project and programme; Monitoring and evaluation of CSR Interventions. Reporting - CSR Documentation and report writing. Reporting framework, format and procedure.

REFERENCES:
Syllabus

Unit 1

Unit 2

Unit 3
Strategies of Help and Care: Positive impact of work on health, Characteristics of mentally healthy workplace, Employee and employer obligations, Promoting mental health and well being- corporate social responsibility (CSR), an inclusive work environment, Training and awareness raising, managing performance, inclusive recruitment, Supporting individuals-talking about mental health, making reasonable adjustments, Resources and support for employees - Employee Assistance Programme / Provider (EAP), in house counsellor, medical practitioners, online resources and telephone support, 24 hour crisis support, assistance for colleagues and care givers, Legislations. Case Study, Activity.

REFERENCES:
3. Canadian Mental Health Association, Ontario “Workplace mental health promotion, A how to guide”wmhp.cmhaontario.ca/
6. Mental Health Act 1987 (India) www.tnhealth.org/mha.htm
7. Persons with disabilities Act 1995 (India) socialjustice.nic.in
8. The Factories Act 1948 (India) www.caa.in/Image/19ulabourlawshb.pdf
Course Objectives:
- To introduce the students to different literature—Sangam literature, Epics, Bhakthi literature, and modern literature.
- To improve their ability to communicate with creative concepts, and also to introduce them to the usefulness of basic grammatical components in Tamil.

Course Outcomes
CO 1: To understand the Sangam literature
CO 2: To understand the creative literature
CO 3: To understand the literary work on religious scriptures
CO 4: To improve the communication and memory skills
CO 5: To understand the basic grammar components of Tamil language and their usage and applications.
CO 6: Understand creative writing aspects and apply them.

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Syllabus

Unit 1
The history of Tamil literature: Nāṭṭupūṟap pāṭalkal, kataikkal, paḻamolikal - ciṟukataikal tūṟṟamum vaḷarciyum, ciṟṟilakkiyankal: Kaliṅkattapp paraṇi (pōrpāṭiyatu) - mukkūṯar paḷḷu 35.
Kāppiyaṅkaḷ: Cilappatikāram – maṇiṉeḻai ṣuṇṭi yiyal āṵyuvu maṟṟum aṁṟi - aṉciṟuṅ kāppiyaṅkaḷ tōṟṟapāṉa ceytikaḷ.

Unit 2
tiṇai ilakkiyanum nīṭiyilakkiyanum - paṭiṆeṅkiḷ[kaṆanakkku nūlkaḷ tōṟṟapāṉa piṆa ceytikaḷ] - tirukkuṟṟal (aṆpu, paṇpu, kalvi, oḷukkam, naṭpu, vāymai, kēḷvi, ceynaṅri, periyāṟṟiṟṟuṅakkōṭal, vilippiṟṟuvu pēṆṟa atikāṟṟattil uḷḷa ceytikaḷ.
AṆuṅḷal: Ulakanīti (1-5) – ēḷāti (1,3,6). - Cittalkal: Kaṭuveḷi cīttar pāṭalkal (āṆantak kalippu –1, 4, 6, 7, 8), maṟṟum akappēy cīttar pāṭalkal (1-5).

Unit 3
tamiḻ ilakkaṆam: Vākkiya vakaikaḷ – taṆṉaiṆi piṟaiṆi – nēṟkkūṟtu ayarkūṟtu

Unit 4
tamiḻakal aṆiṟkaṆaḷ tamiḻ tonṭum camutāya tonṭum: PāṟatiyāṆ, pāṟatiṟṟi, paṟṟuḷiṟṟi tōṟṟapāṉa kalyāṆacuntaram, curāṭu, cuṟṟi, cuṟṟi, meṟṟu, aptul rakumāṆ, na.Piccaimūrtti, akilaṇ, kalki, jī.Yū.PōṆ, víṟaṁmuṆiṆivar, aṆṆa, paritīmāṆ kalaiṆaṇ, maṟṟumalaiyāṆtikaḷ.
Unit 5


Textbooks:

Course Objectives

- To learn the history of Tamil literature.
- To analyze different styles of Tamil Language.
- To strengthen the creativity in communication, Tamil basic grammar and use of computer on Tamil Language.

Course Outcomes

CO 1: Understand the history of Tamil literature.
CO 2: Apply practical and comparative analyses on literature.
CO 3: Understand thani literature, literature on justice, Pathinenkeelkanaku literature.
CO 4: Understand the tamil scholars’ service to Tamil language and society.
CO 5: Understand components of Tamil grammar and its usage.
CO 6: Understand creative writing aspects and apply them.

CO-PO Mapping

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Syllabus

Unit 1

Unit 2
tiṇai ilakkiyamum nītīyalakkiyamum - patiṇēṅkilkkāṇakkku nūlkā ṭoṭarpāṉa piṟa ceytikaḷ - tirukkuṟaḷ (aṉpu, paṇpu, kalvi, oḷukkaṃ, naṭpu, vāymai, kēḷvi, ceypaṇṭi, periypāruntuṇakkōṭal, vilippuṇarvu pēṅga atikāṟṭil ulḷa ceytikaḷ. Aṉāluḷkaḷ: Ulakanīti (1-5) – ēlāti (1,3,6). - Ĉittarkaḷ: Kaṭuveḷi cittar pāṭalkaḷ (āṉantak kaḷippu –1, 4, 6, 7, 8), maṟṟum akappēy cittar pāṭalkaḷ (1-5).

Unit 3
tamiḻ ilakkaṇam: Vākkiya vakaikaḷ – taṉviṉai piṟaviṉai – nērkkū ṟṟu ayaṟkūṟṟu

Unit 4
Unit 5

Text Books / References