With effect from the A.Y 2018-19

VASAVI COLLEGE OF ENGINEERING(AUTONOMOUS)
Ibrahimbagh, Hyderabad-31

Approved by A.I.C.T.E., New Delhi and
Affiliated to Osmania University, Hyderabad-07

Sponsored by
VASAVI ACADEMY OF EDUCATION
Hyderabad

SYLLABUS BOOK FOR
B.E (CIVIL) III and IV SEMESTER
UNDER CBCS WITH EFFECT FROM 2018–2019
(For the students admitted in 2017-18)

DEPARTMENT OF CIVIL ENGINEERING
+91-40-23146010, 23146011
Fax: +91-40-23146090
Website: www.vce.ac.in
DEPARTMENT MISSION

To dedicate ourselves to strive and impart in-depth knowledge of Civil Engineering and prepare the students to meet the challengers of growing construction activity with confidence and

DEPARTMENT VISION

“To strive for excellence in order to make the students better citizens with technical knowledge and social awareness.”
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>III SEMESTER</th>
<th>Examination</th>
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Department of Civil Engineering
VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
DEPARTMENT OF CIVILENGINEERING
SYLLABUS FOR B.E III SEMESTER
ENGINEERING MATHEMATICS – III
(Common to all Branches except IT)

Subject Code : BS310MA  Instruction : 3+1 Hrs/week  CIE – Marks : 40
SEE – Marks : 60  SEE - Duration : 3 Hours  Credits: 03

Course Objectives

1. **Study** the Fourier series, conditions for expansion of function and half range series
2. **Formulate** and solve linear and nonlinear partial differential equations and apply partial differential equations to engineering problems viz., wave, heat and Laplace’s equations.
3. **Study** the methods to solve equations, apply numerical methods to interpolate, differentiate and integrate functions and to solve differential equations using numerical methods and solve systems of equations.
5. **Understand** how to fit a curve to a given data, how correlation between variables can be measured.

Course Outcomes

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

1. **Expand** any function which is continuous, discontinuous, even or odd in terms of its Fourier series.
2. **Find** the partial differential equations by eliminating arbitrary constants and functions and solve linear, nonlinear Partial differential equations and also will be able solve wave, heat and Laplace’s equations in engineering problems.
3. **Solve** algebraic and transcendental equations using Bisection method Regula-Falsi, Newton-Raphson, apply numerical methods to interpolate, differentiate functions, solve systems of equations and solve differential equations using numerical methods.
4. **Apply** various probability distributions to solve practical problems, to estimate unknown parameters of populations and apply the tests of hypotheses.
5. **Solve** problems on how fitting of a curve to given data using curve fitting, and also to find co-efficient of correlation and to determine regression lines and their applications.

**UNIT- I:**

**Fourier Series:** Introduction to Fourier series – Conditions for a Fourier expansion – Functions having points of discontinuity – Change of Interval - Fourier series expansions of even and odd functions - Fourier Expansion of Half- range Sine and Cosine series.

Department of Civil Engineering
UNIT –II:


UNIT-III:

UNIT–IV:

UNIT-V:
Curve Fitting: Curve fitting by the Method of Least Squares -Fitting of Straight line –Regression - Lines of Regression – Correlation – Karl Pearson’s Co-efficient of Correlation.

Suggested Readings:
3. Dr.B.S Grewal Numerical Methods, Khanna Publishers.
7. S.S.Sastry Numerical Analysis–PHI Learning Ltd.,
SYLLABUS FOR B.E. III-SEMESTER
BUILDING PLANNING AND DRAWING

Instruction : 2+2 Hours/week    SEE Marks : 60    Course Code : ES310CE
Credits : 3          CIE Marks : 40    Duration of SEE : 3 Hours

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<td>The course objectives are to</td>
<td>Upon the completion of this course students will be able to</td>
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<tr>
<td>1. Expose students to the concepts of building planning and various aspects of green buildings</td>
<td>1. Apply the principles of planning and bylaws used for building planning</td>
</tr>
<tr>
<td>2. Impart knowledge on the preparation and presentation of civil engineering drawings with relevant conventional signs</td>
<td>2. Provide scope and provisions for building components and services integrating concepts of green buildings</td>
</tr>
<tr>
<td></td>
<td>3. Draw conventional signs and brick bonds</td>
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<tr>
<td></td>
<td>4. Prepare detailed working drawing of doors, windows and staircases</td>
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<td></td>
<td>5. Draw plan, elevation and section of simple load bearing and framed building structures</td>
</tr>
</tbody>
</table>

UNIT-I

UNIT-II
UNIT-III
Conventional Signs: Conventional representation of building materials in section- Representation of building elements- doors, windows, ventilators, cupboards and grills in plan, Representation of electrical and plumbing services. Bricks and brick sections in isometric view.

Brick Bonds: Plan and isometric view of wall junctions for half brick wall; one and one and a half brick wall; brick masonry courses in English bond and Flemish bond.

UNIT-IV
Doors and Windows: Plan, section and elevation of a fully panelled door and fully panelled window, panelled venetian and glazed doors.

Stair Cases: Types of stair cases, Reinforced Concrete (RC) stair cases – dog legged, open well and bifurcated. Steel spiral stair case.

UNIT-V
Building Drawing: Plans, elevations and sections of simple load bearing and framed building structures.

Suggested Books:

Reference Books:
2. Green Rating for Integrated Habitat Assessment (GRIHA) guidelines.
DEPARTMENT OF CIVIL ENGINEERING
SYLLABUS FOR B.E. III-SEMESTER
STRENGTH OF MATERIALS – I

Instruction : 3+1Hours/week | SEE Marks : 60 | Course Code : PC310CE
Credits : 3 | CIE Marks : 40 | Duration of SEE: 3 Hours

<table>
<thead>
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<th>COURSE OBJECTIVES</th>
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<td>In this subject the students will:</td>
<td>Upon the completion of course students will be able to:</td>
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1. Examine and interpret basic concepts of Strength of materials and analyze statically determinate and indeterminate structures.
2. Analyze simple beams subjected to various types of loading and plot shear force and bending moment diagrams and compute bending stresses.
3. Define and analyze shear stresses in beams and plot shear stress distribution across cross section of beams.
4. Define and analyze problem of columns subjected to direct and bending stresses.
5. Define the concepts of compound stresses and strains in beams and also Investigate the behaviour of thin cylinder, spherical shells and thick cylinders.

1. Express understanding of the basic concepts and principles of Strength of materials and solve problems of composite sections, statically determinate and indeterminate structures.
2. Construct shear force and bending moment diagrams for beams and compute stresses and strains in bending and shear in the cross section of beams subjected to transverse loading.
3. Compute direct and bending stresses in columns and beams subjected to eccentric loading.
4. Identify and interpret the governing equation for compound stress and strains and compute the principal stress and strains.
5. Compute stresses in thin cylinders, spherical shells and thick cylinders subjected to internal and external pressure.

UNIT-I

*Department of Civil Engineering*
UNIT-II
Shear Force and Bending Moment: Definitions. Different types of beams and loads; shears force and bending moment diagrams for cantilever and simply supported beams with and without overhangs subjected to different types of loads viz., point loads, uniformly distributed loads, uniformly varying loads and couples. Relationship between loading, shear force and bending moment.

UNIT-III
Shear Stresses in Beams: Distribution of transverse shear stresses over rectangular, circular, triangular, I- and T- sections.

UNIT-IV
Direct and Bending Stresses: Distribution of stresses over symmetrical sections under combined axial load and bending moment. Cores of solid and hollow circular and rectangular sections.

UNIT-V
Thin Cylinders and spherical shells: Thin Cylinders subjected to internal fluid pressure; wire wound cylinders & shells
Thick Cylinders: Stresses under internal and external pressure. Compound cylinders.

Suggested Books:

References Books:
DEPARTMENT OF CIVIL ENGINEERING
SYLLABUS FOR B.E. III-SEMESTER
SURVEYING – I

<table>
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<th>Instruction : 3Hours/week</th>
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**COURSE OBJECTIVES**

*In this subject the students will*

1. Learn the basic concepts and use of surveying in Civil Engineering
2. Understand the measurement techniques and equipment used in land surveying such as chain/tape, compass, plane table and level with respect to equipments used, methods, errors and analysis of data
3. Acquire knowledge on use of theodolite and total station equipment, its adjustments, measurements, methods employed, errors and computation of data.

**COURSE OUTCOMES**

*Upon the completion of this course students will be able to*

1. Employ basic surveying operations and computations using chain/tape and compass
2. Identify the instruments used, principles adopted and methods involved in plane table surveying.
3. Illustrate the levelling operations and apply the principles of levelling and contouring and prepare contour maps.
4. Compute areas and volumes for the given data
5. Interpret the principles of measurement of angles with theodolite and total station, make traverse computations and identify omitted measurements in traverse and give solutions to such problems

**UNIT-I**

**Introduction to Surveying:** Plane and Geodetic surveying, Principle of surveying, Classification of surveys.

**Chain Surveying:** Principles of chain survey, Accessories and instruments employed in chain survey. Chain surveying concepts including ranging

**Compass Surveying:** Use and adjustment of prismatic and surveyor’s compass. Methods of surveying with a compass, Bearing systems and conversions, Magnetic declination, Dip, local attraction. Errors in prismatic survey.

**UNIT-II**

**Plane Table Surveying:** Instruments employed in plane table survey and their use, importance of orientation and different methods of orientation, Various methods of plane table survey, Three-point and two-point problems, Errors in plane table survey.
UNIT-III

**Levelling:** Definitions and principles of levelling, components of various levelling instruments, Use and adjustment of leveling instruments. Terms used in levelling, booking and reduction of levels. Establishment of bench marks by leveling. Longitudinal leveling, Cross-section leveling, Fly levelling, and Reciprocal leveling. Errors in levelling; curvature and refraction corrections. Sensitivity of bubble tube.

**Contouring:** Definition and characteristics of contours, Direct and indirect methods of contouring, Interpolation of contours, Uses of contours.

UNIT-IV

**Computation of areas:** Simpsons rule, Trapezoidal rule, Meridian distance method, Double meridian distance method, Double parallel distance method, Departure and total latitude method, coordinates method, Introduction to planimeter.

**Computation of volumes:** Computation of area of cross section for level section, two level section, side hill two level section, three level section and multilevel section. Volume of earthwork by trapezoidal and prismoidal method. Volume from spot levels and contour plans

UNIT-V

**Theodolite and Total station surveying:** Introduction to digital theodolite and total station, Electronic distance measurement concepts, Measurement of horizontal and vertical angles, Measurement of distances

Introduction to total station – Concepts, capabilities and functions

**Traversing and Computations:** Methods of traversing, Checks in open and closed traverse, Computation of latitude and departures, consecutive and independent coordinates, closing error and its adjustment by Bowditch method, Transit rule and Graphical method. Gale’s traverse table, omitted measurements in traverse and their computations. Errors in theodolite survey.

**Suggested Books:**

**References Books:**

**Online Resources:**
1. NPTEL Course (www.nptel.ac.in)
DEPARTMENT OF CIVIL ENGINEERING
SYLLABUS FOR B.E. III-SEMESTER
GEOLOGY

Instruction : 3 Hours/week  SEE Marks : 60  Course Code : BS320CE
Credits : 3  CIE Marks : 40  Duration of SEE: 3 Hours

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<td>Upon the completion of this course students will be able to</td>
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<tr>
<td>1. Describe the various properties of minerals, distinguishing features of rocks.</td>
<td>1. Identify the different minerals and distinguishing features exhibited by the rocks</td>
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<tr>
<td>2. Describe the geological structures, processes of weathering and classification of soils.</td>
<td>2. Identify the geological structures like folds, faults, joints and unconformities present in rocks and describe the processes of weathering, classify and distribution of soils.</td>
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<tr>
<td>3. Explain the process of ground water exploration.</td>
<td>3. Assess the occurrence of ground water in various lithological formations and location of bore wells.</td>
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<td>4. Illustrate the knowledge of geological studies for dams and reservoirs.</td>
<td>4. Evaluate the suitability of site for the dam construction.</td>
</tr>
<tr>
<td>5. Illustrate the knowledge of geological studies for tunnels, list the causes and effects of earth quakes, and landslides with their mitigation measures.</td>
<td>5. Evaluate the suitability of site for the tunnel construction, recognize the causes and effects of earth quakes, and landslides and suggest mitigation measures.</td>
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UNIT-I
Mineralogy: Definition of mineral and crystal, physical properties used in the identification of minerals, physical properties of quartz, feldspars, hornblende, biotite, muscovite, talc, olivine, calcite, kyanite and garnet.
Rocks: Textures and structures of igneous, sedimentary and metamorphic rocks. Geological description and Indian occurrence of granite, basalt, dolerite, gabbro, laterite, sandstone, shale, limestone, slate, gneiss, quartzite, marble.

UNIT-II
Geological Structures: Classification, mode of origin and engineering importance of folds, faults, joints and unconformities.
Rock Weathering: Processes and end-products of weathering. Susceptibility of rocks to weathering; assessment of the degree of weathering, tests of weatherability.
**Geology of Soils:** Formation of soils, soil profile, nature of parent materials, relative stability of minerals, geological classification of soils, types of Indian soils.

**UNIT-III**
**Hydrogeology:** Hydrological cycle, water table, aquifers, occurrence of ground water in various lithological formations. Ground water movement, springs, Ground water exploration.

**UNIT-IV**
**Geology for Dams and Reservoirs:** Types of dams. Dam foundations and reservoirs. Engineering and geological investigations for a masonry dam site; analysis of dam failures in the past. Engineering geology of major dam sites of India, Reservoir induced seismicity.

**UNIT-V**
**Tunnels:** Engineering geological investigations of tunnels in rock; Stand-up time of different rocks. Problems of tunnelling, pay line and over break, logging of tunnels, and geology of some well-known tunnels.
**Geological Hazards:** Geological aspects of earthquakes and landslides.

**Suggested Books:**

**References Books:**
SYLLABUS FOR B.E III SEMESTER
FS – I : COMMUNICATION SKILLS IN ENGLISH-I

Course Code : HS310EH
Instruction : 2+2Hrs/week
CIE – Marks : 40
SEE – Marks : 60
SEE - Duration : 3 Hours
Credits: 02

Course Objectives
1. The four major skills of language learning, listening, speaking, reading and writing provide the right key to success.
2. The main objective of this finishing school curriculum is to involve content for all the above mentioned four skills in teaching English and to get students proficient in both receptive and productive skills.

Course Outcomes
At the end of the course, students will be able to:
1. Respond to questions and engage in an informal conversation.
2. Narrate a message/story/incident, both verbally and in writing.
3. Describe an event / a session / a move / an article and recognize and list the key points in a topic/message/article. Debate on a topic by picking up the key points from the arguments placed.
4. Respond to others while being in a casual dialogue and participate in group and form discussions by providing factual information, possible solutions, and examples.
5. Comprehend facts given and respond in an appropriate manner and provide logical conclusions to the topics under discussion.
6. Construct sentences in a coherent form and provide explanations to prepare, present, and analyze reports.

UNIT I – FUNDAMENTALS OF COMMUNICATION

Competencies:
- Basic conversational ability.
- Write e-mails introducing themselves & their purpose.

Topics covered
- Greeting and Introductions
- Small Talk
- Recalling

Topic Level Details
Greeting & Introductions

Competencies:
- Greeting appropriately
- Introducing themselves, a friend
- Responding to simple statements and questions both verbally and in writing
- Seeking introduction from others about themselves or about any
topic.
- Writing an email with appropriate salutation, subject lines, self introduction, and purpose of mail.

Small Talk
**Competencies:**
- Identifying the topic of conversation.
- Speaking a few sentences on a random list of topics
- Reading simple information like weather reports, advertisements
- Seeking clarifications.

Recalling
**Competencies:**
- State takeaways from a session or conversations

UNIT II: NARRATIONS AND DIALOGUES
**Competencies:**
- Framing proper phrases and sentences to describe in context
- Speaking fluently with clarity and discrimination
- Responding to others in the dialogue.

**Topics covered**
Paraphrasing
Describing

**Topic Level Details**
**Paraphrasing**
**Competencies:**
- Listen for main ideas and reformulating information in his/her own words
- Draw appropriate conclusions post reading a passage.
- Writing an email confirming his/her understanding about a topic

**Describing**
**Competencies:**
- Speaking, Reading, and Writing descriptive sentences and paragraphs.

UNIT-III: RATIONAL RECAP
**Competencies:**
- Organizing and structuring the communication
- Detailing a topic
- Summarizing a topic.

**Topics Covered:**
Organizing

*Department of Civil Engineering*
Sequencing
Explaining
Summarizing

**Topic Level Details**

**Organizing**

**Competencies:**
- Organizing the communication based on the context and audience

**Sequencing**

**Competencies:**
- Structuring the content based on the type of information.

**Explaining**

**Competencies:**
- Explaining a technical/general topic in detail.
- Write an email giving detailed explanation/process

**Summarizing**

**Competencies:**
- Recapitulating

**UNIT-IV: PROFESSIONAL DISCUSSIONS AND DEBATES**

**Competencies:**
- Analytical and Probing Skills
- Interpersonal Skills

**Topics Covered:**

**Discussing**

Learning Outcome:
The students should be able to explore and support issues by adding explanations and examples.

**Competencies:**
- Thinking
- Assimilating

**Debating**

**Competencies:**
- Comprehending key points of the debate and note decisive points including supporting details.
- Construct a logical chain of arguments and decisive points.
- Writing a review about a product by providing reasons, causes, and effects

**UNIT - V: DRAWING CONCLUSIONS AND REPORTING**

**Competencies:**

*Department of Civil Engineering* 16
• Reasoning skills - Coherent and logical thinking
• Reporting and Analyzing skills.

Topics Covered:
Concluding
Reporting

Topic Level Details
Concluding
Competencies:
• Analyzing the points discussed.
• Connecting all points without gaps.
• Identifying clinchers.
• Communicating the decisions

Reporting
Competencies:
• Reporting an incident
Writing/Presenting a project report
SYLLABUS FOR B.E III SEMESTER
INTRODUCTION OF ENTREPRENEURSHIP

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<tr>
<th>Course objectives</th>
<th>Course Outcomes</th>
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<tr>
<td>1. inspire students and help them imbibe an entrepreneurial mind-set.</td>
<td>At the end of the course, students will be able to:</td>
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<tr>
<td>2. introduce key traits and the DNA of an entrepreneur</td>
<td>1. Develop awareness about entrepreneurship and successful entrepreneurs.</td>
</tr>
<tr>
<td>3. provide the information about the facilities, schemes available to start enterprise in INDIA</td>
<td>2. Understand the supporting organizations available to establish the business in the country</td>
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<td>4. improve the entrepreneur skills</td>
<td>3. Understand the different government policies which support the entrepreneur</td>
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<td>4. Develop how to improve the communication and sales skills and generate and analyze the business ideas</td>
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UNIT -I
Entrepreneurship, myths about entrepreneurship, entrepreneur characteristics and its styles – Classification of Entrepreneurship – Forms of Business organizations – Role of Entrepreneurship in economic development. Managing risks and learning from failures. E-cells, successful entrepreneurs, start-ups and incubators, institutions supporting small business enterprises.

UNIT -II
Central level supporting institutions: NABARD, SIDBI, NIC, KVIC, NIESBUD, SIDO, DST, EDI, FICCI, CII, ASSOCHAM etc. – state level institutions – DICs – SFC – SIDC. Design thinking and its process

Idea Generation and evaluation: Ideas in Entrepreneurships – Sources of New Ideas – Techniques for generating ideas – Opportunity Recognition and evaluation, Entrepreneurial skills, selling and selling skills – communication and modes of it, be an entrepreneur.
Learning Resources:
SYLLABUS FOR B.E IV SEMESTER
HUMAN VALUES AND PROFESSIONAL ETHICS – I

Subject Code : MC300EH  Instruction : 1 Hrs/ week  CIE Marks : 30
SEE Marks : 40  SEE - Duration : 2 Hours  Credits: 01

<table>
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<tr>
<th>Course Objectives</th>
<th>Course Outcomes</th>
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| • Get a holistic perspective of value-based education.  
• Grasp the meaning of basic human aspirations vis-a-vis the professional aspirations.  
• Understand professionalism in harmony with self and society.  
• Develop ethical human conduct and professional competence.  
• Enrich their interactions with the world around, both professional and personal. | At the end of the course, students will be able to:  
1. Gain a world view of the self, the society and the profession and obtain a holistic vision about value-based education and professional ethics.  
2. Make informed decisions.  
3. Start exploring themselves in relation to others and their work – constantly evolving into better human beings and professionals.  
4. Inculcate Human values into their profession.  
5. Validate their aspirations through right understanding of human relationship and see the co-relation between the human values and prevailing problems.  
6. Strike a balance between physical, mental, emotional and spiritual parts their being |

UNIT-I
Human and Ethical values
What are they? --The Indian concept of values-- Modern approach to the study of values - Basis for Moral Judgement--- A new approach to Human Values-- freedom, creativity, love, wisdom, concern.

UNIT-II
Canons of Ethics
Virtue Ethics-- Ethics of Duty-- Ethics of Responsibility-- Factors to be considered in making Ethical Judgments.

UNIT-III
The Value of time
The importance of managing time-- Factors that hinder time management--Benefits of time management-- Using time judiciously-- practical strategies to manage time.

Department of Civil Engineering
UNIT-IV
The Power of Positive thinking
Nature and Scope of Positive thinking-- Methods to change one's thinking---Strategies to change the cycle of one's thinking.

UNIT-V
The Value of Setting Goals
Goal setting-- Importance of setting goals for oneself--Achieving excellence through SMART goals.

Learning Resources:
6. Caroline Whitback < Ethics in Engineering Practice and Research, Cambridges University Press
7. Georgs Reynolds, Ethics in Information Technology", Cengage Learning

Relavant Websites,CD's and Documentaries
- Value Education website, Http://www.universalhumanvalues.info
- UPTU webiste, Http://www.uptu.ac.in
- Story of stuff, Http://www.storyofstuff.com
- AlGore, As Inconvenient Truth, Paramount Classics ,USA
- Charlie Chaplin, Modern Times, United Artists, USA
- IIT Delhi, Modern Technology-The Untold story-Anand Gandhi, Right Here Right Now, Cyclewala production
DEPARTMENT OF CIVIL ENGINEERING  
SYLLABUS FOR B.E. III-SEMESTER  
MECHANICS OF MATERIALS

<table>
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<th>SEE Marks : 60</th>
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</tbody>
</table>

1. Examine and interpret basic concepts of Strength of materials and analyze statically determinate and indeterminate structures to compute axial stresses, strains and deformations.
2. Analyze simple beams subjected to various types of loading and plot shear force and bending moment diagrams analytically and graphically and compute bending stresses.
3. Define and analyze shear stresses in beams and plot shear stress distribution across cross section of beams.
4. Define and analyze problem of columns subjected to direct and bending stresses and predict the effect of eccentricity of loading on stresses by solution of numerical examples.
5. Investigate the behaviour of thin and thick cylinders subjected to internal and external pressure and apply the concepts to the solution of example problems.

1. Express understanding of the basic concepts and principles of Strength of materials and solve problems of composite sections for axial stresses and strains and thermal effects and problems of statically determinate and indeterminate structures.
2. Construct shear force and bending moment diagrams for beams subjected to various types of loading (analytically and graphically) and compute stresses and strains in bending and shear in the cross section of beams subjected to transverse loading.
3. Compute direct and bending stresses in columns and beams subjected to eccentric loading.
4. Compute internal forces in space trusses by method of tension coefficients.
5. Compute stresses in thin cylinders and thick cylinders subjected to internal and external pressure.

UNIT-I
UNIT-II

UNIT-III
Shear Stresses in Beams: Distribution of shear stresses in rectangular, I- and T-, standard steel and hollow sections. Compound stresses, principal stresses and strains. Mohr’s circle of stress.

UNIT-IV
Deflections: Slope and deflections by the method of double integration in cantilever, simply supported beams and beams with overhangs subjected to point loads and uniformly distributed loads.
Torsion: Derivation of torsion formula for circular sections. Torsional stresses, angle of twist, power transmission, effect of combined bending and torsion. Close coiled and laminated springs.

UNIT-V
Cylinders: Stresses in thin and thick cylinders with internal and external pressures. Hoop and longitudinal stresses. Stresses in compound cylinders.
Direct and bending stresses: Core of rectangular, circular, I- and T-sections.
Columns and Struts: Euler and Rankine formulae for axial load applications. Secant and Perry formulae for eccentrically loaded columns.

Suggested Books:

References Books:

Department of Civil Engineering
DEPARTMENT OF CIVIL ENGINEERING
SURVEYING-I LAB
SYLLABUS FOR B.E. III-SEMESTER

Instruction : 2 Hours/week  SEE Marks : 50  Course Code : PC331CE
Credits : 1  CIE Marks : 30  Duration of SEE: 3 Hours

<table>
<thead>
<tr>
<th>COURSE OBJECTIVES</th>
<th>COURSE OUTCOMES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objectives of this course are to:</strong></td>
<td><strong>Upon the completion of this course students will be able to</strong></td>
</tr>
</tbody>
</table>
| 1. Develop skills for applying classroom knowledge to field problems and handling of surveying tools such as chain, compass, level, plane table, theodolite and total station. | 1. Locate the objects, measure the distances and area and transfer the same onto the drawings  
2. Use conventional surveying tools such as chain, compass, level, plane table, theodolite and total station in the field of civil engineering applications such as structural plotting and highway profiling  
3. Apply the procedures involved in field work and to work as a surveying team  
4. Plan a survey appropriately with the skill to understand the surroundings  
5. Take accurate measurements, field booking, plotting and control the accumulation of errors. |

LIST OF EXPERIMENTS

1. Practice of direct and indirect ranging and measuring the distance using Chain.
2. Traversing by using Compass – plotting and adjustments.
4. Solution to resection by Two-point problem.
5. Solution to resection by Three-point problem using trial and error method and tracing paper methods.
6. Reduction of levels by Height of Instrument (HI) & Rise and fall method.
7. Contour surveying and plotting using Grid method.
8. Horizontal and vertical distance measurement using Total Station
9. Location of ground features and contouring using total station and plotting the same.
11. Demonstration of minor surveying instruments.
DEPARTMENT OF CIVIL ENGINEERING
SYLLABUS FOR B.E. III-SEMESTER
GEOLOGY LAB

<table>
<thead>
<tr>
<th>Instruction : 2 Hours/week</th>
<th>SEE Marks : 50</th>
<th>Course Code : BS321CE</th>
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</thead>
<tbody>
<tr>
<td>Credits : 1</td>
<td>CIE Marks : 30</td>
<td>Duration of SEE: 3 Hours</td>
</tr>
</tbody>
</table>

**COURSE OBJECTIVES**

*In this subject the students will*

1. Familiarize with the procedures for the identification of minerals, rocks and structural models.
2. Calculate the specific gravity, porosity and water absorption in rocks.
3. Operate electrical resistivity meter.
4. Describe the various types of maps.
5. Measure the attitude of beds and draw the sections for geological maps.

**COURSE OUTCOMES**

*Upon the completion of this course students will be able to*

1. Identify the physical properties of minerals, rocks and various structural features like folds, faults and unconformities.
2. Calculate the specific gravity, porosity and water absorption in rocks, operate electrical resistivity meter and study of various types of maps.
3. Draw the sections pertaining to the formation geology of major dam sites of India.
4. Practise working as a team member and lead a team
5. Demonstrate professional behaviour in conducting the experiments and present the results effectively

**LIST OF EXPERIMENTS**

1. Identification and description of physical properties of minerals.
2. Identification and description of geotechnical characteristics of rocks.
3. Determination of apparent specific gravity, porosity and water absorption of different rocks; IS:1124 - 1974.
4. Study of structural models; folds, faults and unconformities.
7. Vertical electrical sounding.
8. Study of geological and geotechnical maps of Telangana, Andhra Pradesh and India.
9. Study of Topographic maps.
10. Study of maps and sections pertaining to the study of folds, faults and unconformities.

*Department of Civil Engineering*
DEPARTMENT OF CIVIL ENGINEERING
SYLLABUS FOR B.E. III-SEMESTER
CIVIL ENGINEERING DRAFTING LAB

<table>
<thead>
<tr>
<th>Instruction : 2 Hours/week</th>
<th>SEE Marks : 50</th>
<th>Course Code : PC341CE</th>
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<tr>
<td>Credits : 1</td>
<td>CIE Marks : 30</td>
<td>Duration of SEE: 3 Hours</td>
</tr>
</tbody>
</table>

### COURSE OBJECTIVES

Objectives of this course are to:

1. Develop skills to generate civil engineering drawings using AUTOCAD tools
2. Learn various tools and functions in AUTOCAD

### COURSE OUTCOMES

Upon the completion of this course students will be able to:

1. Navigate the AutoCAD user interface
2. Apply the fundamental features of AutoCAD in a practical situation
3. Prepare civil engineering drawings in a detailed and visually impressive way
4. Streamline the planning process and become more productive with AutoCAD
5. Demonstrate professional behaviour in preparation of drawings

### LIST OF EXPERIMENTS

1. **CAD**: Introduction to Computer Aided Drafting, Advantages and Disadvantages of CAD, List of CACED Softwares.
   **AUTOCAD**: Introduction and Features of AUTOCAD Software.
2. **Environment of AutoCAD**: Workspace, Application Menu, Quick Access Toolbar, Ribbon, Search for information, Pull-down menu, Status bar, Function keys.
   **Coordinate systems**: Used in AutoCAD - absolute and relative, Cartesian and polar coordinate systems.
3. **Basic Managing/ Display control Tools**: New, Save, Qnew, Open, Close, Quit/ Exit, Undo, Redo, Limits, Units, Zoom, Pan, Steering Wheel, View Cube etc.
   **Basic Drafting Tools**: Line, Polylines, Point, Circle, Arc, Spline, Ellipse, Rectangle, Polygons, Text, Hatch.
4. **Editing/ Inquiry Tools**: Erase, oops, Move, Copy, Mirror, Rotate, Scale, Fillet, Chamfer, Trim, Extend, Break, Join, Stretch, Offset, Array, Distance, Radius, Angle, Area, Volume.
5. **Dimensioning Tools**: Linear, Aligned, Radius, Diameter, Centre, Angular, Baseline, Continuous, Ordinate, Arc Length, Jogged Radius Dimension, Dimension Space, Dimension Break, Inspection Dimension, Multileader and its Style.

Department of Civil Engineering

**Block/Wblock and Attributes**: Concept and Significance of Blocks in AutoCAD Drawings, Creating Blocks, Editing and Managing Blocks

7. **Doors and Windows**: Plans, Sections and Elevations for different types of Doors and Windows.

8. **Stairs**: Details of Various Types of Staircases.

**Footings**: Sectional Elevations of RC footings for columns of Residential Buildings.


10. Introduction to AUTOCAD 3D.
DEPARTMENT OF CIVIL ENGINEERING
SYLLABUS FOR B.E. III-SEMESTER
MECHANICS OF MATERIALS LAB

Instruction : 2 Hours/week  SEE Marks : 50  Course Code : PC351CE
Credits : 1  CIE Marks : 30  Duration of SEE: 3 Hours

<table>
<thead>
<tr>
<th>COURSE OBJECTIVES</th>
<th>COURSE OUTCOMES</th>
</tr>
</thead>
<tbody>
<tr>
<td>In this subject the students will</td>
<td>Upon the completion of this course students will be able to</td>
</tr>
<tr>
<td>1. Determine the properties of materials under the action of various loads. 2. Learn the ability to work in a team and make effective presentations.</td>
<td>1. Determine Young’s Modulus of materials of beams by conducting deflection test. 2. Assess the quality of materials by conducting hardness test and impact test. 3. Learn the operation of universal testing machine (UTM). 4. Determining modulus of rigidity of materials by conducting torsion test and spring test. 5. Practice working as a team member and make effective presentations.</td>
</tr>
</tbody>
</table>

List of Experiments
1. Determination of Young’s modulus by conducting Deflection test on Cantilever beam
2. Determination of Young’s modulus by conducting Deflection test on Simply supported beam
3. Izod Impact test
4. Direct tension test on metal rods
5. Brinnell and Rockwell Hardness test
6. Compression test on brittle and ductile materials
7. Determination of modulus of rigidity by conducting tension test on a helical spring
8. Determination of modulus of rigidity by conducting compression test on a helical spring
9. Determination of modulus of rigidity by conducting torsion test
10. Determination of modulus of elasticity by conducting deflection test on fixed beam
11. Determination of modulus of elasticity by conducting deflection test on continuous beam
12. Bend test on metal rod
DEPARTMENT OF CIVIL ENGINEERING
MECHANICS FOR ENGINEERS
(Civil, Mech., & EEE)
SYLLABUS FOR BRIDGE COURSE B.E. III-SEMESTER

<table>
<thead>
<tr>
<th>Instructor : 2 Hours/week</th>
<th>SEE Marks : 60</th>
<th>Course Code : ES161CE</th>
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</thead>
<tbody>
<tr>
<td>Credits : -</td>
<td>CIE Marks : 40</td>
<td>Duration of SEE: 3 Hours</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>COURSE OBJECTIVES</th>
<th>COURSE OUTCOMES</th>
</tr>
</thead>
<tbody>
<tr>
<td>In this subject the students will</td>
<td>Upon the completion of this course students will be able to</td>
</tr>
<tr>
<td>1. To learn the resolution of a system of spatial forces.</td>
<td>1. Judge whether the body under the action of spatial force system.</td>
</tr>
<tr>
<td>2. To assess the frictional forces on rigid body.</td>
<td>2. Solve problem of bodies subjected to friction.</td>
</tr>
<tr>
<td>3. To understand the concepts of dynamics and its principles.</td>
<td>3. Distinguish between statics and dynamics and differentiate between kinematics and kinetics.</td>
</tr>
<tr>
<td>4. To explain kinetics and kinematics of particles, projectiles, curvilinear motion and centroidal motion.</td>
<td>4. Understand the kinetics and kinematics of a body undergoing rectilinear, curvilinear, rotatory motion and rigid body motion.</td>
</tr>
<tr>
<td>5. To impart the concepts of work-energy method and its applications to rectilinear translation, centroidal motion.</td>
<td>5. Know the concepts of work and energy principles subject and derive the work energy equations for translation, rotation and connected systems.</td>
</tr>
</tbody>
</table>

UNIT-I
**Force Systems:** Components of forces, moments in space and its applications.

UNIT-II
**Friction:** Laws of friction, application to simple systems and wedge friction.

UNIT-III
**Kinematics:** Rectilinear motion, curvilinear motion, velocity and acceleration of a particle.

UNIT-IV
**Kinetics:** Analysis as a particle, analysis as a rigid body in translation, fixed axis rotation and rolling bodies.

Department of Civil Engineering
UNIT-V

Work Energy: Principles of work energy and its application to translation, particle motion and connected systems.

Suggested Books:


References Books

Online Resources:
1. NPTEL Course (www.nptel.ac.in)
2. Virtual labs (www.vlab.co.in)
With effect from the A.Y 2018-19

OPEN ELECTIVES OFFERED BY VARIOUS DEPARTMENTS IN  
B.E- III SEMESTER (2018-19)

<table>
<thead>
<tr>
<th>Dept</th>
<th>Title</th>
<th>Code</th>
<th>credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIVIL</td>
<td>Geographical Information Systems</td>
<td>OE310CE</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Building Materials</td>
<td>OE320CE</td>
<td>2</td>
</tr>
<tr>
<td>CSE</td>
<td>Introduction to Data Structures</td>
<td>OE310CS</td>
<td>2</td>
</tr>
<tr>
<td>ECE</td>
<td>Introduction to Signals &amp; Systems</td>
<td>OE310EC</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Introduction to Communication Systems</td>
<td>OE320EC</td>
<td>2</td>
</tr>
<tr>
<td>EEE</td>
<td>Electrical Installation and Safety</td>
<td>OE310EE</td>
<td>2</td>
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<tr>
<td>Mech</td>
<td>Basic Mechanical Engineering</td>
<td>OE300ME</td>
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<tr>
<td></td>
<td>Mechanical Technology</td>
<td>OE310ME</td>
<td>2</td>
</tr>
<tr>
<td>IT</td>
<td>Introduction to Scripting Languages</td>
<td>OE310IT</td>
<td>2</td>
</tr>
<tr>
<td>Maths</td>
<td>Linear Algebra and its Applications</td>
<td>OE310MA</td>
<td>2</td>
</tr>
</tbody>
</table>
DEPARTMENT OF CIVIL ENGINEERING  
SYLLABUS FOR B.E. III-SEMESTER  
GEOGRAPHICAL INFORMATION SYSTEMS  
Open Elective – I (to other branches)

COURSE OBJECTIVES

Objectives of this course are to:

1. Provide theoretical framework on fundamentals and basic concepts of GIS applications with its capabilities
2. have an in-depth understanding of the functionality of GIS and be critically aware of the potential and limitations of GIS in integrated analysis of spatial and non-spatial data

COURSE OUTCOMES

Upon the completion of this course the students will be expected to:

1. Explain Geographic Information Systems, become familiar with the basic principles of map projections and coordinate systems and understand the requirements of different user disciplines for applying GIS technology.
2. Describe the basics of working of geographical databases, various data structures and understand the concepts of data capture, storage,
3. Analyse outputs in a GIS environment.
4. Identify various analytical tools and functions in GIS and address various geospatial problems.

UNIT-I


UNIT-II


UNIT-III

Data Analysis and Modelling: Spatial analysis, data retrieval, query (SQL) – Simple analysis, Recode overlay, Vector data analysis, Raster data analysis – Modeling in GIS – Digital elevation model – Cost and path...
analysis – Knowledge based systems.

**UNIT-IV**

**Geographic Information Systems (GIS) Analysis Functions:**
Organizing data for analysis, classification of GIS, analysis function, maintenance and analysis of spatial data – transformations, conflation, edge matching and editing. Maintenance and analysis of non-spatial attribute data – editing and query functions.

**Suggested Books:**

**References Books**
DEPARTMENT OF CIVIL ENGINEERING
SYLLABUS FOR B.E. III-SEMESTER
BUILDING MATERIALS
Open Elective – I (to other branches)

<table>
<thead>
<tr>
<th>Instruction : 2 Hour/week</th>
<th>SEE Marks : 60</th>
<th>Course Code : OE 320CE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credits : 2</td>
<td>CIE Marks : 40</td>
<td>Duration of SEE: 3 Hours</td>
</tr>
</tbody>
</table>

**COURSE OBJECTIVES**

In this subject the students will

1. Acquire basic knowledge on building materials such as stones, bricks, cement, aggregates, mortar and concrete.
2. Study various aspects of paints, varnishes and timber.

**COURSE OUTCOMES**

Upon the completion of this course students will be able to

1. Explain the characteristics of stones and bricks.
2. Describe the properties of cement, aggregate, concrete, mortar.
3. Identify the suitability of timber
4. Application of paints and varnishes for building works.

**UNIT-I**

**Stones:** Classifications of stones, uses of stones as building materials, characteristics of good building stones.


**UNIT-II**

**Cement:** Chemical composition of cement, manufacturing process. Specifications for Ordinary Portland Cement, Types of cements.

**Fine Aggregate:** Characteristics of good sand and its classifications, bulking of sand. Quarry sand.

**Coarse Aggregate:** Characteristics of good coarse aggregates for manufacture of concrete.
UNIT-III
Cement Mortar : Types and uses.
Concrete: Designation, workability of concrete – factors affecting, Slump test, Ready Mix Concrete (RMC).

UNIT-IV
Reinforcing steel: Types of reinforcement, specifications - M.S., HYSD, TMT.
Paints: Constituents, characteristics of good paints, varnishes.

Suggested Books:

References Books:
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR B.E III SEMESTER
INTRODUCTION TO DATA STRUCTURES
Open Elective-I (for other Departments)

<table>
<thead>
<tr>
<th>Course Objectives</th>
<th>Course Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students should be able to</td>
<td>At the end of the course, Students will be able to</td>
</tr>
<tr>
<td>• Identify and use appropriate data structure for a given problem with effective utilization of space and time.</td>
<td>1. Implement linear data structures.</td>
</tr>
<tr>
<td>• Describe the linear and nonlinear data structures.</td>
<td>2. Develop an application using stacks and queues.</td>
</tr>
<tr>
<td></td>
<td>3. Choose the appropriate nonlinear data structure and perform operations on them.</td>
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<tr>
<td></td>
<td>4. Analyze the time and space complexities of Algorithms.</td>
</tr>
</tbody>
</table>

UNIT - I
Arrays: Arrays - ADT, Polynomials, Sparse matrices,
Linked Lists: Singly Linked Lists, Circularly linked lists, Doubly Linked Lists.

UNIT – II
Stacks: Array Representation, Linked Representation, Applications.
Queues: Array Representation, Linked Representation, Applications.

UNIT – III
Introduction to non linear Data Structures : Tree Definitions and Properties, Representations of Binary Trees, Operations, Binary Tree Traversal, Graph Definitions, properties and representations.

UNIT – IV
Performance analysis- time complexity and space complexity, Asymptotic Notation-Big O, Omega and Theta notations

Suggested Books:

Instruction: 2 Hrs /week | SEE Marks :60 | Course Code :OE310CS
Credits :2 | CIE Marks: 40 | Duration of SEE : 3 Hrs
Reference Books:

Online Resources:
2. http://nptel.ac.in/courses/106106127/
3. http://www.nptel.ac.in/courses/106102064
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
SYLLABUS FOR B.E. III SEMESTER
INTRODUCTION TO SIGNALS & SYSTEMS (Open Elective-I)
(for other Departments)

Instruction: 2 Hrs /week  SEE Marks :60  Course Code : OE310EC
Credits : 2  CIE Marks: 40  Duration of SEE : 3Hrs

<table>
<thead>
<tr>
<th>Course Objectives</th>
<th>Course Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Define and classify continuous</td>
<td>At the end of the course, students will be able to:</td>
</tr>
<tr>
<td>and discrete time signals and</td>
<td>1. Analyze basic signals and systems in continuous and discrete time domain.</td>
</tr>
<tr>
<td>systems.</td>
<td>2. Apply the properties of different transformation techniques to convert a</td>
</tr>
<tr>
<td>2. Determine frequency domain</td>
<td>continuous time domain signal to frequency domain.</td>
</tr>
<tr>
<td>characteristics of continuous and</td>
<td>3. Apply the properties of different transformation techniques to convert a</td>
</tr>
<tr>
<td>discrete time signals.</td>
<td>discrete time domain signal to frequency domain.</td>
</tr>
<tr>
<td></td>
<td>4. Describe the distortion less transmission through an LTI system.</td>
</tr>
</tbody>
</table>

UNIT - I
Continuous time signals, types of signals, representation of signals, basic elementary signals, operations on signals.
Continuous time systems, classification of systems: static and dynamic, linear and non linear, time invariant and time variant.

UNIT - II
Continuous time Fourier transforms: Introduction, existence, properties, magnitude and phase spectrums.
Laplace transforms: Introduction, existence, Laplace transform of basic elementary signals, properties, inverse Laplace transforms.

UNIT - III
Discrete time signals, types of signals, representation of signals, basic elementary signals, operations on signals.
Discrete time systems, classification of systems: static and dynamic, linear and non linear, time invariant and time variant.
UNIT - IV
Introduction to continuous and discrete time LTI systems, properties, impulse response, causality, stability, transfer function, distortion less transmission through systems. Z-transform: Introduction, existence, Z-transform of basic elementary signals, properties, inverse Z-transforms.

Suggested Readings:
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
SYLLABUS FOR B.E. III SEMESTER
Introduction to Communication Systems (Open Elective-I)
(for other Departments)

Course Objective:
1. Distinguish between Amplitude and Frequency modulation methods and their application in Communication Receivers
2. Explain why multiplexing methods are necessary in communications and compare FDM with TDM
3. Compare and contrast FSK and BPSK modulation schemes employed in digital data transmission
4. Draw the block diagrams of different types of communication systems and explain their operation

Course Outcomes
At the end of the course, students will be able to:
1. Identify the Radio frequency spectrum and the bands of different types of radio systems
2. Analyze the power, efficiency and transmission bandwidth of Amplitude and Frequency Modulated signals.
3. Convert the Radio frequency to Intermediate frequency and explain the operation of Super heterodyne Receiver.
4. Compare and contrast Frequency Division Multiplexing and Time Division Multiplexing used in the Communication systems
5. Detect and correct errors present in bit stream data using parity check
6. Explain the basic principles of different types of communication systems.

UNIT - I
Introduction to Electronic Communication: Communication systems, Types of Electronic Communication, Modulation and Multiplexing, The Electromagnetic Spectrum, Bandwidth, Communication Applications, Gain and Attenuation definitions
Amplitude Modulation Fundamentals: AM concepts, Modulation Index and Percentage of Modulation, Sidebands and the Frequency Domain, AM Power.

UNIT - II

Department of Civil Engineering

**UNIT - III**

**Digital Communication Techniques**: Digital Transmission of Data, Parallel and Serial Transmission, Data Conversion, Pulse Modulation.

**Multiplexing and De-multiplexing**: Multiplexing Principles, Frequency Division Multiplexing, Time Division Multiplexing, PCM Multiplexing.

**UNIT - IV**


**References:**

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
SYLLABUS OF B.E III- SEMESTER
ELECTRICAL INSTALLATION AND SAFETY (Open Elective –I)

<table>
<thead>
<tr>
<th>Instruction: 3Hrs /week</th>
<th>SEE Marks : 60</th>
<th>Course Code: OE310EE</th>
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<tbody>
<tr>
<td>Credits : 2</td>
<td>CIE Marks: 40</td>
<td>Duration of SEE : 3 Hrs</td>
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<table>
<thead>
<tr>
<th>Course Objectives</th>
<th>Course Outcomes</th>
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<tbody>
<tr>
<td>Enable the student to</td>
<td>After completion of the course student will be able to</td>
</tr>
<tr>
<td>Have a fair knowledge about the fundamentals of wiring systems, electrical safety procedures, Estimation of lighting &amp; Power loads.</td>
<td>1. Identify and choose the proper type wiring for domestic &amp; industrial applications.</td>
</tr>
<tr>
<td></td>
<td>2. Apply and implement the Electrical safety procedures for repairs &amp; hazards.</td>
</tr>
<tr>
<td></td>
<td>3. Design and Estimate the domestic lighting installation.</td>
</tr>
<tr>
<td></td>
<td>4. Design and Draw the wiring layout for a big office building, electrical laboratory, big industry and big hotel with lift arrangement.</td>
</tr>
</tbody>
</table>

Unit – I

Unit – II
Safety Procedures: Distribution fuse boards - Main switches – Different types of fuses and fuse carriers - Safety procedures – Electric shock and first aid, causes for fire hazards in Electrical installations

Unit – III
Unit – IV
Estimation of power loads: Power wiring installation - Drawing wiring layout for a big office building, electrical laboratory, big industry, big hotel with lift arrangement and a residential building with 2 bed room house.- estimation upto 20 kVA calculation of load current based on ratings of various equipment’s to be installed - size of wire.

Suggested Books:

Reference Books:
1. Balbir Singh-Electrical Drawing
2. Arora -Electrical wiring
5. CRDargar -Electrical Installation design and drawing -New Asian publishers.

Online resources:
1. http://ocw.tufts.edu
3. www.open.edu/openlearn/
4. http://nptel.ac.in/courses/
DEPARTMENT OF INFORMATION TECHNOLOGY
SYLLABUS FOR B.E. III SEMESTER
Introduction to Scripting Languages (Open Elective-I)
(for other Departments)

Instruction: 2 Hrs /week  SEE Marks :60  Course Code :OE310IT
Credits : 2  CIE Marks: 40  Duration of SEE : 3Hrs

<table>
<thead>
<tr>
<th>Course Objectives</th>
<th>Course Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The course will enable the students to:</strong></td>
<td><strong>At the end of the course student will be able to:</strong></td>
</tr>
</tbody>
</table>
| This course will enable the students to acquire basic skills for writing python scripts. | 1. Write a python script to solve a basic problem using structured programming constructs  
2. Write a python script to solve a basic problem using object oriented programming constructs  
3. Create and use python modules.  
4. Create a project skeleton  
5. Use automated testing to test a python module |

Unit – I
Introduction to Python, running a python script, writing comments, using variables, operators, strings and text, format specifiers, printing information. passing command line arguments, prompting users, parameters, unpacking variables.

Unit – II
Decision making: if and else if, repetition: while loops and for loops, lists, operations on list, tuples, dictionaries, operations on dictionaries.

Unit – III
Defining functions, passing arguments to functions, returning values from functions, Exception handling.

Unit – IV
Modules, Classes and Objects, is – a relationship: inheritance, has-a relationship: composition. Creating project skeleton and automated testing.

Learning Resources
2. https://www.python.org
DEPARTMENT OF MECHANICAL ENGINEERING
SYLLABUS FOR B.E. III SEMESTER
BASIC MECHANICAL ENGINEERING (Open Elective-I)
(for other Departments)

<table>
<thead>
<tr>
<th>Instruction : 2Hours/week</th>
<th>SEE Marks : 60</th>
<th>Course Code : OE300ME</th>
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</thead>
<tbody>
<tr>
<td>Credits : 2</td>
<td>CIE Marks : 40</td>
<td>Duration of SEE : 3 Hours</td>
</tr>
</tbody>
</table>

Course Objectives
The course will enable the students to:
learn the basic principles of Mechanical Engineering in the areas of Heat transfer, Refrigeration, power generation and Manufacturing processes.

Course Outcomes
At the end of the course, students will be able to:
1. understand the modes of heat transfer and different types heat exchangers.
2. Study the working principles of IC engines and gas turbines.
3. know the principles of refrigeration and psychrometry.
4. study the basic manufacturing processes.

UNIT – I
Heat Exchangers: classification and applications of heat exchangers in industry, derivation of LMTD in parallel and counter– flow heat exchangers and problems.

UNIT – II
IC Engines: Working of Four Stroke and Two Stroke Petrol and Diesel Engine with p– V diagrams, Valve timing diagram, Calculation of Indicated power, Brake power, Specific Fuel Consumption, Mechanical and Thermal efficiencies.

Gas Turbines: Classification, calculation of efficiency of simple open gas turbine cycle (Joule cycle/Brayton cycle) and applications.
UNIT– III

UNIT– IV
Manufacturing Processes: Welding, Brazing, Soldering, brief description of process and parameters, associated principles of gas welding, arc welding.
Machining Processes: Turning, Milling and Drilling.
Introduction to Additive Manufacturing and its applications.

Learning Resources:
DEPARTMENT OF MECHANICAL ENGINEERING
SYLLABUS FOR B.E. III SEMESTER
MECHANICAL TECHNOLOGY (Open Elective-I)
(for other Departments)

Instruction : 2 Hours / week  SEE Marks : 60  Course Code : OE310ME
Credits : 2  CIE Marks : 40  Duration of SEE : 3 Hours

<table>
<thead>
<tr>
<th>Course Objectives</th>
<th>Course Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>The objective of this course is to:</td>
<td>On completion of the course the student will be able to:</td>
</tr>
<tr>
<td>learn the basic principles of excavating equipment, conveying equipment</td>
<td>1. Identify the operations of various earth moving equipments for maintenance</td>
</tr>
<tr>
<td>hoisting equipment, concrete producing equipment and pneumatic equipment</td>
<td>and selection with respect to their applications.</td>
</tr>
<tr>
<td></td>
<td>2. Justify various conveying equipment for transporting material based on working</td>
</tr>
<tr>
<td></td>
<td>3. Study various types of hoisting equipment in civil engineering applications.</td>
</tr>
<tr>
<td></td>
<td>4. Examine various aggregate and concrete producing equipments used in concrete</td>
</tr>
<tr>
<td></td>
<td>production and working of pneumatic equipment.</td>
</tr>
</tbody>
</table>

UNIT-I
Excavating Equipment: General description, operation, maintenance and selection of the following: Earth moving and Excavating Equipment: Shovels, Dragline, Clamshell, Cable excavator, Bucket wheel excavator, Tractor, Bulldozer, Scraper, Trenchers, Grader, Earth Compactors.

UNIT-II
Conveying Equipment: Belt conveyor, Screw Conveyor, Bucket Conveyor, Apron Conveyor, Aerial Ropeway.

UNIT-III
Hoisting Equipment: Hoist winch, Differential and Worm geared chain hoists, Fork lift trucks, Guyed and stiffly derricks, swing and non-swing mobile crane, whirler crane, Construction elevator, passenger lift and Bucket elevators.
UNIT– IV

**Aggregate and Concrete Producing Equipment:** Crushers – Jaw, Gyratory, Hammer and Roll Crushers, Screens – Stationary, Shaking and Vibrating screens. Concrete mixers and Concrete pumps.

**Pneumatic Equipment:** Reciprocating air– compressor, construction pneumatic tools; jack hammer, paving breaker, Rock drill, concrete vibrator.

**Learning Resources:**

DEPARTMENT OF MATHEMATICS
SYLLABUS FOR B.E. III SEMESTER
LINEAR ALGEBRA AND ITS APPLICATIONS (Open Elective-I)

<table>
<thead>
<tr>
<th>Instruction :2 Hours / week</th>
<th>SEE Marks :60</th>
<th>Course Code : OE310MA</th>
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</thead>
<tbody>
<tr>
<td>Credits : 2</td>
<td>CIE Marks :40</td>
<td>Duration of SEE : 3 Hours</td>
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</table>

Course Outcomes: At the end of the course the students will learn:

1. The concepts of vector spaces, bases and dimension and change of bases. These concepts are useful to generate Code Words to improve the quality of transmissions.
2. The concepts of linear transformations and isomorphism and these concepts are useful in Computer Graphics.
3. The concepts of inner product spaces Orthonormal bases. These concepts are useful in Least Square Approximations, which is used in engineering applications and statistics.

UNIT – I: 8 hrs
Vector Spaces: Definition of Vector Space, Subspaces, Basis and Dimension, Coordinates and Change of Basis

UNIT – II: 7 hrs
Linear Transformations: The Null Space and Range, Isomorphisms, Matrix Representation of a Linear Transform

UNIT – III: 6 hrs
Inner Product Spaces: The Dot Product on $\mathbb{R}^n$ and Inner Product Spaces

UNIT – IV: 6 hrs
Inner Product Spaces: Orthonormal Bases, Orthogonal Complements

Text Books:
1. Introduction to linear algebra with applications, Jim DeFranza, Daniel Gagliardi, Tata McGraw-Hill

Reference Books:
1. Elementary Linear algebra, Anton and Rorres, Wiley India Edition
3. Elementary Linear algebra, ron Larson, Cengage Learning
DEPARTMENT OF CIVIL ENGINEERING
SCHEME OF INSTRUCTION AND EXAMINATION FOR IV-SEMESTER under CBCS w.e.f 2018-19
(Students admitted in 2017-18)

<table>
<thead>
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<th>IV SEMESTER</th>
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<tr>
<td>BS410MA</td>
<td>Engineering Mathematics – IV</td>
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<td>MC320CE</td>
<td>Environmental Science</td>
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<td>PC410CE</td>
<td>Strength of Materials – II</td>
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<tr>
<td>PC420CE</td>
<td>Surveying-II</td>
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<tr>
<td>PC430CE</td>
<td>Fluid Mechanics – I</td>
<td>3</td>
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<td>ES410CE</td>
<td>Building Materials and Construction</td>
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<td>FS-II : Communication Skills</td>
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<tr>
<td>OE410CE</td>
<td>Open Elective – II (Green Buildings)</td>
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<tr>
<td>OE420CE</td>
<td>Open Elective–III(Disaster Management)</td>
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LABS

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<td>PC451CE</td>
<td>Surveying-II Lab</td>
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<td>PC461CE</td>
<td>Fluid Mechanics Lab</td>
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Total

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VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
DEPARTMENT OF CIVIL ENGINEERING
SYLLABUS FOR B.E IV SEMESTER
ENGINEERING MATHEMATICS – IV
(For Civil, EEE, CSE, ECE, MECH Branches)

Subject Code : BS410MA  Instruction : 3+1 Hrs/ week  CIE Marks : 40
SEE – Marks : 60  SEE - Duration : 3 Hours  Credits: 03

<table>
<thead>
<tr>
<th>Course Objectives</th>
<th>Course Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Understand the Definition of Laplace and inverse Laplace Transforms-Shifting Properties and various theorems and how to apply them in solving Differential Equations.</td>
<td>At the end of the course, students will be able to:</td>
</tr>
<tr>
<td>3. Study the concept of Fourier and inverse Fourier Transform of a function and various Properties.</td>
<td>2. Apply Z-transform in the analysis of continuous time and discrete time systems and also solve the Difference Equations using Z-transform.</td>
</tr>
<tr>
<td>4. Understand the Analytic functions, to evaluate a line integral of a function of a complex variable using Cauchy’s integral formula, to evaluate real integrals using complex integration and how to evaluate Laurent Series and residues.</td>
<td>3. Determine Fourier transform, Fourier sine and cosine transform of a function.</td>
</tr>
<tr>
<td></td>
<td>4. Know the condition(s) for a complex variable function to be analytic and/or harmonic and state and prove the Cauchy Riemann Equation and use it to show that a function is analytic and to define singularities of a function, know the different types of singularities, evaluate contour integrals using the Cauchy Integral Theorem and the Cauchy Integral Formula and will be able to determine transformation in complex space.</td>
</tr>
</tbody>
</table>

UNIT - I
With effect from the A.Y 2018-19

Constant Coefficients.

UNIT - II


UNIT - III


UNIT - IV

Functions of Complex Variables: Limits and Continuity of function - Differentiability and Analyticity - Necessary & Sufficient Condition for a Function to be Analytic - Milne-Thomson’s method - Cauchy-Riemann Equations in Polar Form - Harmonic Functions - Complex Integration - Cauchy’s Theorem - Extension of Cauchy’s Theorem for multiply connected regions- Cauchy’s Integral Formula.

UNIT - V


Suggested Reading:

Department of Civil Engineering
DEPARTMENT OF CIVIL ENGINEERING
SYLLABUS FOR B.E. IV-SEMESTER
ENVIRONMENTAL SCIENCE

Instruction : 2+1Hours/week  SEE Marks : 60  Course Code : MC320CE
Credits : 2  CIE Marks : 40  Duration of SEE: 3 Hours

<table>
<thead>
<tr>
<th>COURSE OBJECTIVES</th>
<th>COURSE OUTCOMES</th>
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</thead>
<tbody>
<tr>
<td>In this subject the students will</td>
<td>Upon the completion of this course students will be able to</td>
</tr>
<tr>
<td>1. Describe various types of natural resources available on the earth surface.</td>
<td>1. Describe the various types of natural resources.</td>
</tr>
<tr>
<td>2. Explain the concepts of an ecosystem and the biotic and abiotic components of various aquatic ecosystems.</td>
<td>2. Differentiate between various biotic and abiotic components of ecosystem.</td>
</tr>
<tr>
<td>3. Identify the values, threats of biodiversity, endangered and endemic species of India along with the conservation of biodiversity.</td>
<td>3. Examine the values, threats of biodiversity, the methods of conservation, endangered and endemic species of India.</td>
</tr>
<tr>
<td>4. Explain the causes, effects and control measures of various types of environmental pollutions.</td>
<td>4. Illustrate causes, effects, control measures of various types of environmental pollutions.</td>
</tr>
<tr>
<td>5. Describe the methods for water conservation, the causes, effects of global warming, climate change, acid rain and ozone layer depletion</td>
<td>5. Explain the methods of water conservation, causes, effects of climate change, global warming, acid rain and ozone layer depletion</td>
</tr>
</tbody>
</table>

UNIT-I
Environmental Studies: Definition, importance of environmental studies. Natural resources: Water resources; floods, drought, conflicts over water, dams-benefits and problems. Food resources; Effects of modern agriculture, fertilizer-pesticide problems, water logging salinity. Energy resources: Renewable and non-renewable energy resources. Land Resources, soil erosion and desertification.

UNIT-II
Ecosystems: Structure and function of an ecosystem, producers, consumers and decomposers, food chains, food webs, ecological pyramids, aquatic ecosystem (ponds, oceans, estuaries).

UNIT-III
Biodiversity: Genetic species and ecosystem diversity. Values of
biodiversity, threats to biodiversity, endangered and endemic species of India, conservation of biodiversity.

UNIT-IV
Environmental Pollution: Causes, effects and control measures of air pollution, water pollution, soil pollution, noise pollution, thermal pollution and solid waste & e-waste management.

UNIT-V

Suggested Books:

References Books:
DEPARTMENT OF CIVIL ENGINEERING
SYLLABUS FOR B.E. IV-SEMESTER
STRENGTH OF MATERIALS – II

Instruction : 3 Hours/week
Credits : 3

SEE Marks : 60
CIE Marks : 40
Course Code : PC410CE
Duration of SEE: 3 Hours

<table>
<thead>
<tr>
<th>COURSE OBJECTIVES</th>
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</thead>
<tbody>
<tr>
<td>In this subject the students will be able to</td>
<td>Upon the completion of this course students will be able to</td>
</tr>
<tr>
<td>1. Examine and interpret the deflection of simply supported, cantilever and overhanging beams</td>
<td>1. Express understanding of methods of double integration, conjugate beam and Mohr’s theorems to solve problems of deflection of beams and construct shear force and bending moment diagrams</td>
</tr>
<tr>
<td>2. Analyze propped cantilevers, fixed and continuous beams for deflection, shear and bending moment</td>
<td>2. Determine shear centre for simple sections.</td>
</tr>
<tr>
<td>3. Locate shear centre and draw shear flow in simple sections.</td>
<td>3. Compute the torsional shear stress across the cross section of circular shafts.</td>
</tr>
<tr>
<td>4. Analyze torsion of circular shafts and analyse helical and bending springs and examine the concept of strain energy</td>
<td>4. Compute stresses in helical springs and compute strain energy in bars subjected to axial and flexural deformation</td>
</tr>
<tr>
<td>5. Investigate the behaviour of columns and struts.</td>
<td>5. Compute the axial and bending stresses in columns using various formulae</td>
</tr>
</tbody>
</table>

UNIT-I
Deflections: Slope and deflection by the double integration method for cantilever and simply supported beams, and beams with overhanges carrying point loads, uniformly distributed and varying load over entire span. Moment area and conjugate beam methods for single beams having different moment of inertia.

UNIT-II
Propped Cantilevers: Cantilever beams on elastic and rigid props for point loads and uniformly distributed loads. Bending moment and shear force diagrams, and deflections.
Fixed Beams: Determination of shear force, bending moment, slope and deflection in fixed beams with and without sinking of supports for point loads, uniformly distributed loads, and uniformly varying load over entire span. SFD, BMD - Elastic curve.
UNIT-III
**Continuous Beams:** Determination of moments in continuous beams with and without sinking of supports by the theorem of three-moments; bending moment and shear force diagrams. Elastic curve.

**Shear Centre:** Concept and importance of shear centre shear flow and determination of shear centre of simple sections such as T sections and Channel sections with one axis of symmetry.

UNIT-IV

**Springs:** Close and open coiled helical springs under axial load and axial twist.

UNIT-V
**Strain Energy:** Strain energy of resilience in determinate bars subjected to gradually applied loads and impact loads. Resilience of beams. Castigliano’s theorem and its applications to beams. Theorem of reciprocal deflections.

**Columns and struts:** Euler’s theory. Rankine – Gordan’s formula, straight-line formula, effect of end conditions, slenderness ratio, eccentrically loaded columns, and Secant and Perry’s formulas.

**Suggested Books:**

**References Books:**
DEPARTMENT OF CIVIL ENGINEERING
SYLLABUS FOR B.E. IV-SEMESTER
SURVEYING-II

Instruction : 3 Hours/week         SEE Marks : 60         Course Code : PC420CE
Credits : 3                         CIE Marks : 40         Duration of SEE: 3 Hours

<table>
<thead>
<tr>
<th>COURSE OBJECTIVES</th>
<th>COURSE OUTCOMES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>In this subject the students will</strong></td>
<td><strong>Upon the completion of this course students will be able to</strong></td>
</tr>
<tr>
<td>1. Understand basic surveying operations and computations using theodolite for various applications in field such as determination of elevations and setting of various curves</td>
<td>1. Employ the methods to handle different cases to determine the elevations of various points using concepts of trigonometrical levelling and apply the corrections such as curvature, refraction and axis signal in geodetic observations</td>
</tr>
<tr>
<td>2. Learn tacheometry and hydrographic surveying</td>
<td>2. Compute the parameters required for setting out simple circular curve, reverse curve, compound curves and introduce the concepts of transition curves and vertical curves.</td>
</tr>
<tr>
<td>3. Study the modern techniques in surveying with GPS, aerial photogrammetry, remote sensing, GIS.</td>
<td>3. Report the various methods and capabilities of tacheometric surveying and hydrographic surveying</td>
</tr>
<tr>
<td></td>
<td>4. Apply the concepts of modern tools such as GPS and aerial photogrammetry</td>
</tr>
<tr>
<td></td>
<td>5. Understand the concepts of Remote sensing and GIS and apply them in civil engineering problems</td>
</tr>
</tbody>
</table>

UNIT-I

**Trigonometric leveling and Geodetic observations:** Trigonometrical levelling, calculation of elevations and distances of accessible and inaccessible objects, Problems. Geodetic observations, Refraction and curvature corrections, axis signal correction, determination of difference in elevation by single and reciprocal observations, problems.

UNIT-II

**Curves:** Theory of simple curves. Setting out simple curves by linear and angular methods. Compound curves – Elements – Solution to different cases. Reverse curves – Parallel straights and Non parallel straights. Introduction to transition curves and vertical curves.

Department of Civil Engineering
UNIT-III
Tacheometry: Fixed and movable hair tacheometers. Principle of stadia method, distance and elevation formula for staff held vertical and normal, instrumental constants, Anallactic lens, tangential method, use of subtense bar.
Hydrographic Survey: Brief introduction, Equipment used in hydrographic survey, methods and applications.

UNIT-IV
Global Positioning System (GPS): Overview of GPS, Functional system of GPS – Space segment, control segment and user segment, working principle of GPS/DGPS, Errors in GPS
Introduction to photogrammetry: Basic definitions, scale of vertical photograph, Displacements and errors in aerial photogrammetry

UNIT-V
Remote Sensing: Definition, Elements of remote sensing, Electromagentic spectrum and radiation, concept of spectral reflectance, Types of remote sensing, Remote sensing satellites, sensor resolutions, and applications to Civil Engineering.
Geographic Information Systems (GIS): Definition, components of GIS, Functions and advantages of GIS, applications to Civil Engineering

Suggested Books:

References Books:
DEPARTMENT OF CIVIL ENGINEERING
SYLLABUS FOR B.E. IV- SEMESTER
FLUID MECHANICS-I

<table>
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<tr>
<th>Instruction : 3 Hours/week</th>
<th>SEE Marks : 60</th>
<th>Course Code : PC430CE</th>
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<tbody>
<tr>
<td>Credits : 3</td>
<td>CIE Marks : 40</td>
<td>Duration of SEE: 3 Hours</td>
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</table>

**COURSE OBJECTIVES**

In this subject the students will

1. Learn the properties of fluids
2. Apply the laws of conservation of mass, energy and momentum for fluid flow.
3. Assess the phenomenon of flow in pipes and study concepts of dimensional analysis and model studies.

**COURSE OUTCOMES**

Upon the completion of this course students will be able to

1. Compute properties of fluid and discuss about fluid statics
2. Understand various aspects of Fluid kinematics
3. Formulate equations based on conservation of mass, energy and momentum. Analyse forces on nozzles and describe devices use for discharge.
4. Compute Reynolds number, formulate equations for laminar and turbulent flow through pipes and water hammer in pipes.
5. Discuss and solve problems on compressible flow and dimensional analysis and model studies.

**UNIT-I**

**Fluid Properties:** Definition of fluid, properties of fluids, density, specific weight, specific volume, specific gravity, bulk modulus, vapour pressure, viscosity. Newton’s law of viscosity and its applications. Capillarity and surface tension.

**Measurement of Pressure:** Piezometer and U tube Manometers. Bourdon Gauge. Absolute pressure and Gauge pressure.

**Hydro Statics:** Pascal law, buoyancy, metacentre and metacentric Height, Total pressure and centra pressure on Horizontal plane and vertical plane surfaces.

**UNIT-II**

**Fluid Kinematics:** Classification of fluid flow; steady, unsteady, uniform, non-uniform, one, two and three-dimensional flows, Rotational and irrotational flows. Concepts of streamline, stream tube, path line and streak line. Law of mass conservation. Continuity equation from control volume and system analysis. Stream function, and velocity potential function. Convective and local acceleration, flow net and its uses.

Department of Civil Engineering
UNIT - III
Fluid Dynamics: Body forces and surface forces. Euler’s equation of motion in three dimensions.
Law of Energy Conservation: Bernoulli’s equation from integration of Euler’s equation. Significance of the Bernoulli’s equation, limitations, modifications and application to real fluid flows, venture meter and orifice meter.
Impulse Momentum Equation: Application of the impulse momentum equation to evaluate forces on nozzles and bends. Vortex flow; forced and free vortex.
Measure of Discharge in Free Surface Flows: Notches and weirs.

UNIT-IV

UNIT-V
Dimensional Analysis and Model Studies: Dimensional analysis as a tool in experimental hydraulics, Buckingham’s pi-theorem, applications, geometric, Kinematics and dynamic similarity, similarity laws; significance of Reynold’s, Froude and Mach Numbers, different types of models and their scale ratios.

Suggested Books:


References Books:

Department of Civil Engineering
DEPARTMENT OF CIVIL ENGINEERING
SYLLABUS FOR B.E. IV-SEMESTER
BUILDING MATERIALS AND CONSTRUCTION

COURSE OBJECTIVES
In this subject the students will

3. Acquire knowledge on building materials such as stones, bricks, cement, aggregates, mortar and concrete.
4. Study various aspects of paints, varnishes and timber.
5. Learn the construction principles of floors, and different types of flooring

COURSE OUTCOMES
Upon the completion of this course students will be able to

1. Explain the characteristics of stones and bricks.
2. Describe the properties and tests on cement, aggregate, concrete, mortar.
3. Understand the significance of emerging building materials.
4. Identify the suitability of timber, paints and varnishes for building works.
5. Review the construction principles of floors.

UNIT-I
Stones: Classifications of stones, uses of stones as building materials, characteristics of good building stones. Quarrying, various methods. Dressing and polishing of stones.

UNIT-II
Blended Cements: Various types and their uses.
Fine Aggregate: Characteristics of good sand and its classifications, bulking of sand. Alternatives to natural sand.
Coarse Aggregate: Characteristics of good coarse aggregates for manufacture of concrete. Tests on aggregates.
UNIT-III
Mortar: Different types of mortars, preparation, setting and curing. Manufacturing methods of mortar.
Concrete: Designation, workability of concrete in fresh state.
Reinforcing steel: Types of reinforcement, specifications

UNIT-IV
Paints: Constituents, characteristics of good paints, varnishes.

UNIT-V

Suggested Books:

References Books:
SYLLABUS FOR B.E IV SEMESTER
FS - II: COMMUNICATION SKILLS IN ENGLISH-II

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<td>2+2 Hrs/ week</td>
<td>40</td>
<td>60</td>
<td>3 Hours</td>
<td>02</td>
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</table>

Course Objectives

1. identify the various features and functions of human language and communication.
2. develop the habit of listening effectively so as to analyze the speaker’s tone and tenor.
3. choose appropriate words so as to speak and write accurately.
4. read various types of texts and sift information correctly.
5. study organizational structures and behavioral patterns and adapt appropriately.

Course Outcomes

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

1. Participate in group and forum discussions by providing factual information, possible solutions, and examples.
2. Debate on a topic by picking up the key points from the arguments placed.
3. Provide logical conclusions to the topics under discussions and summarize with 70% comprehension.
4. Prepare, present, and analyze reports.
5. Choose appropriate words and tone to present accurate, specific, and factual reports and apply reading skills, including how to approach different types of literature.
6. Compose a summary of beginning high level reading text that identifies the thesis and key supporting details.

Unit 1: Professional Discussions and Debates

Module Overview:
The module enables the students to build strategies for effective interaction and help them in developing decisive awareness and personality maintaining emotional balance.

Learning Outcome:
The students should be able to:

1. Participate in group and forum discussions by providing factual information, possible solutions, and examples.
2. Debate on a topic by picking up the key points from the arguments placed.

Competencies:
- Analytical and Probing Skills
- Interpersonal Skills

Topics Covered:
Topic1 - Discussing
Topic 2 - Debating

**Topic Level Details**

**Topic 1 - Discussing**

**Learning Outcome:**
The students should be able to explore and support issues by adding explanations and examples.

**Competencies:**
- Thinking
- Assimilating

**Topic 2 - Debating**

**Learning Outcome:**
The students should be able to develop their case and present their points using relevant facts and logic.

**Competencies:**
- Comprehending key points of the debate and note decisive points including supporting details.
- Construct a logical chain of arguments and decisive points.
- Writing a review about a product by providing reasons, causes, and effects

**Unit 2: Drawing Conclusions**

**Unit Overview:**
This module is intended to provide necessary inputs that enable the students to draw conclusions out of a discussion and provide reports.

**Learning Outcome:**
Students should be able to:
- Provide logical conclusions to the topics under discussion.
- Prepare, present, and analyze reports.

**Competencies:**
- Reasoning skills - Coherent and logical thinking
- Reporting and Analyzing skills.

**Topics Covered:**
Topic 1 - Concluding
Topic 2 - Importance of Logic

**Topic Level Details:**

**Topic 1 - Concluding**

**Learning Outcome:**
The students should be able to conclude a discussion or deliberation with appropriate reasoning.

**Competencies:**
• Analyzing the points discussed.
• Connecting all points without gaps.
• Identifying clinchers.
• Communicating the decisions

Unit 3 - Reporting

Learning Outcome:
The Students should be able to choose appropriate words and tone to present accurate, specific, and factual reports.

Competencies:
• Reporting an incident
• Writing/Presenting a project report

Unit 4 - Reading for Context

Learning Outcomes
Upon completion of the course, students should be able to:
1. Compose a summary of beginning high level reading text that identifies the thesis and key supporting details.
2. Summarize with 70% comprehension.
3. Apply reading skills, including how to approach different types of literature.

Competencies
Develop metacognitive strategies

Topics
a. Recognition of author’s purpose
b. Awareness of stylistic differences
c. Discernment of fact and opinion
d. Evaluation of fact and opinion
e. Recognition of propaganda techniques
2. Present vocabulary building methods
3. Use comprehension and vocabulary strategies to raise reading rate.

Unit 5 - Develop critical reading skills:
• Theme Detection
• Note making and Inference
• Summary and main idea identification
### DEPARTMENT OF CIVIL ENGINEERING
### SYLLABUS FOR B.E. IV-SEMESTER
### STRENGTH OF MATERIALS LAB

<table>
<thead>
<tr>
<th>Instruction : 2 Hours/week</th>
<th>SEE Marks : 50</th>
<th>Course Code : PC441CE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credits : 1</td>
<td>CIE Marks : 30</td>
<td>Duration of SEE: 3 Hours</td>
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<table>
<thead>
<tr>
<th>COURSE OBJECTIVES</th>
<th>COURSE OUTCOMES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objectives of this course are to:</td>
<td>Upon the completion of this course students will be able to:</td>
</tr>
<tr>
<td>1. Determine the properties of materials under the action of various loads.</td>
<td>1. Determine Young's Modulus of materials of beams by conducting deflection tests.</td>
</tr>
<tr>
<td></td>
<td>2. Assess the properties of materials by conducting hardness test, impact test, tension test and compression test.</td>
</tr>
<tr>
<td></td>
<td>3. Determine modulus of rigidity of materials by conducting torsion test and tests on springs.</td>
</tr>
<tr>
<td></td>
<td>4. Practise working as a team member and lead a team</td>
</tr>
<tr>
<td></td>
<td>5. Demonstrate professional behaviour in conducting the experiments and presenting the results effectively</td>
</tr>
</tbody>
</table>

**List of Experiments**

1. Determination of Young’s modulus by conducting Deflection test on Cantilever beam
2. Determination of Young’s modulus by conducting Deflection test on Simply supported beam
3. Izod Impact test
4. Direct tension test on metal rods
5. Brinnell and Rockwell Hardness test
6. Compression test on brittle and ductile materials
7. Determination of modulus of rigidity by conducting tension test on a helical spring
8. Determination of modulus of rigidity by conducting compression test
9. Determination of modulus of rigidity by conducting torsion test
10. Determination of modulus of elasticity by conducting deflection test on fixed beam
11. Determination of modulus of elasticity by conducting deflection test on continuous beam
12. Bend test on metal rod
# DEPARTMENT OF CIVIL ENGINEERING

## SYLLABUS FOR B.E. IV-SEMESTER

### SURVEYING-II LAB

<table>
<thead>
<tr>
<th>Instruction : 2 Hours/week</th>
<th>SEE Marks : 50</th>
<th>Course Code : PC451CE</th>
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<tbody>
<tr>
<td>Credits : 1</td>
<td>CIE Marks : 30</td>
<td>Duration of SEE: 3 Hours</td>
</tr>
</tbody>
</table>

## COURSE OBJECTIVES

**Objectives of this course are to:**

1. Apply classroom knowledge in laboratory exercises and handling of Theodolite, GPS and Total station.

## COURSE OUTCOMES

**Upon the completion of this course students will be able to:**

1. Determine the RL of a given point in different practical situations
2. Apply the principles of tacheometry in the field
3. Locate the ground features using GPS
4. Practice working as a team member and make effective presentations.
5. Demonstrate professional behaviour in conducting the experiments and present the results effectively

## List of Experiments

1. Measurement of vertical angles; application to simple problems of height and distance using angle of elevation and depression.
2. Reduced Level (RL) of a given point using two instrument-stations in the same vertical plane as that of the point when the base of the point is inaccessible.
3. Difference in levels between two given points using two theodolite stations (baseline) in different planes.
4. Tacheometric survey; determination of constants for both the cases when the line of sight is horizontal and inclined.
5. Finding the gradient of a line connecting two points using Tangential tacheometry and Stadia tacheometry.
6. Traversing and area calculation using Total Station - Plotting.
7. Plotting of simple curve using linear method.
8. Plotting of simple curve using angular method with theodolite and total station.
9. Profile leveling using Total station- Plotting Longitudinal section and Transverse sections
10. Location of ground features using Global Positioning System (GPS) instrument and plotting the same after processing the data

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DEPARTMENT OF CIVIL ENGINEERING
SYLLABUS FOR B.E. IV-SEMESTER
FLUID MECHANICS LAB

<table>
<thead>
<tr>
<th>Instruction : 2 Hours/week</th>
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<th>Course Code : PC461CE</th>
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<tbody>
<tr>
<td>Credits : 1</td>
<td>CIE Marks : 30</td>
<td>Duration of SEE: 3 Hours</td>
</tr>
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</table>

### COURSE OBJECTIVES

*In this subject the students will*

1. Provide practical knowledge in verification of principles of fluid flow
2. Impart knowledge in measuring coefficient of discharge for various devices.

### COURSE OUTCOMES

*Upon the completion of this course students will be able to*

1. Determine coefficient of discharge for various measuring devices such as orifice, venturimeter, mouth piece, notches, weirs and hemi-spherical vessel and Validate Bernoulli’s theorem.
2. Calculate Reynold’s number and classify types of flows.
3. Estimate Darcy’s friction factor for turbulent flow in pipes.
4. Practise working as a team member and lead a team
5. Demonstrate professional behaviour in conducting the experiments and presenting the results effectively

### List of Experiments

1. Determination of $C_d$, $C_v$ and $C_c$ for Circular Orifice
2. Determination of $C_d$ for Mouthpiece
3. Determination of $C_d$ for V-notch
4. Determination of $C_d$ for Rectangular notch
5. Determination of $C_d$ for Venturimeter
6. Determination of $C_d$ for Hemi-spherical Vessel
7. Determination of types of flows using Reynold’s Apparatus
8. Determination of Darcy’s coefficient of friction.
9. Verification of Bernoulli’s Theorem.
10. Determination of $C_d$ for Orifice Meter
11. Determination of coefficient of sudden contraction (minor losses)
## OPEN ELECTIVES OFFERED BY VARIOUS DEPARTMENTS
### B.E- IV SEMESTER (2018-19)

### B.E- IV SEM OPEN ELECTIVE-II COURSES

<table>
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<tr>
<td>CIVIL</td>
<td>Green Buildings</td>
<td>OE410CE</td>
<td>1</td>
</tr>
<tr>
<td>CSE</td>
<td>Cyber Security</td>
<td>OE410CS</td>
<td>1</td>
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<tr>
<td>ECE</td>
<td>Medical Electronics</td>
<td>OE 410EC</td>
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<tr>
<td>EEE</td>
<td>Non-Conventional Energy Sources</td>
<td>OE410EE</td>
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<tr>
<td>IT</td>
<td>Introduction to Software Engineering</td>
<td>OE410IT</td>
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<tr>
<td>Mech</td>
<td>Value Analysis and Value Engineering</td>
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### B.E- IV SEM OPEN ELECTIVE-III COURSES

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<tr>
<td>CSE</td>
<td>Introduction to Python Programming</td>
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<tr>
<td>ECE</td>
<td>Sensors for Engineering Applications</td>
<td>OE420EC</td>
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<td>Basics of Wireless Communications</td>
<td>OE430EC</td>
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<tr>
<td>EEE</td>
<td>Electric Heating and Illumination</td>
<td>OE420EE</td>
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<tr>
<td>IT</td>
<td>Introduction to Database Management Systems</td>
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### B.E- IV SEM OPEN ELECTIVE-I COURSES

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<td>Polymer Technology</td>
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<td>Industrial Pollution and its Control</td>
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<tr>
<td>PHY</td>
<td>Display Devices</td>
<td>OE400PH</td>
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<tr>
<td></td>
<td>Fundamentals of Vacuum technology</td>
<td>OE410PH</td>
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<tr>
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<td>Introduction to Non-Destructive Testing</td>
<td>OE420PH</td>
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### B.E- IV SEM OPEN ELECTIVE-III COURSES

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<td>CHEM</td>
<td>Electrochemical Energy Systems</td>
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<td>Corrosion Science and Technology</td>
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<tr>
<td>PHY</td>
<td>Fundamentals of Cryogenics</td>
<td>OE430PH</td>
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<tr>
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<td>Smart Materials and Applications</td>
<td>OE440PH</td>
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<tr>
<td></td>
<td>Fundamentals of thin film Technology</td>
<td>OE450PH</td>
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DEPARTMENT OF CIVIL ENGINEERING
SYLLABUS FOR B.E. IV-SEMESTER
GREEN BUILDINGS
Open Elective-II (to other Branches)

Instruction: 1 Hours/week  | SEE Marks: 40  | Course Code: OE410CE
Credits: 1  | CIE Marks: 30  | Duration of SEE: 3 Hours

<table>
<thead>
<tr>
<th>Course Objective:</th>
<th>Course Outcomes</th>
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</table>
| • Learn the principles of the planning and the orientation of the buildings.  
• Acquire the knowledge on various aspects of green buildings. | At the end of the course, students will be able to:  
1. Explain the principles of the building planning  
2. Study the by-laws and provide facilities for rain water harvesting.  
3. Application of renewable energy system for green building  
4. Benefit to the environment with the green building technique |

UNIT-I
Planning of building: Principles of planning, Relevant building bylaws, site selection for buildings, orientation of buildings, common errors in planning, Provision of rain water harvesting

UNIT-II

Suggested Books:

References Books:
DEPARTMENT OF CIVIL ENGINEERING  
SYLLABUS FOR B.E. IV-SEMESTER  
DISASTER MANAGEMENT  
Open Elective-III (to other Branches)

Instruction : 2 Hours/week  |  SEE Marks : 60  |  Course Code : OE420CE  
Credits : 2  |  CIE Marks : 40  |  Duration of SEE: 3 Hours

### COURSE OBJECTIVES

Objectives of this course are to:

1. Know about the state of art of disaster management in world and explore the history of the disasters and comprehend how past events have helped shape the future.
2. Study the various natural and manmade disasters and apply the mitigation measures.
3. Expose students to various technologies used for disaster mitigation and management.

### COURSE OUTCOMES

Upon the completion of this course the students will be expected to:

1. Attain knowledge on various types, stages, phases in disaster with international & national policies and programmes with reference to the disaster reduction.
2. Understand various types of natural disaster, their occurrence, Effects, Mitigation and Management Systems in India.
3. Understand different types of manmade disasters, their occurrence, Effects, Mitigation and Management Systems in India.
4. Explain the utility of geography information systems (GIS), Remote sensing technology in all phases of disaster mitigation and management.

### UNIT-I

**Introduction** – Hazard, vulnerability and risk, Types of disasters, Disaster management cycle, Progress of disaster management in world, vulnerability profile of India, Disaster management act, Disaster management in India

### UNIT-II

**Natural Disasters** – Hydro- meteorological based disasters – Tropical cyclones, floods, drought and desertification zones, Geographical based disasters – Earthquake, Tsunamis, Landslides and avalanches – Causes, Types, effects and Mitigation measures.
UNIT-III
Human induced hazards – chemical industrial hazards, major power breakdowns, traffic accidents, etc.

UNIT-IV
Role of Remote Sensing and Geographical Information Systems (GIS) in Disaster Management: Introduction to remote sensing and GIS, its applications in disaster management.

Suggested Books:
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING  
SYLLABUS FOR B.E IV SEMESTER  
CYBER SECURITY (open elective-II)  
(for other Branches)

Instruction: 1Hr /week  SEE Marks :40  Course Code :OE410CS
Credits :1  CIE Marks: 30  Duration of SEE : 2Hrs

<table>
<thead>
<tr>
<th>Course objectives</th>
<th>Course outcomes</th>
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</thead>
<tbody>
<tr>
<td>Students should be able to</td>
<td>At the end of the course, Students will be able to</td>
</tr>
<tr>
<td>• Utilize the concepts of cyber security to safeguard from threats and infection spread through the internet</td>
<td>1. Explain the concepts of confidentiality, availability and integrity</td>
</tr>
<tr>
<td></td>
<td>2. Explain the basics of fraud techniques used by a hacker</td>
</tr>
<tr>
<td></td>
<td>3. Explore the common exploitation mechanisms and inspect data sniffing over the network</td>
</tr>
<tr>
<td></td>
<td>4. Determine the ways an organization attempts to discover threats</td>
</tr>
</tbody>
</table>

UNIT I- CYBER SECURITY FUNDAMENTALS
Network and Security concepts: Information assurance fundamentals, Basic Cryptography, Public key encryption, DNS, Firewalls, Virtualization. Attacker Techniques and Motivations: How hackers cover their tracks, Fraud Techniques, Threat Infrastructure

UNIT II – EXPLOITATION

Suggested Books:

Online Resources:
1. https://www.edx.org/micromasters/ritx-cybersecurity
2. https://www.coursera.org/specializations/cyber-security
3. http://nptel.ac.in/courses/106105031/

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR B.E IV SEMESTER
INTRODUCTION TO PYTHON PROGRAMMING
(open elective-III for other Branches)

Instruction: 2 Hrs /week
Credits :2

<table>
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<th>Course objective</th>
<th>Course outcomes</th>
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<tbody>
<tr>
<td>Students should be able to</td>
<td>At the end of the course, students will be able to</td>
</tr>
<tr>
<td>• Acquire problem solving skills</td>
<td>1. Design python programs using arithmetic expressions and decision making</td>
</tr>
<tr>
<td>• Develop flow charts</td>
<td>2. Design modular python programs using functions</td>
</tr>
<tr>
<td>• Learn programming and solve problems using Python language</td>
<td>3. Design programs using strings and list</td>
</tr>
<tr>
<td></td>
<td>4. Develop programs using tuples and dictionaries</td>
</tr>
</tbody>
</table>

UNIT-I
Introduction to Python – variables, expressions and statements, order of operations
Conditionals- Modulus operators, Boolean expressions, logical operators, conditional execution, alternative executions, chained conditional, nested conditional
Iteration - while statement

UNIT-II
Functions- function calls, type conversion and coercion, mathematical functions, User-defined functions, parameters and arguments.
Recursion

UNIT-III
Strings – string length, string traversal, string slices and string comparison with examples, strings are immutable, find function, string module
List – list values, accessing elements, list traversal, list length, list membership, list and for loop, list operations with examples
UNIT-IV
Tuples-Mutability, tuple assignment, tuple as return values
Dictionaries- dictionary operations, dictionary methods, aliasing and copying, counting letters using dictionaries

Suggested Books:

Reference Books:
3. Allen Downey, Think Python, 2nd Edition(2015), Shroff Publisher Orielly

Online Resources:
1. http://nptel.ac.in/courses/117106113/34
Instruction: 1 Hr /week  
SEE Marks : 40  
Course Code : OE410EC  
Credits : 1  
CIE Marks: 30  
Duration of SEE : 2 Hrs

<table>
<thead>
<tr>
<th>Course Objective:</th>
<th>Course Outcomes</th>
</tr>
</thead>
</table>
| 1. Will study the human body and various physiological systems  
2. Will understand various transducers used in bio-medical applications  
3. Will acquire good knowledge about various ICU, Electro surgery and imaging equipment | At the end of the course, students will be able to: |
|                   | 1. Identify the instruments used for various physiological measurements and bio-potential recordings  
2. Understand the working principles and operation of life supporting and medical imaging systems  
3. Learn and analyse the advanced hospital equipment used in health care industry.  
4. Apply different medical imaging techniques for diagnosis purposes. |

UNIT –I


Bio Signal Acquisition: types of bio signals, noise reduction strategies, physiological signal amplifiers, differential amplifiers, isolation amplifiers, chopper stabilized amplifiers, multiple input circuits,

UNIT - II


Therapeutic Equipment: Short wave diathermic, microwave diathermy, ultrasound diathermy - bladder simulators.
Life supporting: Ventilators, pace makers, dialysis machines.

Specialized Medical Equipment: Defibrillator, blood gassanalyser blood cell counter – multi channel ECG and EEG m/c – foetal Doppler and foetal monitor – Heart-lung machine.


Suggested Reading:
2. Leslie Cromwell, Fred J. Weibell, Erich A. P Feiffer, “Biomedical Instruments and Measurements”, 2/e, PHI.
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
SYLLABUS FOR B.E. IV SEMESTER
SENSORS FOR ENGINEERING APPLICATIONS (Open Elective-III)
(for other Branches)

Instruction: 2 Hrs /week  SEE Marks : 60  Course Code :OE420EC
Credits : 2  CIE Marks: 40  Duration of SEE : 3 Hrs

<table>
<thead>
<tr>
<th>Course Objective:</th>
<th>Course Outcomes</th>
</tr>
</thead>
</table>
| 1. The student will come to know the various stimuli that are to be measured in real life instrumentation.  
2. He will be able to select the right process or phenomena on which the sensor should depend on  
3. He will be aware of the various sensors available for measurement and control applications. | **At the end of the course, students will be able to:**  
1. Appreciate the operation of various measuring and control instruments which they encounter in their respective fields.  
2. Visualize the sensors and the measuring systems when they have to work in areas of interdisciplinary nature and also think of sensors and sensors systems when a for a new situation they encounter in their career.  
3. Identify & select the right process or phenomena on which the sensor should depend on.  
4. Know various stimuli that are to be measured in real life instrumentation. |

UNIT - I
Introduction: What is a sensor and what is a transducer? Electrical sensor – need for sensors in the modern world. Different fields of sensors based on the stimuli - various schematics for active and passive sensors. General characteristics and specifications of sensors – Implications of specifications uses of sensors – measurement of stimuli - block diagram of sensor system. Brief description of each block.

UNIT - II
Sensors for mechanical systems or mechanical sensors - Displacement - acceleration and force - flow of fluids – level indicators – pressure in fluids – stress in solids. Typical sensors - wire and film strain gauges, animometers, piezo electric and magnetostrictive accelerometers, potentiometric sensors, LVDT.

Department of Civil Engineering
UNIT - III
Optical sensors: light intensity – wavelength and color – light dependent resistors, photodiode, photo transistor, CCD, CMOS sensors.
Radiation detectors: radiation intensity, particle counter – Gieger Muller counter (gas based), Hallide radiation detectors.

UNIT - IV
Magnetic sensors: magnetic field, magnetic flux density – magneto resistors, Hall sensors, super conduction squids.
Acoustic or sonic sensors: Intensity of sound, frequency of sound in various media, various forms of microphones, piezo electric sensors.
Electrical sensors: conventional volt and ammeters, high current sensors, (current transformers), high voltage sensors, High power sensors.
High frequency sensors like microwave frequency sensors, wavelength measuring sensors.
MEMs and MEM based sensors.

Suggested Reading:
## DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

### SYLLABUS FOR B.E. IV SEMESTER

#### BASICS OF WIRELESS COMMUNICATIONS (Open Elective-III) (for other Branches)

### Instruction: 2 Hrs/week

<table>
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<tr>
<td>CIE Marks: 40</td>
<td>Duration of SEE: 3 Hrs</td>
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### Credits: 2

### Course Objective

1. To provide fundamental principles and concepts required to understand the wireless communication systems.

### Course Outcomes

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

1. Demonstrate the fundamental knowledge of wireless communication systems.
2. Differentiate between large scale & small scale fading channel effects.
3. Calculate the path loss, coverage area and power budgeting related aspects.
4. Acquaint with recent advancements and developments in the area of wireless communication systems.

#### UNIT - I


#### UNIT - II


#### UNIT - III

Multiple Access Techniques for Wireless Communications: Introduction, Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), Code Division Multiple Access (CDMA), Space Division Multiple Access (SDMA).
UNIT - IV
Wireless Systems and Standards: Global System for Mobile (GSM), CDMA Digital Cellular Standard (IS-95), Bluetooth and Personal Area Networks (PANs).

Suggested Reading:
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
SYLLABUS OF B.E IV- SEMESTER
NON-CONVENTIONAL ENERGY SOURCES (Open Elective –II)

<table>
<thead>
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<th>SEE Marks :40</th>
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<tr>
<td>Credits :1</td>
<td>CIE Marks: 30</td>
<td>Duration of SEE : 2Hrs</td>
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### COURSE OBJECTIVES
To provide a survey of the most important renewable energy resources and the technologies for harnessing these resources within the framework of a broad range of simple to state-of-the-art energy systems.

### COURSE OUTCOMES
After completion of the course, students will be able to:
1. Demonstrate the generation of electricity from various Non-Conventionalsources of energy, have a working knowledge on types of fuel cells.
2. Estimate the solar energy, Utilization of it, Principles involved in solar energy collection and conversion of it to electricity generation.
3. Explore the concepts involved in wind energy conversion system by studying its components, types and performance.
4. Illustrate ocean energy and explain the operational methods of their utilization.
5. Acquire the knowledge on Geothermal energy.

### UNIT-I:
Need for Non-conventional energy sources, Types of Non-Conventionals energy sources
Biomass Energy: Definition-Biomass conversion technologies.
UNIT-II:
Ocean Energy: Ocean thermal electric conversion (OTEC) methods: Open cycle and Closed cycle- Principles of tidal power generation-Advantages and limitations of tidal power generation.

Suggested Reading:
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING  
SYLLABUS OF B.E IV- SEMESTER  
ELECTRIC HEATING AND ILLUMINATION (Open Elective –III)  

<table>
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<tr>
<td>Credits :2</td>
<td>CIE Marks: 40</td>
<td>Duration of SEE : 3Hrs</td>
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Course objective:
1. This subject gives a comprehensive idea in utilization of electrical power such as electric heating, electric welding and illumination

Course Outcomes:
At the end of the course, students will be able to:
1. Identify a heating schemes for heating application
2. Welding schemes for welding application
3. Describe and measure units illumination.
4. Identify various lamps and fittings for street, factory and flood lighting schemes.

UNIT-I

UNIT-II

UNIT-III
Illumination fundamentals: Introduction, nature and production of light, Sensitivity of the eye, Units of light. The inverse square law and cosine law, Solid angle, Lighting calculations, Determination of M.S.C.P, Rousseau’s construction

UNIT-IV
Various illumination methods, Discharge lamps, Sodium vapour lamps, Mercury vapour lamps, Flourescent lamps, LED Lamps, Starting and power factor corrections, Stroboscopic effects, Noen signs, Application to factory lighting, Street lighting and Flood lighting.

SUGGESTED READING:
1. Art & Science of Utilization of Electrical Energy-Partab,Dhanpat Rai & Sons
DEPARTMENT OF INFORMATION TECHNOLOGY
SYLLABUS FOR B.E. IV SEMESTER
INTRODUCTION TO SOFTWARE ENGINEERING (Open Elective-II)  
(for other Branches)

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<th>Course Code : OE410IT</th>
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</thead>
<tbody>
<tr>
<td>Credits : 1</td>
<td>CIE Marks: 30</td>
<td>Duration of SEE : 2 Hrs</td>
</tr>
</tbody>
</table>

**Course Objectives**
The course will enable the students to:

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

<table>
<thead>
<tr>
<th>Understand the various SDLC models</th>
<th>1. Apply SW engineering methods, practices and their appropriate application.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. Analyze the software engineering layered technology and Process framework.</td>
</tr>
<tr>
<td></td>
<td>3. Demonstrate the significance of software requirements.</td>
</tr>
<tr>
<td></td>
<td>4. Develop the ability to elicit, analyze and specify software requirements through a productive working relationship with various stakeholders of the project.</td>
</tr>
</tbody>
</table>

**UNIT- I**

**UNIT-II**
Requirements Engineering: Requirements Engineering and Analysis, Scenario Based Modeling, Flow-Oriented Modeling, Creating a BehavioralModeling.

**Learning Resources:**
DEPARTMENT OF INFORMATION TECHNOLOGY
SYLLABUS FOR B.E. IV SEMESTER
INTRODUCTION TO DATABASE MANAGEMENT SYSTEMS
(Open Elective-III)
( for other Branches)

<table>
<thead>
<tr>
<th>Instruction: 2 Hrs /week</th>
<th>SEE Marks : 60</th>
<th>Course Code :OE420IT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credits : 2</td>
<td>CIE Marks: 40</td>
<td>Duration of SEE : 3 Hrs</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Objectives</th>
<th>Course Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>The course will enable the students to:</td>
<td>At the end of the course student will be able to:</td>
</tr>
<tr>
<td>The objective of the course is to explain the need of database for storing, accessing and updating the data, eliminate redundant data, allow multiple users to be active at one time and protect the data from unauthorized access.</td>
<td>1. Develop ER model for a given problem and understand functional components of the DBMS.</td>
</tr>
<tr>
<td>1. Develop ER model for a given problem and understand functional components of the DBMS.</td>
<td></td>
</tr>
<tr>
<td>2. Devise queries using SQL.</td>
<td></td>
</tr>
<tr>
<td>3. Design a normalized database schema using different normal Forms.</td>
<td></td>
</tr>
<tr>
<td>4. Comprehend the properties of a transaction and understand the concept of transaction processing.</td>
<td></td>
</tr>
</tbody>
</table>

UNIT – I

UNIT – II
Structured Query Language: Data Definition, Basic Structure of SQL Queries, Set Operations, Aggregate Functions, Null Values, Nested Subqueries, Joined Relations, Integrity Constraints.

UNIT – III
UNIT – IV

Learning Resources:
DEPARTMENT OF MECHANICAL ENGINEERING
SYLLABUS FOR B.E. IV-SEMESTER
COOLING OF ELECTRONIC COMPONENTS (Open Elective -III)
(for other Departments)

Instruction : 2 Hours/week | SEE Marks : 60 | Course Code : OE410ME
Credits : 2 | CIE Marks: : 40 | Duration of SEE : 3 Hours

<table>
<thead>
<tr>
<th>Course Objective</th>
<th>Course Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>The objectives of this course are to: expand the scope of the engineer to include the importance of effective heat transfer in electronic equipments. This should include the heat transfer processes occurring in electronic equipment, the methods of cooling and finally the analysis of thermal failure for electronic components.</td>
<td>On completion of the course the student will be able to: • analyse heat transfer processes involved in cooling of electronics components. • analyse and define solution for thermal failure of electronic components. • identify the best cooling method for each individual application. • design of heat sinks and heat pipes for cooling purpose.</td>
</tr>
</tbody>
</table>

UNIT – I
Introduction To Electronics Cooling: Needs, Goals. Temperature effects on different failure modes, Fundamentals of heat transfer: Conduction, Convection and Radiation, Electronic equipment for Airplanes, Missiles, Satellites and spacecraft; electronic equipment for Ships and Submarines; electronic equipment for Communication systems and Ground support system; chassis and circuit boards cooling.

UNIT – II
Heat Transfer Principles in Electronics Cooling-I: Conduction Heat Transfer, Contact resistance, Extended surfaces, Transient Conduction

UNIT – III
UNIT – IV

Learning Resources:

DEPARTMENT OF MECHANICAL ENGINEERING
SYLLABUS FOR B.E. IV-SEMESTER
VALUE ANALYSIS AND VALUE ENGINEERING (Open Elective -II)
(for other Departments)

Instruction: 1 Hour/week  SEE Marks : 40  Course Code: OE400ME
Credits: 1  CIE Marks: 30  Duration of SEE: 2 Hours

<table>
<thead>
<tr>
<th>Course Objectives</th>
<th>Course outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>The objectives of this course are to:</td>
<td>On completion of this course, students will be able to:</td>
</tr>
<tr>
<td>Understand the importance of value</td>
<td>1. choose the Concept of value engineering in their respective program to</td>
</tr>
<tr>
<td>engineering and its application in</td>
<td>improve overall effectiveness.</td>
</tr>
<tr>
<td>their respective fields and its</td>
<td>2. Examine orientation and information phases of value engineering to provide</td>
</tr>
<tr>
<td>implementation.</td>
<td>training and analyse information.</td>
</tr>
<tr>
<td></td>
<td>3. Study the creative, evaluation and recommendation phases for</td>
</tr>
<tr>
<td></td>
<td>implementation of value analysis.</td>
</tr>
<tr>
<td></td>
<td>4. perceive the concept of auditing process and its certification of value</td>
</tr>
<tr>
<td></td>
<td>engineering.</td>
</tr>
</tbody>
</table>

UNIT-I

Introduction: Meaning of Value Engineering (VE), Difference from other initiatives, Value and its types, Relationship between value vis-à-vis person, time and environment, History of Value Engineering / Value Analysis / Value Management, World bodies of Value Engineering & their activities, Multi-disciplinary team approach in Value Engineering study.

VALUE ENGINEERING JOB PLAN: Introduction, comparison of job plans of various value engineering. Finance and human relations in VE.

ORIENTATION PHASE: training associates in Value Analysis and Value Engineering (VAVE). Different trainings and certifications available in VAVE, Method to conduct VAVE studies.

INFORMATION PHASE: information needed for VAVE, Method to collect and analyze information, ABC Analysis, Pareto Analysis, Breakeven analysis.

UNIT-II

FUNCTION ANALYSIS PHASE: Breakdown item into elements and sub-elements, questions to be asked, introduction to functions, practice session, types of functions (use and sell function), levels of function (basic
With effect from the A.Y 2018-19

and secondary), identify various functions, elements of cost, procedure for cost allocation, cost allocation to function, concept of worth, process flow for determining worth, discussions on worth, meaning of FAST, use of FAST, different types of FAST. Ground rules of FAST, FAST diagram.

CREATIVE PHASE: Definition of creativity, misconceptions about creativity, introduction to creative techniques like TRIZ, 3P, lateral adoption and others

EVALUATION PHASE: selection of criteria, feasibility analysis, weighted evaluation methods, decision matrix.

RECOMMENDATION PHASE: Need for recommendation, method to make presentation, impact analysis and justification report, implementation plan, presentation skills.

IMPLEMENTATION PHASE: Detailed design, verification and validation, certification, change implementation.

AUDIT PHASE: Need for audit, types of audit, how to do audit.

Learning Resources:
2. Anil Kumar Mukhopadhaya: Value Engineering Mastermind: From Concept to Value Engineering Certification. SAGE, New Delhi
6. K.R.Chari : Value engineering
**DEPARTMENT OF PHYSICS**
**SYLLABUS FOR B.E. IV SEMESTER**
**DISPLAY DEVICES (Open Elective-I)**

<table>
<thead>
<tr>
<th>Instruction : 1 Hours / week</th>
<th>SEE Marks : 40</th>
<th>Course Code : OE400PH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credits : 1</td>
<td>CIE Marks : 30</td>
<td>Duration of SEE : 2 Hours</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course objectives</th>
<th>Course outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students will be able to learn</td>
<td>At the end of the course students will be able to</td>
</tr>
<tr>
<td>Basics of luminescence and display devices</td>
<td>1. List out different types of luminescence mechanisms</td>
</tr>
<tr>
<td></td>
<td>2. Classify types of display devices</td>
</tr>
<tr>
<td></td>
<td>3. Explain working of some display devices</td>
</tr>
<tr>
<td></td>
<td>4. Compare the output intensities emitted by LED, OLED et</td>
</tr>
</tbody>
</table>

**UNIT-I:**
Introduction to Luminescence, fluorescence, phosphorescence, principle and classification, luminescence mechanisms for various types and its applications.

**UNIT-II:**
Classification of display devices, working of Liquid crystal displays, comparison of LED and LCD, dynamic scattering display, OLEDs and their applications.

**SUGGESTED BOOKS:**
2. Adrian Kita, Luminescent Materials and Applications, John Willey & Sons
DEPARTMENT OF PHYSICS
SYLLABUS FOR B.E. IV SEMESTER
FUNDAMENTALS OF VACCUM TECHNOLOGY (Open Elective-I)

<table>
<thead>
<tr>
<th>Course objectives</th>
<th>Course outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Students will be able to learn</strong> Fundamentals of vacuum technology</td>
<td><strong>At the end of the course students will be able to</strong></td>
</tr>
<tr>
<td></td>
<td>1. Define basic vacuum technology related notations.</td>
</tr>
<tr>
<td></td>
<td>2. Enumerate methods production of vacuum.</td>
</tr>
<tr>
<td></td>
<td>3. List out different vacuum gauges and their limitations.</td>
</tr>
<tr>
<td></td>
<td>4. Identify types of vacuum leaks.</td>
</tr>
</tbody>
</table>

**UNIT-I:**
Definition of vacuum, units of vacuum-Vacuum ranges, evaporation theory-rate of evaporation, Hertz- Knudsen equation, types of evaporation, adsorption, desorption, Production of Vacuum, vacuum measurement, Vacuum pumps: pumping speed, throughput, Rotary oil pump, multi stage rotary pumps, diffusion pump, cryo-pump. Vacuum applications in various areas of engineering.

**UNIT-II:**
Measurement of vacuum, Vacuum gauges: thermocouple gauge, Pirani gauge, ionization gauge, Penning gauge, leak detection, Leak detection methods

**SUGGESTED BOOKS:**
2. Dr. V.V. Rao, Dr. T.B. Gosh, Dr. K.L. Chopra, Vacuum Science and Technology, Allied Publishers, New Delhi, 2008
DEPARTMENT OF PHYSICS
SYLLABUS FOR B.E. IV SEMESTER
INTRODUCTION TO NON-DESTRUCTIVE TESTING (Open Elective-I)

<table>
<thead>
<tr>
<th>Instruction : 1 Hours / week</th>
<th>SEE Marks : 40</th>
<th>Course Code : OE420PH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credits : 1</td>
<td>CIE Marks : 30</td>
<td>Duration of SEE : 2 Hours</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Course objectives</th>
<th>Course outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students will be able to learn</td>
<td>At the end of the course students will be able to</td>
</tr>
<tr>
<td>Basics of acoustics and non-destructive testing</td>
<td>1. Illustrate non-destructive testing</td>
</tr>
<tr>
<td></td>
<td>2. Explain production mechanisms of ultrasonics</td>
</tr>
<tr>
<td></td>
<td>3. Differentiate various methods of non-destructive testing</td>
</tr>
<tr>
<td></td>
<td>4. Compare the non-destructive testing methods and identify suitable one for given application.</td>
</tr>
</tbody>
</table>

UNIT-I:
Ultrasonic waves and their properties, Production of ultrasonics by Piezoelectric and magnetostriction methods, Detection of ultrasonics, Acoustic grating: ultrasonic velocity measurement, cavitation, Applications: ultrasonic cleaning, Echo cardiogram (ECG), ultrasonic imaging.

UNIT-II:

SUGGESTED BOOKS:
DEPARTMENT OF PHYSICS
SYLLABUS FOR B.E. IV SEMESTER
FUNDAMENTALS OF CRYOGENICS (Open Elective-II)

Instruction : 2 Hours / week  SEE Marks : 60  Course Code : OE430PH
Credits : 2  CIE Marks : 40  Duration of SEE : 3 Hours

<table>
<thead>
<tr>
<th>Course objectives</th>
<th>Course outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students will be able to learn</td>
<td>At the end of the course students will be able to</td>
</tr>
<tr>
<td>Liquefaction of gases</td>
<td>1. Define ranges of liquid temperatures</td>
</tr>
<tr>
<td></td>
<td>3. Enumerate properties and use of cryogenic fluids.</td>
</tr>
<tr>
<td></td>
<td>4. Explore applications and use of cryostats and cryocoolers.</td>
</tr>
</tbody>
</table>

UNIT-I:

UNIT-II:

UNIT-III:
Properties of cryogenic helium and Properties of Materials at Cryogenic Temperatures.

UNIT-IV:
Adiabatic demagnetization, practical applications of low temperatures, super fluidity Liquid He-II and He-III cryostat- Cryocoolers, Cryogenic Insulations-applications.

SUGGESTED BOOKS:
DEPARTMENT OF PHYSICS
SYLLABUS FOR B.E. IV SEMESTER
SMART MATERIALS AND APPLICATIONS (Open Elective-II)

Instruction : 2 Hours / week  SEE Marks : 60  Course Code : OE440PH
Credits : 2  CIE Marks : 40  Duration of SEE : 3 Hours

<table>
<thead>
<tr>
<th>Course objectives</th>
<th>Course outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students will be able to learn Essentials of smart materials • Different types of smart materials</td>
<td>At the end of the course students will be able to 1. List out various properties of functional materials 2. Identify smart materials based on properties and their appropriate usage. 3. Write different types of smart materials 4. Categorize suitable alloys for specific application.</td>
</tr>
</tbody>
</table>

UNIT I:
Introduction to functional materials, ferroelectricity, piezo electricity, pyroelectricity, Magnetostriiction. Properties of smart materials such as piezo electric, magneto-strictive, electro-strictive, thermos-responsive

UNIT-II:
Electrochromic materials, photochromic materials, thermo-chromic materials, thermoelectric materials, smart gels, electro-rheological (ER) and Magnetorheological MR fluids

UNIT III:
Introduction to metal alloys, classification of metal alloys as ferrous and non-ferrous alloys. Properties and applications of ferrous and non-ferrous alloys.
Introduction to shape memory alloys (SMA)- advantages and disadvantages of SMAs- Austenite, martensite, shape memory effect and types of shape memory effects- temperature transformation

UNIT IV:
Properties and characteristics of engineering SMAs - Ni-Ti shape memory alloy, Cu-based shape memory alloys: Cu-Zn-Al, Cu-Al-Ni, ferromagnetic shape memory alloys Applications of SMAs.

SUGGESTED BOOKS:
DEPARTMENT OF PHYSICS
SYLLABUS FOR B.E. IV SEMESTER
FUNDAMENTALS OF THIN FILM TECHNOLOGY (Open Elective-II)

Instruction : 2 Hours / week | SEE Marks : 60 | Course Code : OE450PH
Credits : 2 | CIE Marks : 40 | Duration of SEE : 3 Hours

<table>
<thead>
<tr>
<th>Course objectives</th>
<th>Course outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students will be able to learn Fundamentals of thin film technology Properties and preparation mechanisms</td>
<td>At the end of the course students will be able to</td>
</tr>
<tr>
<td></td>
<td>1. Differentiate bulk materials and thin films</td>
</tr>
<tr>
<td></td>
<td>2. Explore growth process of thin films.</td>
</tr>
<tr>
<td></td>
<td>3. List out various thin film preparation techniques.</td>
</tr>
<tr>
<td></td>
<td>4. Narrate properties of thin films</td>
</tr>
</tbody>
</table>

UNIT-I:
Classification of films- nucleation and growth- nucleation theories: capillarity and atomistic models, substrate effect, film thickness effect.

UNIT-II:
Thin film deposition techniques- simple thermal evaporation-electron beam evaporation-sputtering (d.c and a.c), flash evaporation, Laser ablation- spin coating- molecular beam epitaxy- Film thickness measurement- ellipsometry, Fizeu (Tolonsky) technique, quartz crystal oscillator techniques.

UNIT-III:
Electrical conduction in metallic films- Continuous and discontinuous films, electrical, optical and dielectric properties of thin films

UNIT-IV:
fabrication of thin film resistor, capacitor, diode, anti-reflection coatings, gas sensors and temperature sensors.

SUGGESTED BOOKS:
2. Goswami, thin film fundamentals, New age international, 2006
## DEPARTMENT OF CHEMISTRY

### SYLLABUS FOR B.E. IV SEMESTER

#### ELECTRONIC ENGINEERING MATERIALS (Open Elective-I)

<table>
<thead>
<tr>
<th>Instruction: 1 Hours / week</th>
<th>SEE Marks: 40</th>
<th>Course Code: OE400CH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credits: 1</td>
<td>CIE Marks: 30</td>
<td>Duration of SEE: 2 Hours</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OBJECTIVES</th>
<th>OUTCOMES</th>
</tr>
</thead>
<tbody>
<tr>
<td>The course will enable the students:</td>
<td>At the end of the course students should be able to:</td>
</tr>
</tbody>
</table>

1. To familiarize with various types of liquid crystals, their chemical constitution and behavior
2. To acquaint with different types of sensors and chemistry involved in them
3. To discuss the conductance in polymers and mechanism of conductance in undoped and doped polymers

1. Explain the classification, types and applications of liquid crystals
2. Discuss the principles, mechanism and applications of potentiometric and amperometric sensors
3. Explain the principle, mechanism and applications of fluorophore based, chromophore based and enzyme based fibre optic biosensors
4. Discuss the mechanism of conduction in undoped and doped polymers and applications of conducting polymers

### UNIT-I: Liquid Crystals


### UNIT-II: Conducting Polymers and Sensors


With effect from the A.Y 2018-19

Suggested Reading:
5. Chemistry of Advanced Materials: CNR Rao, RSC Publication

Online resources:
1. www.nptel.ac.in
2. http://ndl.iitkgp.ac.in
DEPARTMENT OF CHEMISTRY
SYLLABUS FOR B.E. IV SEMESTER
POLYMER TECHNOLOGY (Open Elective-I)

<table>
<thead>
<tr>
<th>Instruction :1 Hours / week</th>
<th>SEE Marks :40</th>
<th>Course Code : OE410CH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credits : 1</td>
<td>CIE Marks :30</td>
<td>Duration of SEE :2 Hours</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OBJECTIVES</th>
<th>OUTCOMES</th>
</tr>
</thead>
<tbody>
<tr>
<td>The course will enable the students:</td>
<td>At the end of the course students should be able to:</td>
</tr>
<tr>
<td>1. To familiarize with various types of polymers and polymerization methods and effect of their structure on properties. 2. To acquaint with different types of moulding techniques. 3. To discuss the reinforced plastics and biomedical applications of polymers.</td>
<td>1. Explain the classification and types of polymerization methods. 2. Discuss the moulding constituents and moulding techniques. 3. Discuss the different polymer blends and engineering plastics. 4. Choose the polymers for different applications.</td>
</tr>
</tbody>
</table>


UNIT-II: Moulding constituents of plastic, moulding techniques-Compression moulding, injection moulding, and extrusion moulding. Reinforced plastics, polymer blends and alloys, engineering plastics-polymides, polycarbonates, polyurethanes. Polymers in medicine, biomedical applications of polymers.

Suggested Reading:
DEPARTMENT OF CHEMISTRY
SYLLABUS FOR B.E. IV SEMESTER
INDUSTRIAL POLLUTION PREVENTION AND CONTROL (Open Elective-I)

<table>
<thead>
<tr>
<th>Instruction :1 Hours / week</th>
<th>SEE Marks :40</th>
<th>Course Code : OE420CH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credits : 1</td>
<td>CIE Marks :30</td>
<td>Duration of SEE : 2 Hours</td>
</tr>
</tbody>
</table>

**OBJECTIVES**

The course will enable the students:

1. An overview of pollution in industries
2. Principles of various processes the treatment of air and water pollution

**OUTCOMES**

At the end of the course students should be able to:

1. Explain the causes of pollution.
2. Describe the various sources of pollution.
3. Understand the effects of uncontrolled emissions.
4. Apply various methods to dispose the waste and minimize the pollution.

**UNIT-I**: Introduction, types of industrial waste, definition of pollutant, air pollutants- gases, hydro carbon pollutants, particulates - inorganic and organic particulates- effects of particulate pollutants, chlorofloro carbons(CFC)- cause of ozone depletion- harmful effects of cfc, photo chemical smog, air pollutant control methods: particulate emission control-gravitational setting chambers-cyclone separators, fabric filters, electrostatic precipitators.

**UNIT-II**: Water pollution: Definition of water pollution, types of water pollutants- Inorganic pollutants, toxic metals, organic pollutants, detrimental effects of Inorganic pollutants, toxic metals and organic pollutants, water pollution control methods-primary and secondary treatment. Treatment and disposal of industrial wastes, treatment of wastes or effluents with organic impurities, treatment of wastes or effluents with inorganic impurities, the nature, effect and treatment of some important chemical wastes. Case study.

**Suggested Reading:**

DEPARTMENT OF CHEMISTRY
SYLLABUS FOR B.E. IV SEMESTER
ELECTROCHEMICAL ENERGY SYSTEMS (Open Elective-II)

<table>
<thead>
<tr>
<th>Instruction : 2 Hours / week</th>
<th>SEE Marks : 60</th>
<th>Course Code : OE430CH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credits : 2</td>
<td>CIE Marks : 40</td>
<td>Duration of SEE : 3 Hours</td>
</tr>
</tbody>
</table>

**OBJECTIVES**

The course will enable the students:

1. To introduce the various terms to understand the efficiency of batteries.
2. To know the relevant materials required for the construction of primary and secondary batteries.
3. To familiarize with the reactions involved during charging and discharging processes.
4. To focus on the need of fuel cells and the concept of their construction and functioning.
5. To emphasize on the merits and demerits of each type of battery.

**OUTCOMES**

At the end of the course students should be able to:

1. Discuss the construction, electrochemistry, technology and applications of selected primary batteries.
2. Discuss the construction, electrochemistry, technology and applications of few secondary batteries.
3. Explain the working principle, electrochemistry, technology and applications of prominent fuel cells.
4. Choose a suitable battery or a fuel cell for a given application.
5. Evaluate different batteries or fuel cells in order to select a suitable battery or fuel cell for a given application.

**Unit-I: Batteries- Fundamentals**

Types of cells: Reversible and Irreversible cells, Primary, Secondary and Reserve batteries.

Battery characteristics: Free energy change, Electromotive force of battery, Ampere-Hour, Capacity, Power, Power density, Energy density, Efficiency, Cycle life, Tolerance to service conditions, Performance characteristics.

**Unit-II: Primary Batteries**

Construction, electrochemistry and technology of Zinc-Air Battery, Nickel metal hydride battery, Primary lithium batteries: Soluble Cathode Cells, Solid Cathode Cells - Lithium Manganese dioxide, Lithium-Vanadium Pentoxide battery, Solid electrolyte cells - Lithium polymer electrolyte Battery - Applications.

**Unit-III: Secondary Batteries**

Construction, electrochemistry and technology of Maintenance Free Lead Acid battery (MFLA), Valve Regulated Lead Acid battery (VRLA), Absorbed Glass Mat Lead Acid battery (AGMLA). Nickel-Cadmium battery, Reserve battery.
Secondary Lithium batteries: Liquid organic electrolyte cells, polymer electrolyte cells, lithium ion cells, applications.

**Unit – IV: Fuel Cells**

Introduction, classification based on temperature and nature of electrolyte. Working principle, components, applications and environmental aspects of Alkaline fuel cell (AFC) - Hydrogen-Oxygen alkaline fuel cell, Methyl alcohol - Oxygen alkaline fuel cell, Phosphoric acid fuel cell (PAFC), Molten carbonate fuel cell (MCFC), Polymer Electrolyte membrane Fuel cell (PEMFC), Solid oxide fuel cell (SOFC).

**Suggested Reading**

DEPARTMENT OF CHEMISTRY
SYLLABUS FOR B.E. IV SEMESTER
CORROSION SCIENCE AND TECHNOLOGY (Open Elective-II)

<table>
<thead>
<tr>
<th>Instruction : 2 Hours / week</th>
<th>SEE Marks : 60</th>
<th>Course Code : OE440CH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credits : 2</td>
<td>CIE Marks : 40</td>
<td>Duration of SEE : 3 Hours</td>
</tr>
</tbody>
</table>

**OBJECTIVES**

The course will enable the students:

1. To acquaint with the causes and factors influencing the rate of corrosion
2. To understand the different types of corrosion like dry, wet and galvanic corrosion and their relative impact
3. To familiarize with various preventive methods of corrosion such as cathodic protection, use of inhibitors, coatings, etc.
4. To know various industrial methods like electroplating, electroless plating.

**OUTCOMES**

At the end of the course students should be able to:

1. Explain different types of corrosion with suitable examples
2. Analyze the given case study and diagnose the type of corrosion in a given corrosion problem
3. Discuss different factors that affect corrosion and passivation of metals
4. Select a suitable metallic coating for corrosion control of the equipment in a given application
5. Explain the mechanism by which organic coatings and inhibitors control corrosion of metals
6. Discuss the principles and application of cathodic protection and surface conversion coatings for corrosion control

**UNIT-I: Chemical and Electrochemical Corrosion**

Introduction - gravity, cause, Chemical and Electrochemical corrosion, Pilling – Bed worth rule, effect of nature of oxide layer on rate of chemical corrosion, Galvanic corrosion, electrochemical series and galvanic series. Formation of anodic and cathodic areas, Differential aeration corrosion -pitting, water line corrosion & crevice corrosion, stress corrosion, corrosion fatigue. Passivation of metals, polarization curve of passivating metals, effect of pH and potential-pH diagram for iron (Pourbaix Diagram) and polarization curve of iron, application of Pourbaix diagram for corrosion mitigation.

**Factors influencing corrosion**

a. **Nature of metal**: Relative position of metal in galvanic series, Over voltage, Relative areas of anode & cathode and Nature of corrosion product.

b. **Nature of environment**: Temperature, pH and Humidity.
UNIT-II: Corrosion Control by Metallic Coatings

UNIT-III: Corrosion Control by Inhibitors and Organic Coatings

UNIT-IV: Corrosion Control by Cathodic Protection and Surface Conversion

Suggested Reading:
3. Chemistry of Engineering Meterials by R.P Mani and K.N.Mishra, CENGAGE learning
7. Fundamentals of Corrosion: Michael Henthorne, Chemical Engineering

Online resources:
1. www.nptel.ac.in
2. http://ndl.iitkgp.ac.in

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