Study & Evaluation Scheme with Syllabus

for

B.Tech. Second Year

Civil Engineering

On

Choice Based Credit System

(Effective from the Session: 2017-18)
<table>
<thead>
<tr>
<th>S. No.</th>
<th>Subject Code</th>
<th>Subject Name</th>
<th>L-T-P</th>
<th>ESE</th>
<th>Sessional CT</th>
<th>Sessional TA</th>
<th>Total</th>
<th>Credit</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>ROE030 to 039/ RAS301</td>
<td>Science Based Open Elective/Mathematics-III</td>
<td>3-1-0</td>
<td>70</td>
<td>20</td>
<td>10</td>
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<tr>
<td>2.</td>
<td>RVE301/RAS302</td>
<td>Universal Human Values &amp; Professional Ethics/ Environment &amp; Ecology</td>
<td>3-0-0</td>
<td>70</td>
<td>20</td>
<td>10</td>
<td>100</td>
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<tr>
<td>3.</td>
<td>RME303</td>
<td>Mechanics of Solids</td>
<td>3-0-0</td>
<td>70</td>
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<td>4.</td>
<td>RCE301</td>
<td>Building Materials &amp; Construction</td>
<td>3-1-0</td>
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<td>20</td>
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<td>5.</td>
<td>RCE302</td>
<td>Surveying</td>
<td>3-0-0</td>
<td>70</td>
<td>20</td>
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<td>6.</td>
<td>RCE303</td>
<td>Fluid Mechanics</td>
<td>3-0-0</td>
<td>70</td>
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<td>10</td>
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<td>7.</td>
<td>RCE351</td>
<td>Building Materials Lab</td>
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<td>8.</td>
<td>RCE352</td>
<td>Surveying Lab</td>
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<td>9.</td>
<td>RCE353</td>
<td>Fluid Mechanics Lab</td>
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<td>10.</td>
<td>RCE354</td>
<td>Computer Based Statistical &amp; Numerical Techniques Lab</td>
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<td>11.</td>
<td>RME101*</td>
<td>Elements of Mechanical Engineering*</td>
<td>3-1-0</td>
<td>70</td>
<td>20</td>
<td>10</td>
<td>100*</td>
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<td>12.</td>
<td>RCE151*</td>
<td>Computer Aided Engineering Graphics*</td>
<td>0-0-3</td>
<td>50</td>
<td>30</td>
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<td>100*</td>
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**CT:** Class Test  **TA:** Teacher Assessment  **L/T/P:** Lecture/ Tutorial/ Practical

*B.Tech. II\textsuperscript{nd} year lateral entry students belonging to B.Sc. Stream, shall clear the subjects RCE151/RCE251 and RME101/201 of the first year Engineering Programme along with the second year subjects.

**Science Based Open Electives:**
- a. ROE030/ROE040 Manufacturing Process
- b. ROE031/ROE041 Introduction to soft computing
- c. ROE032/ROE042 Nano Science
- d. ROE033/ROE043 Laser System and Application
- e. ROE034/ROE044 Space Science
- f. ROE035/ROE045 Polymer Science & Technology
- g. ROE036/ROE046 Nuclear Science
- h. ROE037/ROE047 Material Science
- i. ROE038/ROE048 Discrete Mathematics
- j. ROE039/ROE049 Applied Linear Algebra
## 2nd Year IV-SEMESTER

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Subject Code</th>
<th>Subject Name</th>
<th>L-T-P</th>
<th>ESE Marks</th>
<th>Sessional CT</th>
<th>TA</th>
<th>Total</th>
<th>Credit</th>
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<tbody>
<tr>
<td>1.</td>
<td>RAS401/ROE040 to 049</td>
<td>Mathematics-III/ Science Based Open Elective</td>
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<td>RAS402/RVE401</td>
<td>Environment &amp; Ecology/Universal Human Values &amp; Professional Ethics</td>
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<td>RCS405</td>
<td>Data Structures</td>
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<td>4.</td>
<td>RCE401</td>
<td>Hydraulics &amp; Hydraulic Machines</td>
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<td>5.</td>
<td>RCE402</td>
<td>Geoinformatics</td>
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<td>6.</td>
<td>RCE403</td>
<td>Structural Analysis</td>
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<td>RCE452</td>
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<td>9.</td>
<td>RCE454</td>
<td>Building Planning &amp; Drawing Lab</td>
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<td>11.</td>
<td>RME201*</td>
<td>Elements of Mechanical Engineering*</td>
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<td>Computer Aided Engineering Graphics*</td>
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**Total** | 1000 | 24

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*B.Tech. II\textsuperscript{nd} year lateral entry students belonging to B.Sc. Stream, shall clear the subjects RCE151/RCE251 and RME101/201 of the first year Engineering Programme along with the second year subjects.

**Industrial Training:**

Industrial Training: Students will go for Industrial Training of 8-10 weeks in total in two parts (Industrial Training-1 & Industrial Training-2) which is to be evaluated in VII semester after submission of separate training report for each part.

**Industrial Training-1:** Students will go to Industrial Training-1 of 4 weeks after IV semester which will be evaluated in VII semester.

**Science Based Open Electives:**

a. ROE030/ROE040 Manufacturing Process  
b. ROE031/ROE041 Introduction to soft computing  
c. ROE032/ROE042 Nano Science  
d. ROE033/ROE043 Laser System and Application  
e. ROE034/ROE044 Space Science  
f. ROE035/ROE045 Polymer Science & Technology  
g. ROE036/ROE046 Nuclear Science  
h. ROE037/ROE047 Material Science  
i. ROE038/ROE048 Discrete Mathematics  
j. ROE039/ROE049 Applied Linear Algebra
RCE301: BUILDING MATERIALS & CONSTRUCTION

UNIT I

UNIT II

UNIT III

UNIT IV

UNIT V
References:
1. SK Duggal, “Building Materials” New Age International
3. PC Varghese, “Building Materials” PHI
5. Sushil Kumar, “Building Construction” Standard Publisher.
10. Sahu, “Building Materials and Construction” Mc Grew Hill Education
UNIT I

UNIT II

UNIT III
Leveling: Methods of determining elevations, Direct levelling- basic terms and definitions, principle, booking and reduction of field notes, curvature and refraction correction, use of Automatic level, Digital Level, Vertical Control. Contouring: contours, contour interval, horizontal equivalent, characteristics, methods and interpolation, use to prepare profiles. Tachometry: Principles of stadia systems, subtense bar and tangential methods.

UNIT IV
Traversing and triangulation: Principles of traversing by compass and theodolite, computations of traverse coordinates, omitted measurements, Principles and classification of triangulation systems, strength of figures, satellite stations, and triangulation field work. Introduction to modern surveying Instruments /Techniques like total station.

UNIT V
Elements of simple circular curves, theory and methods of setting out simple circular curves, transition curves- types and their characteristics, ideal transition curve, equations of various transition curves, Introduction to vertical curves. Survey Layout for culverts, canals, bridges, road/railway alignment and buildings.

References:
5. AK Dey Plain Survey, S Chand
6. SK Duggal: Surveying Vol. I, II.
7. R Subramanian : Surveying & Leveling , Oxford University Press
UNIT I
Fluid and continuum, Physical properties of fluids, Rheology of fluids. Pressure-density-height relationship, manometers, pressure transducers, pressure on plane and curved surfaces, centre of pressure, buoyancy, stability of immersed and floating bodies, fluid masses subjected to linear acceleration and uniform rotation about an axis.

UNIT II
Types of fluid flows: Continuum & free molecular flows. Steady and unsteady, uniform and non-uniform, laminar and turbulent flows, rotational and irrotational flows, compressible and incompressible flows, subsonic, sonic and supersonic flows, sub-critical, critical and supercritical flows, one, two and three dimensional flows, streamlines, continuity equation for 3D and 1D flows, circulation, stream function and velocity potential.

UNIT III
Potential Flow: source, sink, doublet and half-body. Equation of motion along a streamline and its integration, Bernoulli’s equation and its applications- Pitot tube, orifice meter, venturimeter and bend meter, notches and weirs, momentum equation and its application to pipe bends, resistance to flow. Minor losses in pipe in series and parallel, power transmission through a pipe, siphon, water hammer, three reservoir problems and pipe networks.

UNIT IV
Equation of motion for laminar flow through pipes, Stokes’ law, transition from laminar to turbulent flow, turbulent flow, types of turbulent flow, isotropic, homogenous turbulence, scale and intensity of turbulence, measurement of turbulence, eddy viscosity, mixing length concept and velocity distribution in turbulent flow over smooth and rough surfaces, Boundary layer thickness, boundary layer over a flat plate, laminar boundary layer, application of momentum equation, turbulent boundary layer, laminar sub-layer, separation and its control.

UNIT V
Drag and lift, drag on a sphere, a two dimensional cylinder, and an aerofoil, Magnus effect. Similarity Laws: geometric, kinematics and dynamic similarity, undistorted and distorted model studies, Dimensional analysis, Buckingham’s Pi theorem, important dimensionless numbers and their significance.

References:
2. Fox & Donald, “Introduction to Fluid Mechanics” John Wiley &Sons Pvt Ltd,
15. RK Bansal “Fluid Mechanics and Hydraulic Machines” Laxmi Publication

RCE351/ RCE451: BUILDING MATERIALS LAB

Testing of various properties of following materials as per BIS specifications

I. **Cement**
   1. Normal Consistency of cement.
   2. Initial & final setting time of cement
   3. Compressive strength of cement
   4. Fineness of cement by air permeability and Le-chatelier’s apparatus.
   5. Soundness of cement.
   6. Tensile strength

II. **Coarse Aggregate**
   1. Water absorption of aggregate
   2. Sieve Analysis of Aggregate
   3. Specific gravity &bulk density
   4. Grading of aggregates.

III. **Fine Aggregate**:
   1. Sieve analysis of sand
   2. Silt content of sand
   3. Bulking of sand

IV. **Bricks**:
   1. Water absorption.
   2. Dimension Tolerances
   3. Compressive strength
   4. Efflorescence
RCE352: SURVEYING LAB

1. To prepare conventional symbol chart based on the study of different types of topographical maps.
2. To measure bearings of a closed traverse by prismatic compass and to adjust the traverse by graphical method.
3. To find out reduced levels of given points using Auto/dumpy level.
4. To perform fly leveling with Auto/tilting level.
5. To study parts of a Vernier theodolite and measurement of horizontal and vertical angle.
6. To measure horizontal angle between two objects by repetition/reiteration method.
7. To determine the height of a vertical structure (e.g. chimney/ water tank etc.) using trigonometrical leveling by taking observations in single vertical plane.
8. To study various parts of Electronic Theodolite, Total Station and practice for measurement of distance, horizontal and vertical angles.
9. To set out a simple circular curve by Rankine’s method.
10. To plot contour map of given area.

RCE353: FLUID MECHANICS LAB

Note: Ensure to conduct at least 10 experiments from the list:

1. To verify the momentum equation using the experimental set-up on impact of jet.
2. To determine the coefficient of discharge of an orifice of a given shape. Also to determine the coefficient of velocity and the coefficient of contraction of the orifice mouth piece.
3. To calibrate an orifice meter and study the variation of the co-efficient of discharge with the Reynolds number.
4. To calibrate a Venturi meter and study the variation of the co-efficient of discharge with the Reynolds number.
5. To calibrate a bend meter and study the variation of the co-efficient of discharge with the Reynolds number.
6. To draw a flow-net using Electrical Analogy Method.
7. To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number.
8. To study the velocity distribution in a pipe and also to compute the discharge by integrating the velocity profile.
9. To study the variation of friction factor, ‘f’ for turbulent flow in commercial pipes.
10. To study the boundary layer velocity profile over a flat plate and to determine the boundary layer thickness.
11. To determine Meta-centric height of a given ship model.
12. To determine the head loss for a sudden enlargement
13. To determine the head loss for a sudden Contraction.
RCE354: COMPUTER BASED STATISTICAL & NUMERICAL TECHNIQUES LAB

Write computer program in C/C++/visual basic for mathematical and engineering solutions.

1. Write a code for finding out the root of the algebraic and transcendental equations using Newton-Raphson’s iterative method.
2. Write a computer program for inversion of matrix.
3. Write a computer program for Eigen value solution of matrix.
4. Write a computer program for Runge Kutta fourth order method (RK4) to solve ordinary differential equation.
5. Write a computer program to find the engineering properties of I and channel sections.
6. Write a computer program to solve simultaneous linear equations.
7. Write the program to implement the Gauss forward interpolation formula and backward interpolation formula.
8. Write code for one dimensional heat equation and one dimensional fluid flow problem (boundary value problem).
UNIT I
Introduction: Basic concepts of free surface flows, velocity and pressure distribution, Mass, energy and momentum principle for prismatic and non-prismatic channels critical, sub-critical and super-critical type of flows. Critical depth, concepts of specific energy and specific force. Chezy’s and Manning’s equations for uniform flow in open channel, Velocity distribution, most efficient channel section, compound sections.

UNIT II

UNIT III
Rapidly varied flow: hydraulic jump, Evaluation of the jump elements in rectangular and non-rectangular channels on horizontal and sloping beds. Open channel surge, celerity of the gravity wave, deep and shallow water waves, Rectangular free overfall.

UNIT IV

UNIT V
Rotodynamic Machines, Pelton Turbine, equations for jet and rotor size, efficiency, spear valve, reaction turbines, Francis and Kaplan type, Head on reaction turbine, unit quantities, similarity laws and specific speed, cavitation, characteristic curves.

References:
2. Subramanya, K., Flow through Open Channels, TMH, New Delhi
3. Ranga Raju, K.G., Flow through open channels, T.M.H. New Delhi
4. Rajesh Srivastava, Flow through Open Channels , Oxford University Press
7. RK Bansal “Fluid Mechanics and Hydraulic Machines” Laxmi Publication
UNIT I
Photogrammetric Survey, basic principles, elevation of a point, determination of focal length of lens, aerial camera, scale of a vertical photograph, relief displacement of a vertical photograph, height of object from relief displacement, scale of a tilted photograph, tilt distortion, relief displacement of a tilted photograph, combined effects of tilt and relief, flight planning for aerial photography, selection of altitude, interval between exposures, crab and drift, stereoscope parallax, parallax in aerial stereoscopic views, parallax equations. Photogrammetry – analog, analytical and digital photogrammetry.

UNIT II
Remote Sensing, Introduction, concepts and physical basis of Remote Sensing, Electromagnetic spectrum, radiation laws, atmospheric effects, image characteristics. Remote sensing systems; sources of remote sensing information, spectral quantities spectral signatures and characteristics spectral reflectance curves for rocks, soil, vegetation and water. Introduction to Aerial and space borne platforms. Optical, thermal and microwave sensors and their resolution, salient features of some of operating Remote Sensing satellites.

UNIT III
Digital image processing: introduction, image rectification and restoration, image enhancement, image transformation, manipulation, image classification, fusion. Applications of remote sensing to civil engineering.

UNIT IV
GIS system: Definition terminology and data types, basic components of GIS software, data models, data acquisition, both raster based and vector based data input and data processing and management including topology, overlaying and integration and finally data product and report generation. GIS applications in civil engineering.

References:
6. B C Punamia: Higher Surveying Laxmi Publication
14. GS Srivastava “An Introduction to Geoinformatics” TMH.
RCE403: STRUCTURAL ANALYSIS

UNIT I
Classification of Structures, Types of structural frameworks and Load transfer Mechanisms, stress resultants, degrees of freedom, Static and Kinematic Indeterminacy for beams, trusses and building frames. Analysis of cables with concentrated and continuous loadings, Effect of Temperature upon length of cable.

UNIT II
Classification of Pin jointed determinate trusses, Analysis of determinate plane trusses (compound and complex). Method of Substitution, Method of tension coefficient for analysis of plane trusses.

UNIT III

UNIT IV
Rolling loads and influence line diagrams for determinate beams and trusses, Absolute maximum bending moment and shear force. Muller-Breslau’s principal & its applications for determinate structures.

UNIT V
Arches, Types of Arches, Analysis of three hinged parabolic and circular Arches. Linear arch, Eddy’s theorem, spandrel braced arch, moving load & influence lines for three hinged parabolic arch.

References
1. Hibbler, “Structural Analysis”, Pearson Education
13. Devas Menon “Advanced Structural Analysis” Narosa
Group.

RCE452: GEOINFORMATICS LAB

1. Demonstration and working on Electronic Total Station. Measurement of distances, horizontal & vertical angles and coordinates.
3. To layout a precise traverse in a given area and to compute the adjusted coordinates of survey stations.
4. Demonstration and working with Mirror stereoscopes, Parallax bar and Aerial photographs.
5. Visual Interpretation of standard FCC (False colour composite).
6. Digitization of physical features on a map/image using GIS software.
7. Coordinates measurement using GPS.

RCE453: STRUCTURAL ANALYSIS LAB

1. To determine Flexural Rigidity (EI) of a given beam
2. To verify Maxwell’s Reciprocal theorem.
3. To find horizontal thrust in a three-hinged arch and to draw influence line diagrams for Horizontal Thrust and Bending moment.
4. To find horizontal thrust in a two hinged arch and to draw influence line diagrams for horizontal Thrust and bending moment.
5. To find deflection of curved members.
6. To find bar forces in a three members structural frames with pin jointed bar
7. To find Critical load in Struts with different end conditions.
8. To find deflections in Beam having unsymmetrical bending.
RCE454: BUILDING PLANNING & DRAWING LAB

Drawing and drafting of following with CAD software
1. Introduction to the tools and commands of drafting software.
2. Working in layers, blocks, x-ref, drawing layout and print setup.
3. 3D drafting and rendering
4. Planning and drafting of elevation and cross section of door and window
5. Planning and drafting of plan and cross section of Dog legged and open well staircase.
6. Planning and Drawings of Residential building of 1 room set (plan and section).
7. Planning and drawing of 3 room residential building with staircase.
8. Preparation of details general arrangement drawing of 4 room duplex house including planning and drafting.

RCE455: HYDRAULICS & MACHINE LAB

Note: Ensure to conduct at least 10 experiments from the list:
1. To determine the Manning’s coefficient of roughness ‘n’ for the bed of a given flume.
2. To study the velocity distribution in an open channel and to determine the energy and momentum correction factors
3. To study the flow characteristics over a hump placed in an open channel.
4. To study the flow through a horizontal contraction in a rectangular channel.
5. To calibrate a broad-crested weir.
6. To study the characteristics of free hydraulic jump.
7. To study centrifugal pump and their characteristics
8. To study characteristics of Pelton Turbine.
9. To study characteristics Francis Turbine.
10. To study characteristics of Kaplan Turbine.
11. To study the free overfall phenomenon in an open channel and to determine the end depth
12. To determine coefficient of discharge for given rectangular notch.
13. To determine coefficient of disc.