

# **Government College of Engineering Jalgaon**

**“Globally Accepted Engineers with Human Skills”**

**(An Autonomous Institute of Government of Maharashtra)**



**Civil Engineering Department**

**Second Year BTech Syllabus**

**2015-16**

**GOVERNMENT COLLEGE OF ENGINEERING JALGAON**

Department of Civil Engineering.  
Scheme for B.Tech (Civil Engineering)

**SEM III**

Course Code	Name of the Course	Group	Teaching Scheme Hrs /week				Evaluation Scheme							Credits
			TH	TU	PR	Total	Theory				Practical			
							ISA	ISE1	ISE2	ESE	ICA	ESE	Total	
CE201	Surveying-I	D	3	1	---	4	10	15	15	60	---	---	100	4
CE202	Engineering Geology and Hydrology	B	3	---	---	3	10	15	15	60	---	---	100	3
CE203	Strength of Material	D	3	1	---	4	10	15	15	60	---	---	100	4
CE204	Fluid Mechanics-I	D	3	---	---	3	10	15	15	60	---	---	100	3
CE205	Building Construction and Materials	D	3	---	---	3	10	15	15	60	---	---	100	3
CE255	Computer Applications in Civil Engineering-LAB	B	1	---	2	3	---	---	---	---	50	--	50	2
CE206	Engineering Geology and Hydrology-LAB	B	---	---	2	2	---	---	---	---	50	---	50	1
CE207	Surveying-I-LAB	D	---	---	2	2	---	---	---	---	25	25	50	1
CE208	Fluid Mechanics-I-LAB	D	---	---	2	2	---	---	---	---	25	25	50	1
CE209	Building Construction and Materials-LAB	D	---	---	2	2	---	---	---	---	25	25	50	1
Total			16	02	10	28	50	75	75	300	175	75	750	23

**SEM IV**

Course Code	Name of the Course	Group	Teaching Scheme Hrs /week				Evaluation Scheme							Credits
			TH	TU	PR	Total	Theory				Practical			
							ISA	ISE1	ISE2	ESE	ICA	ESE	Total	
SH252	Engineering Math-III	A*	3	1	---	4	10	15	15	60	---	---	100	4
CE251	Concrete Technology	D	3	1	---	4	10	15	15	60	---	---	100	4
CE252	Surveying-II	D	3	---	---	3	10	15	15	60	---	---	100	3
CE253	Building Design and Drawing	D	3	---	---	3	10	15	15	60	---	---	100	3
CE254	Engineering Economics and Humanities	C	3	---	---	3	10	15	15	60	---	---	100	3
SH204	General Proficiency-II	C	1	---	2	3	---	---	---	---	25	25	50	2
CE256	Concrete Technology -LAB	D	---	---	2	2	---	---	---	---	25	25	50	1
CE257	Surveying-II -LAB	D	---	---	2	2	---	---	---	---	25	25	50	1
CE258	Building Design and Drawing-LAB	D	---	---	2	2	---	---	---	---	25	25	50	1
CE259	Strength of Material -LAB	D	---	---	2	2	---	---	---	---	25	25	50	1
Total			16	02	10	28	50	75	75	300	125	125	750	23

**TH: Theory Lecture**

**TUT: Tutorial**

**PR: Practical**

**ISA: Internal Sessional Assessment**

**ISE : In Semester Examination**

**ESE: End Semester Examination, ICA : Internal Continuous**

**Assessment**

## CE201 SURVEYING - I

Teaching Scheme :03L+ 01T, Total: 04

Credit: 04

Evaluation Scheme:15 ISE1 +15 ISE2 + 10 ISA + 60 ESE

Total Marks: 100

Duration of ESE : 03Hrs

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### Introduction to Surveying

**Surveying:** object, definition, principle of surveying, various types of surveying.

**Linear Measurements:** methods of distance measurements, instruments for measurement of distance, chaining a line, chaining along slope, offsets: instruments for laying offsets, triangulation, chain and cross staff survey, errors.

**Angular Measurements:** Types of compass, bearings, local attraction and correction to bearings, chain and compass traversing, graphical method of adjustment, errors. Bench mark and its types, reduced level, rise and fall method, height of instrument method.

### Levelling

Instruments used in levelling, dumpy level, automatic level, types of levelling staff. Principal axes of dumpy level, reciprocal levelling curvature and refraction correction, distance to the visible horizon.

**Profile Levelling:** L - section and cross -sections.

### Theodolite

Principal axes and temporary adjustments of transit theodolite.

**Uses of theodolite:** Measurement of horizontal angles, vertical angles, magnetic bearings, measuring deflection angles.

**Theodolite Traversing:** Computation of consecutive and independent co-ordinates, adjustments of closed traverse, Gales traverse by co-ordinate method.

### Tacheometry

Principle of stadia method, fixed hair method with vertical staff to determine horizontal distances and elevations of the points. Use of tacheometry in surveying, contour characteristics and uses, methods of interpolation, tacheometric contour survey.

### Curves

Horizontal and vertical curves and their purposes. Simple circular curves – elements and setting out by linear and angular methods. Compound curves -elements and setting out of compound curves. Transition curves - types and uses, length of transition curves.

### Plane Table Survey

Objective and equipment required for plane table survey. Methods of plane table - radiation, intersection, traversing and resection. Advantages, disadvantages, limitations and errors of plane table surveying.

**Minor Instruments:** study and use of abney level, box sextant, digital planimeter.

### Text Books:

1. Surveying and levelling (Vol-I & II) by T.P. Kanetkar & S.V. Kulkarni, Pune Vidarthi Griha Prakashan, Pune 23<sup>rd</sup> edition,1990
2. Surveying Vol. I and Vol .II by Dr B. C. Punmia, Laxmi Publication (P) New Delhi,17<sup>th</sup> edition,2008

### Reference Books:

1. Plane surveying by Dr. A.M.Chandra, , New Age International Publishers New Delhi, 2<sup>nd</sup> Edition, 2006
2. Surveying and Levelling by R. Subramanian Oxford University Press, New Delhi, First Edition, 2007
3. Advance Surveying ,Vol I & II, Handbook by P.B. Shahani, New Delhi Oxford and IBH publication,1981
4. A handbook of accurate surveying methods by S. P. Collins , PITMAN, 1972

## CE202 ENGINEERING GEOLOGY AND HYDROLOGY

**Teaching Scheme:** 03L+ 0T, Total: 03

**Credit:** 03

**Evaluation Scheme:** 15 ISE1 +15 ISE2 + 10 ISA + 60 ESE

**Total Marks:** 100

**Duration of ESE :** 03Hrs

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### **Mineralogy and Petrology**

Introduction to the subject - objects, scope, rock forming minerals, primary and secondary minerals. Silicate and non silicate minerals-felsic and mafic minerals, essentials and accessories minerals. Origin, texture, structure, classification of igneous rocks, secondary rocks, metamorphic rocks and their engineering applications. Study of common rock types .

### **Structural Geology, Plate Tectonics and Ground water**

Structural geology: outcrop, dip and strike, conformable series, unconformity and overlap.

Faults and their types, folds and their types, inliers and outliers. Structural features resulted due to igneous intrusions, concordant and discordant igneous intrusions. Joints and their types and introduction to plate tectonics. Water table and depth zones, relation between surface relief and water table, perched water table .Natural springs and seepages, contact springs, hot springs and geysers, artesian wells.

### **Geomorphology, Historical Geology and Building stones**

Geomorphology: geological action of river, rejuvenation, land forms resulted due to river erosion,deposition and rejuvenation. Physiographic divisions of India and their characteristics, geological history of peninsula, study of formations in peninsula and the significance of their structural characters in major Civil Engineering activities. Requirements of good building stones, engineering properties of rocks, availability of blocks of suitable size and appearance on mineral composition, textures, structures. Earthquake and its causes, classification, seismic zones of India & geological consideration for construction of buildings.

### **Hydrology**

**Introduction:** definition and its importance, hydrological, cycle, hydrologic equation.

**Precipitation:** forms, types, factor affecting, measurement, rain gauge network, estimation of missing data, consistency of data, mean area precipitation, artificial rain.

**Evaporation:** process, factor affecting, measurement and estimation, control of evaporation.

**Evapo-Transpiration:** factor affecting, measurement and estimation

**Infiltration:** process, factor affecting, measurement, infiltration indices.

### **Text Books:**

- 1.General and Engineering Geology by Parbin Singh, 6th edition, Kataria S. K. Sons,2014
- 2.Hydrology, by Subramanyam K, 2nd edition, Tata McGraw Hill, 2012
- 3.A Text Book of Geology, by Mukharjee 4th edition, The World Press Private Ltd, Calcutta,2012

### **Reference Books:**

- 1.Water Resources Systems Planning and Management, Chaturvedi M. C., Tata McGraw Hill, New Delhi
- 2.Geology of India by Wadia D.N. , 4th edition Tata McGraw Hill, Delhi, 2012
3. Handbook of Hydrology by Chow Y. T., McGraw Hill, New Delhi ,2012
4. Hydraulics & Fluid Mechanics, Modi and S.M. Seth, 14th edition, Standard Book House, New Delhi, 2012

## CE203 STRENGTH OF MATERIALS

Teaching Scheme:03L+ 01T, Total: 04

Credit: 04

Evaluation Scheme: 15 ISE1 +15 ISE2 + 10 ISA + 60 ESE

Total Marks: 100

Duration of ESE :03 Hrs

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### Stresses and Strains

Normal stress and strain, tensile, compressive and shear stresses. Hooke's law, deformation in prismatic, stepped and composite members due to concentrated load and self-weight. Stress and strain in determinate and indeterminate members, temperature stresses. Shear stress and strain, modulus of rigidity, Poisson's ratio, bulk modulus, relation between E, G and K, generalized Hooke's law, stress strain diagram, working stress, factor of safety. Strain energy, stresses due to various types of axial load using strain energy method.

### Shear Force and Bending Moment

Concept of shear force and bending moment, shear force and bending moment diagrams for cantilevers, simple and compound beams due to concentrated, uniformly distributed, uniformly varying loads and couples, construction of loading diagrams and bending moment diagram from shear force diagram. Bending stresses in beams: Introduction to moment of inertia, parallel and perpendicular axis theorem, theory of simple and pure bending, section modulus, moment of resistance, bending stress distribution diagram.

### Bending and Shear Stresses

Shear stresses in beams, shear stress derivation, and shear stress distribution in different cross sections of beams.

**Torsion** Theory of pure torsion, torsional moment of resistance, power transmitted by shafts, torsional rigidity, shear stresses in shafts due to torsion, stress and strain in determinate shafts of hollow or solid cross-sections.

**Columns:** Axially loaded columns, Euler's theory of long columns, assumptions made in Euler's theory, limitations of Euler's formula. Various end conditions & concept of equivalent length, Rankine's formula,

### Direct and Bending Stress

Direct and bending stresses in short columns and other structural components due to eccentric or lateral loads, the middle third rule, core of section.

### Principal Stresses

Concept of principal stresses and planes, normal and tangential stress on any oblique plane, determination of principal stresses and principal planes, Mohr's circle method.

### Text Books:

1. Strength of material by M. Passi, Tech-max Publications, Pune ,2012
2. Strength of material by S. Rammurthum, Dhanpat Rai & Sons.2012

### Reference Books:

1. Strength of materials by S.S.Ratan, Tata McGraw Hill Delhi ,2011
2. Strength of material by D. S. Prakash Rao, University Press,2009
3. Strength of Materials & Machine Elements by V.L. Shah and R.A. Ogale, Structures Publications, Pune,2006
4. Elements of Strength of Materials by Timoshenko S. and Young D.H.,Tata McGraw Hill, 2006.
5. Strength of Materials by Pytel and Singer, Harper and Row publication ,1987
6. Strength of Materials by R.C.Hibbeler, Prentice Hall,2009
7. Mechanics of Structures by S.B. Junaikar , Charotar Publishers, 2010.

## CE204 FLUID MECHANICS I

**Teaching Scheme:** 03L+ 0T, Total: 03

**Credit:** 03

**Evaluation Scheme:** 15 ISE1 + 15 ISE2 + 10 ISA + 60 ESE

**Total Marks:** 100

**Duration of ESE:** 03Hrs

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**Introduction:** - Scope and applications of fluid mechanics, Newton's law of viscosity, classification of fluids: Newtonian and non-Newtonian fluids, ideal and real fluids.

**Physical Properties of Fluids:** mass density, specific weight, specific volume, specific gravity, dynamic and kinematic viscosity, compressibility, surface tension, capillarity, vapour pressure.

**Fluid Pressure Measurement:** Fluid pressure, pressure head, measurement of pressure Simple and differential manometers, introduction to mechanical gauges.

**Pressure on Surfaces:** Static fluid pressure forces on plane and curved surfaces and their simple Civil Engineering applications.

**Buoyancy:** Archimedes's principle, buoyancy and flotation, metacentric height, stability of floating and submerged bodies.

**Kinematics of Fluid Flow:** Types of fluid flows steady and unsteady, uniform and non uniform laminar and turbulent, one, two and three dimensional, rotational and irrotational flows. Velocity and acceleration for one and three dimensional flows. Stream lines, equipotential lines and flow net, uses and limitations of flow net. equations of continuity for one and three-dimensional flows.

**Dynamics of Fluid Flow:** Forces acting on fluids in motion. Various equations of motion. Euler's equation of motion and Bernoulli's theorem for one and three dimensional flows, hydraulic gradient line and total energy line, kinetic energy correction factor. Simple applications of continuity and Bernoulli's equations such as Pitot tube and Venturimeter.

**Dimensional Analysis and Hydraulic Similitude:** Dimensions of physical quantities, dimensional homogeneity, Buckingham pi-theorem.

**Model Analysis:** Geometric, kinematics and dynamic similitudes, important dimensionless parameters and their significance .Model laws: Reynolds and Froude model laws and their applications to simple fluid flow problems.

**Laminar Flow:** Laminar flow through pipes Hagen-Poiseuille's equation, Stoke's law. Various methods of measurement of viscosity. Reynolds's experiment, transition from laminar to turbulent flow.

**Flow Through Opening** Orifices: types, coefficients of velocity, contraction and discharge, small and large orifices, completely submerged orifices.

**Mouthpieces:** Types, external cylindrical mouthpiece.

**Flows Over Notches and Weirs:** Rectangular, triangular and trapezoidal notches and weirs, Cipolletti weir, empirical formulae for discharge over rectangular weirs, corrections for velocity of approach and end contractions.

### **Text Books:**

1. Hydraulic and Fluid Mechanics by Dr. P.N.Modi , Dr. S.M. Seth, Standard Publications, Delhi,2012
2. A Textbook of Fluid Mechanics & Hydraulic Machines by Dr. R. K. Bansal, Laxmi Publications limited,2014

### **Reference Books:-**

1. Fluid Mechanics by Dr. A. K. Jain, Khanna Publishers, New Delhi ,2011
2. 1000 Solved Problems in Fluid Mechanics by Dr. K. Subramanya, Tata McGraw-Hill Publishing Company Ltd, New Delhi ,2012
3. Introduction to Fluid Mechanics and Fluid Machines by Som S K and Biswas G, Tata

McGraw-Hill Publishing Company Ltd., New Delhi.1998

4. Fluid Mechanics and Fluid Power Engineering by D.S.Kumar ,S.K.Katariya and Sons, New Delhi, 7<sup>th</sup> Edition, 2010

## CE205 BUILDING CONSTRUCTION AND MATERIALS

**Teaching Scheme:** 03L+ 0T Total: 03

**Credit:** 03

**Evaluation Scheme:** 15 ISE1 +15 ISE2 + 10 ISA + 60 ESE

**Total Marks:** 100

**Duration of ESE:** 03Hrs

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### **Types of Buildings and Foundation**

Types of building, load bearing, framed structure, steel structure, timber structure, composite structure. Various parts of building, sub structure and super structure. Plinth, sill, floor, and roof level, plinth height, plinth protection, cornice, coping and their function.

Foundation: Purpose and classification, advantages and disadvantages of each and circumstances under which each is used. Factor considered for selection of foundation.

### **Masonry and Form Work**

**Masonry:** Principle of masonry construction, types of masonry, types of wall (load bearing, partition, timber partition, glass partition etc.)

**Brick and Brick Masonry:** Various types of bond in brick masonry, reinforced brick masonry, precautions to be taken in masonry construction, composite masonry, solid and hollow blocks used for masonry, cavity wall, etc.

**Formwork:** Function of form work, form erection, oiling and stripping of form, requirements of form and form work, material used for form work.

### **Study of Lintel, Doors and Windows, Circulation**

Types of lintel, detailing of R.C.C. lintel, precast lintel and stone lintel.

**Doors and Windows:** Type of each and circumference under which each is used, minimum area of window opening for different climatic conditions, various material used for doors and window, fixtures and fastening used. I.S. notations for doors and windows.

**Circulation:** Horizontal and vertical, stair and staircase planning and design, types of staircase as per shape and material used, type of circulation.

**Floor and Roof:** Ground floor, upper floor, mezzanine floor, design and constructional requirements, various types of floor finishes used, advantage and disadvantages, special flooring.

### **Truss and Its Type, R.C.C. Framed Structure**

Steel trusses: Types, methods of connections, connecting materials. Scaffolding, shoring, under pinning and strutting, their types, purposes and precautions. R.C.C. framed structure, column, beam, footing, slab and their connections, general requirements and details.

### **Study of Various Material Used in Construction**

**Stone:** Natural bed of stone, stone quarrying, uses of stones and qualities of good building stone, test's on stone.

**Bricks:** Composition of good brick earth, classification of burnt brick, manufacturing of bricks, qualities of good bricks, test on bricks.

**Timber:** Properties and uses, testing, conservation and sawing, defects in timbers, artificial timber, veneers, plywood and block board.

**Other Miscellaneous Materials:** Aluminium, glass, heat insulating materials, sound absorbent materials.



**Text Books:**

1. Building Construction by Rangwala- Published by Charotar Publishing House ,2009
2. Building Construction by Sushil Kumar- Published by Standard Publishers Distributors,2010

**Reference Books:**

1. Building Construction by S.P. Bindra, S.P. Arora, Published by Dhanpat Rai Publications,2010
2. Building Construction by Ashok K. Jain, B. C. Punmia, Arun Kr. Jain, Published by Laxmi Publications, 2009
3. Engineering Materials by Rangwala, Publisher Charotar Publishing House, 2011

## SH 204 GENERAL PROFICIENCY-II

Teaching Schemes: 01 L + 02PR; Total: 03

Credits: 02

Evaluation Scheme: 25 ICA + 25 ESE

Total Marks: 50

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### Course Content:

**Managerial Skills Development:** Nature & Concepts, objectives, significance, Managerial Skills, Employability Skills, Soft Skills and Technical Skills

**Self Management:** Self Evaluation, Self Discipline, Self Criticism, Recognition of one's own limits and deficiencies, Independency etc., Thoughtful & Responsible, Self Awareness, emotional intelligence, emotional quotient.

**Time Management Skills:** Introduction, Concept of Time Management-Importance of Time Management, Analysis and Diagnosis of the Use of Time, Steps in Time Management, Techniques of Time Management, Hurdles to Effective Time Management Attendance, Discipline & Punctuality, Act in time on commitment, Quality/ Productive Time,

### Entrepreneur & Entrepreneurship

Evolution of the term entrepreneur, definition of an entrepreneur, entrepreneurs and managers, traits of a true entrepreneur, characteristics of a successful entrepreneur, classification of entrepreneurs, functions of an entrepreneur, problems faced by entrepreneurs, Concepts of entrepreneurship, myths of entrepreneurship, stages in the entrepreneurial process, barriers to entrepreneurship,

**Business Letters and Reports:** Types of business letters, writing routine and persuasive letters, positive and negative messages; writing reports - purpose, kinds and objectives of reports; organization and preparing reports, short and long reports; writing proposals: structure & preparation; writing memos.

**Group Communication:** Meetings- planning, objectives, participants, timing, venue of meetings; meeting documentation: notice, agenda, agenda notes, book of enclosures and resolution & minutes of meeting.

**Presentation skills:** Elements of presentation – designing and delivering business presentations, advanced technological support for presentation, computer based power point presentation.

**Employment communication:** Introduction, Composing Application, Writing CVs, Group discussions, Interview skills, do's and don'ts at GD/PI; technology-enabled communication - communication networks, intranet, internet, videoconferencing.

**Organizational Behavior:** Definition, historical development, fundamental principles of OB, contributing disciplines, challenges and opportunities

**Individual Behavior:** Foundations of individual behavior. Ability: Intellectual abilities, Physical ability, the role of disabilities.

**Personality:** Meaning, formation, determinants, traits of personality, big five and MBTI, personality attributes influencing OB.

**Attitude and Perception:** Formation and components of attitudes, positive attitude, impact of attitude on behavior and decision making, Process of perception, factors influencing perception, link between perception and individual behavior/decision making.

**Emotions:** Affect, mood and emotion and their significance, basic emotions, , emotion management at individual and group level.

**Motivation:** Meaning and significance; theories of motivation-needs theory, two factor theory; application of motivational theories.

**Group Behavior:** Definition, types, formation of groups, building effective teams; conflict: meaning, nature, types, process of conflict, conflict resolution.

• **Guest lecture by industry persons based on the syllabus.**

**Topics for Assignment /Practical**

Minimum ten number of assignments/practical shall be performed to cover entire curriculum of the course. The list given below is just a guideline.

1. Speech preparation and delivery.
2. Power point presentation on general topics/ latest trends
3. Preparation of meeting agenda/ conducting meeting / taking minutes of meeting and preparing related documents.
4. Demonstration of general etiquettes and manners through role playing.
5. Demonstration of attitude/leadership etc through role playing.
6. Writing application letter along with resume
7. Preparing notice/ circular/ memo/ enquiries/ quotations
8. Conducting group discussions
9. Personnel interview
10. Report writing/Paper presentation.
11. Determination of emotion quotient/Intelligent quotient and personality analysis.
12. Prepare business plan/ report

**Text Books:**

1. Business Communication for Managers, Penrose, Rasberry, Myers, 5th edition, Cenage Learning, 2007
2. Business Communication, Rai and Rai, 2nd edition, Himalaya Publishing House, 2014
3. Organization Behavior, Suja R. Nair, Himalaya Publications, 2014
4. Organization Behavior, V.S.P.Rao, 1st edition, Excel Publications, 2009
5. Entrepreneurship Development small business Enterprises by Poornima Charantimath-Pearson, 1st Edi. Reprint, 2005.

**Reference Books:**

1. Business Communication, Raman and Singh, 2nd edition, Oxford Publication, 2012
2. Business Communication Today, Bovee, Thill, 6th edition, Schatzman, Pearson Education, 2000
3. Business Communication (BCOM), Lehman Sinha, 2nd edition, Cengage Learning, 2012
4. Organization Behavior, Stephen P. Robbins, 13th edition, Pearson Education, 2009
5. Organization Behavior, Fred Luthans, 12th edition, TMH, 2012
6. Organization Behavior, K. Ashwathappa, 7th edition, Himalaya Publications, 2007
7. Soft skills Training – A workbook to develop skills for employment by Fredrick H. Wentz
8. Personality Development and Soft skills , Oxford University Press by Barun K. Mitra
9. The Time Trap : the Classic book on Time Management by R. Alec Mackenzie

**NOTE:**

**ICA** – Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (S 10).

**ESE** – The End Semester Examination (ESE) for this laboratory course shall be based on performance in one of the experiments performed by student in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

## CE206 -ENGINEERING GEOLOGY & HYDROLOGY- LAB

**Teaching Scheme:**02 P Total: 02

**Credit :** 01

**Evaluation Scheme:** 50 ICA

**Total Marks:** 50

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Minimum ten experiments shall be performed to cover entire curriculum of course CE251. ( Three from group A, Two from group B and C is mandatory). List given below is just a guideline.

### **A )Engineering Geology**

- 1.Megascopic study of common rock forming and core minerals.
- 2.Megascopic study of the common igneous, sedimentary and metamorphic rocks.
- 3.Geological map reading and construction of selections from simple geological Maps with Engineering problems (about 8 maps)
4. Field visit to rock / soil strata exposure, fault zone, fractures, drilling rigs or machine work.

### **B)Hydrology**

Field visit shall be arrange at dam site to understand the functions and performance for the following aspects,

1. Rain gauge stations
2. Humidity measurements
3. Temperature measurements

### **C)Minimum five assignments covering above syllabus.**

- **ICA** – Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format **(S 10)**.
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## CE207 SURVEYING- I-LAB

**Teaching Scheme:**02P,Total: 02.

**Credit : 01**

**Evaluation Scheme:** 25ICA + 25ESE

**Total Marks: 50**

**ESE Duration : 03 Hours**

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Minimum eight experiments shall be performed to cover entire curriculum of course CE201(six from group A and two from group B). The list given below is just a guideline.

### Group A

1. Use and study of chain, cross staff and compass.
2. Use and study of dumpy level for finding the levels by various methods.
3. Measurements of horizontal and vertical angles by transit theodolite.
4. Measurements of horizontal angles of a triangle by repetition method.
5. Computation of horizontal distances and elevations by tacheometry for horizontal and inclined sights.
6. Radiation and intersection method in plane table survey.
7. Use of box sextant, abney level and digital planimeter.

### Group B

Project-1:- Theodolite Traverse survey project of a closed traverse with at least four sides.

Project-2:- Tacheometric contouring project with at least two instrument stations at 60 m apart.

Project-3:- Road project for minimum length of 300 m, including fixing of alignment, profile levelling, and cross sectioning.

Project-4:- Plane table survey project of a closed traverse of minimum four sides.

### Note:

- **ICA** – Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (**S 10**).
  - **ESE** – The End Semester Examination (ESE) for this laboratory course shall be based on performance in one of the experiments performed by student in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.
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## CE208 - FLUID MECHANICS –I- LAB

Teaching Scheme:02P,Total:02

Credit : 01

Evaluation Scheme: 25 ICA+ 25ESE

Total Marks: 50

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Minimum ten experiments shall be performed to cover entire curriculum of course CE204. The list given below is just a guideline.

**List:**

1. Measurement and study of variation of viscosity of oil with temperature.
- 2 Study of simple and differential manometers.
- 3 Buoyancy and Meta-centric height of ship model.
- 4 Study of Bernoulli's theorem.
- 5 Calibration of Venturimeter.
- 6 Electrical analogy method.
- 7 Study of laminar/turbulent flow in Reynolds apparatus.
- 8 Determination of coefficients of Orifice / Mouthpiece
- 9 Calibration of notch.
- 10 Study of Impact of jet.
- 11 Report based on visit to any such relevant place.

- **ICA** – Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (**S 10**).

- **ESE** – The End Semester Exam for this course shall be based on oral examination to judge the skills acquired by student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

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## CE209- BUILDING CONSTRUCTION AND MATERIALS - LAB

Teaching Scheme:02P,Total: 02.

Credit : 01

Evaluation Scheme: 25 ICA+ 25ESE

Total Marks: 50

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Minimum ten experiments shall be performed to cover entire curriculum of course CE205. The list given below is just a guideline.

**List:**

- 1) Orthographic, isometric, oblique and axonometric view.
- 2) C.C.T.W. panelled door plan, elevation, section
- 3) Flush door plan, elevation and section
- 4) Lintel/ Arches in stone and bricks.
- 5) Stone masonry: U.C.R., C.R. and Ashlars.
- 6) Bonds in brick masonry with isometric view for one bond for one brick.
- 7) Different types of roofs.
- 8) Steel trusses
- 9) Types of stairs.
- 10) Report regarding visit to the construction sites. (Minimum two visits are mandatory).
- 11) Market survey (Including rates)

- **ICA** – Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (**S 10**).

- **ESE** – The End Semester Exam for this course shall be based on oral examination to judge the skills acquired by student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

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## SH 252: ENGINEERING MATHEMATICS – III

Teaching Scheme : 03L+01T Total: 04

Evaluation Scheme: 15 ISE 1 + 15 ISE 2 +10 ISA +60 ESE

Duration of ESE : 03 Hrs

Credit: 04

Total Marks: 100

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**Higher order linear differential equations:** nth order linear differential equations with constant coefficient, complementary function and particular integrals, general method, short cut method, method of variation of parameters, linear differential equations with variable coefficient: Cauchy's differential equations and Legendre's differential equations, simultaneous linear differential equations, applications: deflection of beams, vibrating springs: damping and undamping.

**Partial differential equations:** Lagrange's form, linear PDE with constant coefficients, CF and PI, Method of separation of variables, application to vibrating string-Wave equation, application to one dimensional heat flow-Diffusion equation, application to two dimensional heat flow-Laplace equation, Numerical Methods for partial differential equation. [Finite Difference Method]

**Laplace transform:** Definition of Laplace transform, Laplace transform of elementary functions, Properties of Laplace transform, Laplace transform of special functions: Unit step function, Dirac-delta function and Periodic functions, Inverse Laplace transform: definition and properties, Inverse Laplace transform by partial fraction, convolution theorem, using standard results, application of Laplace transform to linear differential equations.

**Fourier transforms and Vector differentiation:** Fourier integrals, Fourier sine and cosine integrals, Fourier transform, Fourier sine and cosine transform, Inverse Fourier transform, vector differentiation and its physical interpretation, applications to mechanics, vector differential operator, gradient, divergence and curl ,directional derivatives, solenoidal and irrotational fields, vector identities.

**Statistics and probability distributions:** Measures of central tendency, dispersion, moments, skewness and kurtosis, correlation coefficient, lines of regression, curve fitting, method of least square, straight lines, second degree parabola, exponential and power curves. Probability distribution: binomial distribution, Poisson distribution, normal distribution,

### Text books:

1. A text book of Engineering Mathematics (Vol-I and II) by P.N.Wartikar and J.N.Wartikar, 07<sup>th</sup> edition, Pune Vidhyarthi Griha Prakashan, Pune, 2013.
2. A text book of Engineering Mathematics, by N.P.Bali & Manish Goyal, 09<sup>th</sup> edition, Laxmi Prakashan, 2014.

### Reference books:

1. Advanced Engineering Mathematics by Erwin Kreyszig, 8<sup>th</sup> edition ,Wiley Eastern Ltd. Mumbai, 2013.
2. Higher Engineering Mathematics by B. S. Grewal, 33<sup>rd</sup> edition , Khanna Publication, New Delhi, 1996.
3. Advanced Engineering Mathematics by H. K. Dass, 12<sup>th</sup> edition, S. Chand Publication, New Delhi, 2003
4. Higher Engineering Mathematics by B. V. Ramana, 12<sup>th</sup> edition , Tata McGraw Hill, Delhi, 2011.

## CE251-CONCRETE TECHNOLOGY

**Teaching Scheme:** 03L+ 01T, Total: 04

**Evaluation Scheme:** 15 ISE1 +15 ISE2 + 10 ISA + 60 ESE

**Duration of ESE:** 03Hrs

**Credit:** 04

**Total Marks:** 100

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**Cement:** Manufacture of cement, chemical composition, setting and hydration of cement. Types of cement, properties and testing of cement.

**Aggregates:** Classification, properties, grading, impurities in aggregates and testing of aggregates, its effect on strength of concrete, quantity of water for concrete.

### Concrete and Admixtures

Definition and its ingredients, grades of concrete, concreting process, significance of water cement ratio. Properties of fresh concrete. Various properties of hardened concrete, factors affecting various properties, micro cracking, and stress - strain relation, testing of hardened concrete, creep, shrinkage of concrete, quality control during concreting.

**Types of Concrete:** - Light weight concrete, polymer concrete, fibre reinforced concrete, ready mixed concrete, self compacting and high performance concrete, Ferro cement concrete. Special concrete - Transparent concrete, cellular light weight concrete, pre-stressed concrete, Under water concreting-concreting in extreme weather conditions. Classification of admixtures and their effects on various properties of concrete.

### Concrete Mix Design

Introduction, object of mix design, factors to be considered, statistical quality control, introduction to different methods of mix design. Scaffolding, shoring, under pinning and strutting, types, purposes and precautions. Concrete mix design by I.S. method and IRC method

### Non Destructive Testing

Introduction to non-destructive testing of concrete, rebound hammer, ultrasonic pulse velocity, pull out test, impact echo test. Deterioration of concrete, permeability, durability, chemical attack, carbonation of concrete, corrosion of reinforcement.

### Text books:-

1. Concrete Technology by M.S.Shetty, S Chand Publication, 2005
2. Concrete Technology by M. L. Gambhir, McGraw Hill Education (India) Private Limited, 2013

### Reference books:-

1. Concrete Technology by A.N. Neville, J.J. Brooks, Addison Wesley Longman, 1999
2. Concrete Technology by R.S. Varshney, Oxford & I B H, 1982.
3. Concrete: Microstructure, Properties, and Materials, P.Kumar Mehta, Paulo J.M Monteiro, McGraw Hill Education (India), 2014.
4. Concrete Technology by Kulkarni P.D. Ghosh, R.K. Phull Y.R., New Age International, 1998

## CE 252- SURVEYING-II

**Teaching Scheme :** 03L+ 0T, Total: 03

**Credit:** 03

**Evaluation Scheme:** 15 ISE1 +15 ISE2 + 10 ISA + 60 ESE

**Total Marks:** 100

**Duration of ESE:** 03Hrs

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### **Geodetic Surveying**

Objects, methods in geodetic surveying, triangulation figure, strength of figure, classification of triangulation system, selection of stations, inter visibility of height of station towers, signal and their classification, phase of signals, satellite station and reduction to centre eccentricity of signals, base line measurement, apparatus used, base net equipment used for base line measurement, extension of a base.

### **Triangulation Adjustments.**

Kinds of errors laws of weights, determination of the most probable values of quantities. The method of least squares, indirect observations on independent quantities normal equation conditioned quantities . The probable error and its determination distribution of error to the field measurements, method of correlates, station adjustment and figure adjustment , adjustment of a geodetic triangle, figure adjustment of a triangle, calculation of spherical triangle, adjustment of geodetic quadrilateral, adjustment of a quadrilateral with a central station by method of least squares.

### **Photogrammetry**

Objects application to various fields, terrestrial photogrammetry and aerial photogrammetry , aerial camera, comparison of map and vertical photograph ,vertical tilted and oblique photographs , concept of principal point nadir point, isocentre, horizon point and principal plane, scale of vertical photograph computation of length and height from the photograph, relief displacement on vertical photograph, flight planning, ground control , radial line method, mirror and lens stereoscopes.

### **Hydrographic Surveying**

Objects, establishing controls, shore line survey, river surveys, soundings, tide gauges, equipment for taking soundings, signals. Nautical sextant measuring horizontal and vertical angles with the nautical sextant, sounding party, ranges making the soundings, methods of locating the soundings ,reduction of soundings, The three point problem and methods of solution.

### **Remote Sensing**

Basic principles, importance, scope, sensors used in remote sensing, platforms, applications of remote sensing to Civil Engineering.

### **Use of Advance Instruments in Surveys:-**

Study and use of various electronics equipments like EDM and Total station.

### **Text books:-**

1. Surveying and leveling (vol-II) by T.P. Kanitkar, & S.V. Kulkarni, Pune Vidarthi Griha Prakashan, Pune,1990
2. Surveying Vol. II and Vol .III by B.C.Punmia, Laxmi Publication (P) New Delhi,2008

### **Reference Books:**

1. Advance surveying by P.Som ,B.N.Ghosh, Tata McGraw-Hill Publication,1982.
2. Elements of Photogrammetry by Paul Richard Wolf, McGraw-Hill Education (India) Pvt Limited,2000.
3. Plane and geodetic surveying by David Clark, J. E. Jackson, CBS Publishers and Distributors, Delhi, 1983
4. Principal of remote sensing by A. N. Patel, Scientific Publishers ,2004

## CE253 BUILDING DESIGN AND DRAWING

**Teaching Scheme:** 03L+ 0T, Total: 03

**Credit:** 03

**Evaluation Scheme:** 15 ISE1 + 15 ISE2 + 10 ISA + 60 ESE

**Total Marks:** 100

**Duration of ESE:** 03Hrs

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### **Introduction:-**

Building definition and types of building as per occupancy, principles of planning of residential buildings, plan sanctioning procedure, building bye laws & its necessity.

### **Ventilation and Air Conditioning Of Buildings**

Necessity of ventilation, functional requirements, systems of ventilation and their choice, movement of wind through building, wind effect etc. Air conditioning - Classification, comfort and comfort conditions, principles and system of comfort, object and necessity of air conditioning.

**Fire Protection-** Fire load, fire safety, grading of occupancy by fire load, considerations in fire protection, fire resistant construction & wall openings, fire escape elements.

**Building Services:** Its importance, constructional requirements for different building services like electrical, tele communication service & plumbing services. Layout of water supply and drainage system, one pipe and two pipe system, storage & disposal arrangement, septic tank, garbage disposal arrangements, solar water heater.

### **Planning and Designing of Buildings**

Planning and designing of residential buildings (load bearing / frame Structure) Working drawings importance and use of all types of working drawings at site. Planning and designing of apartment houses (flats) (framed Structure only ). Planning and designing of educational buildings, hostel buildings, library buildings, restaurants, hotels/lodging-boarding buildings, and primary health centers / hospitals. (frame Structure only ). Planning and designing of bus stand buildings, commercial complex buildings, bank buildings, post office buildings, community / marriage halls, factory buildings. (frame Structure only )

### **Perspective Drawings**

One point and two point perspective drawings

### **Text books:-**

1. Building Drawing - M.G. Shah, C.M. Kale, S.Y. Patki - Tata McGraw Hills Pvt.Ltd. New Delhi, 2014
2. Planning & Designing Building by Y.S.Sane, Allies Book Stall, 2010

### **Reference Books:**

1. Building Planning and Drawing ,by N. Kumara Swamy and. A. Kameswara Rao, Charotar Publications, 2010.
2. Civil Engineering Drawing Malik & Mayo New Asian Publishers New delhi, 2012
1. Building Science and Planning by Dr . S.V. Deodhar, Khanna Publishers, New Delhi, 2008
2. National building Code ,2005, New Delhi

## CE254- ENGINEERING ECONOMICS AND HUMANITIES

Teaching Scheme :03L+ 0T, Total: 03

Credit: 03

Evaluation Scheme:15 ISE1 + 15 ISE2 + 10 ISA + 60 ESE

Total Marks: 100

Duration of ESE: 03Hrs

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### ECONOMICS

**Introduction:** Nature and scope of economics , special significance of economics to engineers

**Banking:** Function of central, commercial banks and reserve bank of India.

**Taxation:** Principal of taxation, direct and indirect taxes, concept of auditing market: forms, perfect and imperfect competition, pricing under perfect and imperfect competition, prices discrimination under monopoly.

**Economics of Development:** Meaning, characteristics of under development, obstacles to economic growth and vicious circle of poverty, theory of national income, concept of gross domestic product and artificial intelligence in economics.

**Economic Planning:** Meaning, objective and salient features of current five years plan of India economics of comparison of different alternative projects.

### HUMANITIES:

Salient features of Indian constitution, fundamental rights and duties, directive principles of state policy. Latest amendments in Indian constitution such as right to information act, right to education- its definition, applicability and benefits.

**Environmental Laws, Indian Patent Laws, Labour Laws:** definition, significance and application. Impact of science and technology on culture and civilization social responsibility of business. Human Society: Community groups,

**Social Control:** Meaning, types and agencies.

**Psychology:** Definition, nature, scope, hurdles and application in industries.

### Text Books:

1. Human Society, Davis K, Delhi Surjeet Publication,2007
2. Elementary Economic Theory, Dewett and Varma J. D, S. Chand & Co, New Delhi,2011
3. Constitutional Govt. in India, Pylee M. V, S., 4th edition Chand & Co, New Delhi,1984

### Reference Books:

1. The Constitution of India, Joshi G. N., MacMillan India Ltd,1975
2. Economics: An Introduction to its Basic Principles by Mitra, J. K., Word Press Pvt. Ltd,1976
3. Managerial Economics: Concepts and cases, Mote, V. N, Samual Paul and G. S. Gupta, Tata McGraw Hill Co.Ltd.New Delhi,1977
4. Environmental Law, Stuart Bell, and Donald McGillivray.,Oxford University Press.Inc New York ,2008
5. Introduction to Indian Constitution, Durga Das Basu, Prentice-Hall of India ,1982

**CE255-COMPUTER APPLICATIONS IN CIVIL ENGINEERING- LAB**

**Teaching Scheme:** 01 T + 02P, Total: 03

**Credit :** 02

**Evaluation Scheme:** 50 ICA

**Total Marks:** 50

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All the drawings given below shall be drawn with AutoCAD. List given below is just a guideline.

**List:**

A) Practice and assignments on CAD drafting tools (Min. 2 Assignments)

- a) Hands on practice on basic auto CAD software.
- b) One drawing showing use of basic CAD commands.
- c) One drawing sheet showing various objects such as circle, arc, rectangle, Ellipse, Polygon, Chamfer, Mirror etc.
- d) Familiar with AutoCAD interface commands.

B) Detailed Plan of 2 BHK house.

- a) Foundation plan.
- b) Typical floor plan.
- c) Elevations.

- **ICA** – Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (**S 10**).
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## CE256 - CONCRETE TECHNOLOGY -LAB

Teaching Scheme:02P, Total: 02

Credit : 01

Evaluation Scheme:25 ICA+25 ESE

Total Marks: 50

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Minimum ten experiments shall be performed to cover entire curriculum of course CE251. ( Four from group A, Four from group B and Two from group C). List given below is just a guideline.

### List:

#### A) Test on Cement

1. Fineness of cement
2. Consistency of cement
3. Setting time of cement
4. Compressive strength of cement
5. Soundness of cement

#### B)Test on Aggregates

1. Sieve analysis
2. Crushing value test
3. Impact value test
4. Moisture content
5. Abrasion test
6. Shape test
7. Specific gravity test

#### C)Test on Concrete

1. Workability test.
2. Compressive strength test .
3. Split test.

- **ICA** – Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (**S 10**).
  - **ESE** – The End Semester Exam for this course shall be based on oral examination to judge the skills acquired by student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.
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## CE257 -SURVEYING- II-LAB

**Teaching Scheme:**02P,Total: 02

**Credit : 01**

**Evaluation Scheme:** 25 ICA+ 25ESE

**Total Marks: 50**

**Duration of ESE:** 03 Hours

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Minimum eight experiments shall be performed to cover entire curriculum of course CE252. (Four from group A and B is mandatory) The list given below is just a guideline.

### **List:**

#### **Group A**

1. Measurement of horizontal and vertical angles by one second theodolite.
  - a. Study the component parts of one second theodolite.
  - b. Measurement of horizontal angles by face left and right position.
  - c. Measurement of vertical angles by face left and right position.
2. Measurement of horizontal angles by reiteration method.
  - a. Measurement of horizontal angles by face left and right position.
  - b. Verification of check by reiteration method.
3. Study and use of mirror stereoscope and finding out the air base
  - a. Find out the location of principal point on photograph
  - b. Fix the photograph along the line of principal point and conjugate principal point
  - c. Measurement of air base distance by mirror stereoscope
4. Hydrographic survey  
Study and use of nautical sextant for measurement of angles.
5. Measurement of angles and elevation by total station

#### **Group B**

**Minimum four assignments covering above syllabus.**

### **Note:**

- **ICA** – Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (**S 10**).
  - **ESE** – The End Semester Examination (ESE) for this laboratory course shall be based on performance in one of the experiments performed by student in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.
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## CE258- BUILDING DESIGN AND DRAWING-LAB

Teaching Scheme:02P,Total: 02

Credit : 01

Evaluation Scheme: 25 ICA+ 25ESE

Total Marks: 50

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All the drawings given below shall be drawn to cover entire curriculum of course CE253. List given below is just a guideline.

### List:

#### 1.Planning of a small residential buildings/bungalow/duplex from given data (load bearing or framed structure).

- a. Draw furniture arrangement
- b. Draw front elevation, sections (preferably through staircase or bath-wc)
- c. Site plan, built up area calculations
- d. Schedules of area & openings.

#### 2.Project work

Project work shall consist of preparation of working drawings after planning and designing of any one building mentioned in Syllabus. Every student shall select different type mentioned in above units; individual work is expected from the students.

1. Layout plan of project building
2. Typical floor plans.
3. Front and road side elevations
4. Sections.
5. Layout plan showing water supply and drainage arrangements

#### 3. Line plans –

Various public buildings. (any three types) using computer drafting software on A4 size Sheets.

#### 4. Visit report

Report regarding visit of any advanced building construction site, preferably visit to the site of building given for the project work with photos/drawings etc. (visit is mandatory )

- **ICA** – Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (**S 10**).

- **ESE** – The End Semester Exam for this course shall be based on oral examination to judge the skills acquired by student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

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## CE259-STRENGTH OF MATERIALS-LAB

Teaching Scheme: 02P, Total: 02

Credit : 01

Evaluation Scheme: 25 ICA+ 25ESE

Total Marks: 50

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Minimum ten experiments shall be performed to cover entire curriculum of course CE203. (six from group A and four from group B)The list given below is just a guideline.

### List:

#### Group A

1. To determine tensile test on a metal.
2. To determine hardness of metal (mild Steel or aluminium).
3. Torsion test on mild steel rod.
4. To determine impact strength of steel. (By Izod test )
5. To determine impact strength of steel.( By Charpy test)
6. To determine Young's modulus of elasticity for beam materials, simply supported at ends.
7. Shear test on metals.

#### Group B

##### Assignment 1

- a. To solve numerical based on normal stress and strain, tensile, compressive and shear stresses Hooke's law.
- b. To solve problems based on deformation in prismatic, stepped, & composite members due to concentrated load & self-weight, stress & strain in determinate and indeterminate members, temperature stresses.

##### Assignment 2

- a. To solve numerical based on shear stress & strain, modulus of rigidity, poisson's ratio, bulk modulus, generalized Hooke's law, stress strain diagram.
- b. To solve numerical based on strain energy, stresses due to various types of axial load using strain energy method.

##### Assignment 3

- a. To solve problems based on shear force and bending moment for cantilevers, simple and compound beams due to concentrated, uniformly distributed, uniformly varying load and couples.
- b. To solve problems based on construction of loading diagrams and bending moment diagram from shear force diagram.

##### Assignment 4

- a. To solve numerical based on bending stresses in beams, moment of inertia, parallel and perpendicular axis theorem, section modulus, moment of resistance, bending stress distribution diagram.
- b. To solve numerical based on bending stresses in beams for unsymmetrical section

##### Assignment 5

- a. To solve numerical based on shear stresses in beams, shear stress derivation, and shear stress distribution in different cross sections of beams.
- b. To solve problems based on theory of pure torsion, torsional moment of resistance, power transmitted by shafts, torsional rigidity, shear stresses in shafts due to torsion, stress & strain in determinate shafts of hollow or solid cross-sections.

- **ICA** – Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (**S 10**).

- **ESE** – The End Semester Exam for this course shall be based on oral examination to judge the skills acquired by student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.
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