

National Institute of Technology, Raipur (C.G.)

Course of Study & Scheme of Examination							B. Tech. IV Semester		Branch :	Civil Engineering			
S.No.	Board of Studies	Sub.Code	Subject Name	Periods/week			Examination Scheme					Total Marks	Credits L+(T+P)/2
				L	T	P	TA	FE	SE	T.C.A.	ESE		
1	Civil	CE-411	Structural Analysis I	3	1	-	20	15	15	50	70	120	4
2	Civil	CE-412	Fluid Mechanics II	3	1	-	20	15	15	50	70	120	4
3	Civil	CE-413	Surveying II	3	1	-	20	15	15	50	70	120	4
4	Civil	CE-414	Civil Engineering Drawing	3	4	-	20	15	15	50	70	120	5
5	Civil	CE-415	Building Construction	3	1	-	20	15	15	50	70	120	4
6	Civil	CE-416	Transportation Engineering I	3	1	-	20	15	15	50	70	120	4
7	Civil	CE-422	Fluid Mechanics II Lab	-	-	3	30	-	-	30	20	50	2
8	Civil	CE-423	Surveying Field Work II	-	-	3	30	-	-	30	20	50	2
9	Civil	CE-426	Transportation Engineering - I Lab	-	-	3	30	-	-	30	20	50	2
10	Humanities	CE-427	Personality Development	-	-	2	25	-	-	25	0	25	1
11	Civil	CE-428	Discipline	-	-	-	25	-	-	25	0	25	1
Total				18	9	11	260	90	90	440	480	920	33

Note : For attendance of a student in every theory and practical class, the teachers are supposed to keep records ultimately in the following format which will be included in the semester mark-sheets.

T.C.A. = Total of Continuous Assessment.

Format for attendance					
Attendance	>	<	>	<	Category
> 85	>	<	>	<	High "H"
> 70 & < 85	>	<	>	<	Medium "M"
> 60 & < 70	>	<	>	<	Low "L"
< 60	>	<	>	<	Poor "P"

National Institute of Technology Raipur (CG)
Civil Engineering Department
Forth Semester

Structural Analysis-I

Code: CE- 411

Total Theory Periods per Week: 3 Total Tutorial Periods per Weeks: 1 Total Marks: 120

Teacher's Assessment: 20 First Examination: 15 Second Examination: 15 End Semester Examination: 70

UNIT 1 Concept of Structural Analysis: General introduction on concept of analysis, Concept of Force Method of Analysis, Statically Determinate vs. Indeterminate structures, static indeterminacy, External and internal Static indeterminacy, Computation of Static Indeterminacy of structures. Importance of Static Indeterminacy in analysis of Structures using Force Method Analysis of Pin Jointed Space frames, Method of Substitution and Method of tension coefficient.

UNIT 2 Deflection and Slope: Moment curvature relation, The elastic curve, Relation between Loading, SF, BM, Slope and Deflection, Deflection and slopes of statically determinate beams by Double integration method, Macaulay's method, Area moment method, Conjugate beam method.

UNIT 3 Strain Energy : Concepts of Strain energy, Strain Energy due to axial, bending, shear and torsion effects, Castigliano's theorem, Unit load and strain energy method for determination of deflections of statically determinate beams, pin-jointed trusses and frames.

UNIT 4 Rolling Loads & Influence Lines : Introduction to Rolling loads - concept of influence lines - influence lines for reaction, shear force and bending moment in simply supported beams - influence lines for forces in trusses, analysis for different types of rolling loads, single concentrated load, several concentrated loads, uniformly distributed load shorter than span, Uniformly distributed load longer than the span, Absolute maximum bending moment.

UNIT 5 Arches, Cables & suspension bridges : Theory of arches, Eddy's theorem, analysis of three-hinged and two-hinged arches, effect of the settlement and temperature. Influence line diagram. Analysis of forces in cables with concentrated and continuous loadings - suspension bridges.

Name of Text Books:

Basic Structural Analysis (Vol. I & II) – Bhavikatti S.S. (Vikas Publishing)

Theory of Structures – B.C. Punmia (Laxmi Publication)

Name of Reference Books:

Theory & Analysis of Structures (Vol. – I & II) – Jain, O.P. and Jain B.K. (Nem Chand)

Structural Analysis – R.C. Hibber (Pearson Publication)

Structural Analysis – Ghali, A. & Neville, M. (Chapman & Hall Publication. 1974)

Elementary Structural Analysis – Willbur and Norris (Tata McGraw Hill)

Structural Analysis – Negi L.S. & Jangid R.S. (Tata McGraw Hill)

Theory of Structures – Ramamurtham S. & Narayan R. (Dhanpat Rai Publications)

National Institute of Technology Raipur (CG)
Civil Engineering Department
Forth Semester

Fluid Mechanics-II

Code: CE- 412

Total Theory Periods per Week: 3 Total Tutorial Periods per Weeks: 1 Total Marks: 120

Teacher's Assessment: 20 First Examination: 15 Second Examination: 15 End Semester Examination: 70

Unit 1 Turbulent flow in pipe : Nature of turbulence, free and wall turbulence, turbulent flow in pipes, equation for velocity distribution over smooth and rough surfaces, energy and momentum correction factor, Resistance coefficient (Friction factor) and its variation, Colebrook-White equation, Moody's diagram, Explicit equation for friction factors.

Unit 2 Boundary layer Analysis : Boundary layer thickness, boundary layer over a flat plate, laminar boundary layer, turbulent boundary layer, and laminar sub layer, Application of momentum equation, local and average friction coefficient, Boundary layer separation.

Fluid flow past submerged bodies : Drag and lift, drag on sphere, cylinder, Magnus effect.

Unit 3 Compressibility effect in pipe flow : Transmission of pressure waves in rigid and elastic pipes, water hammer, and analysis of simple Surge tank excluding friction.

Dimensional analysis and Hydraulic similitude : Dimensional analysis, Rayleigh method, Buckingham's theorem, important dimensionless numbers and their significances, geometric, kinematics and dynamic similarity, model study.

Unit 4 A. Non-uniform flow in open channel : Specific energy, critical low, nalysis of flow over hump and transition, broad crested weir, equation of gradually varied flow, classification of GVF profiles, hydraulic jump and evaluation of its elements in rectangular channel.

B. Pumps : Classification of pumps, types, efficiencies, specific speed, selection, cavitations, characteristic curves.

Unit 5 Hydraulic Machines : Turbines: Classification of turbines, draft tube, specific speed, unit quantities, and characteristics curves of turbines, and governing of turbine.

Name of Text Books:

Fluid Mechanics and Machines - Dr. A.K. Jain (Khanna Publications) Fluid Mechanics and Machines - Dr. R.K. Bansal (Laxmi Publications)

Name of Reference Books:

Fluid Mechanics - Dr. P.N. Modi (Standard Book House)

Mechanics of Fluid - Irving H. Shames (McGraw Hill)

Introduction to Fluid Mechanics - James A. Fay (Prentice Hall India)

Fluid Machines - Dr. Jagdish Lal (Metropolitan Book Company Private Ltd.)

Fluid Machines - John P. Douglas (Pearson Publication)

National Institute of Technology Raipur (CG)
Civil Engineering Department
Forth Semester

Surveying-II

Code: CE- 413

Total Theory Periods per Week: 3 Total Tutorial Periods per Weeks: 1 Total Marks: 120

Teacher's Assessment: 20 First Examination: 15 Second Examination: 15 End Semester Examination: 70

Unit 1 Trilateration and Triangulation

Principle of Trilateration, EDM instrument and their uses, Reduction of observation, Principle and classification of Triangulation System, Triangulation chains, Strength of Figures, Station marks and Signals, Satellite station, intersected and Resected points, field work- Reconnaissance, Intervisibility of station, Angular measurement, Base line measurement and its extension, Adjustment of Field observation and computation of co-ordinates.

Unit 2 Adjustment Computations

Weighting of observations. Treatment of random errors, probability equation, Normal law of error, Most Probable Value 7 measures of precision, Propagation of errors and variances. Most probable value, Principle of Least square, Observations and correlative Normal Equations. Adjustment triangulation figures and level nets.

Unit 3 Tacheometry

Definitions, Principles of stadia systems. Instrument constants, Substance and Tangential Systems. Construction and use of Reduction Tacheometers, Range Finders,

Unit 4 Remote Sensing

Physics of remote sensing, electromagnetic radiation (EMR), Interaction of EMR with atmosphere, earth surface, soil, water and vegetation; Remote sensing platforms – Monitoring atmosphere, land and water resources - LANDSAT, SPOT, ERS, IKONOS and others, Indian Space Programme.

Digital Image Processing: Satellite Data analysis - Visual interpretation – Digital image processing – Image preprocessing – Image enhancement – Image classification – Data Merging.

Unit 5 GIS

Definition – Basic components of GIS – Map projections and co-ordinate system – Spatial data structure: raster, vector – Spatial Relationship – Topology – Geodatabase models: hierarchical, network, relational, object oriented models – Integrated GIS database -common sources of error – Data quality: Macro, Micro and Usage level components - Meta data - Spatial data transfer standards.

Application of Total Station.

Name of Text Books:

- Surveying (Vol. I & II) – Punmia, B.C. (Laxmi Publications, New Delhi, 1996)
- Surveying (Vol. I & II) – Kanetkar T.P. (Pune Vidyarthi Griha Prakashan, Pune)

Name of Reference Books:

- Engineering Surveying Technology – Kennie, T.J.M. and Petrie G. (Blackie & Sons Pvt. Ltd., London, 1990)
- Surveying (Vol. II & III) – Agor, R (Khanna publications, Delhi, 1995)
- Surveying (Vol. II & III) – Arora, K.R. (Standard Book House, Delhi, 1993)
- Solving Problems in Surveying – Bannister A. and Baker, R. (Longman Scientific Technical, U.K., 1994)

National Institute of Technology Raipur (CG)
Civil Engineering Department
Forth Semester

Civil Engineering Drawing

Code: CE- 414

Total Theory Periods per Week: 3 Total Tutorial Periods per Weeks: 4 Total Marks: 120

Teacher's Assessment: 20 First Examination: 15 Second Examination: 15 End Semester Examination: 70

Unit -I (15 Marks)

General Principles of planning - Aspects, Prospects, Circulation, Grouping, Roominess, Sanitation, Economy, Elegance, Furniture requirements, flexibility, Privacy. Orientation of Building. Introduction to National Building Code. Key Plan, Line Plan and Index

Site selection and requirements of different public buildings such as hospitals, schools, hostels

Municipal regulations and bye-laws for residential buildings.

Unit –II [35 Marks (Compulsory Question)]

Drawing of plan, Elevation, Section of Single story residential buildings and schools, Single line plan of primary health center, hostels, canteen for given site requirements.

Unit -III (15 Marks)

Elements of perspective drawing, examples on blocks and buildings.

Unit –IV (15 Marks)

Drawing of flush shutter, panelled shutter, fully glazed, half glazed and half panelled doors and windows. Detailing of Trusses and Roofs, Industrial Roof .

Minimum 8 drawing sheets are to be prepared based on above syllabus.

Tutorial Work:

1. Field visit & Drawing
2. Introduction to Computer Aided Drafting Software's
3. Preparation of Plan, Elevation, Section, different parts of residential building.
4. Perspective Drawings.
5. Drawing of Roof &Trusses.

Name of Reference Books:

- (1) V.B. Sikka : Civil Engineering Drawing.
- (2) Shah,Kale and Patki : Civil Engineering Drawing
- (3) D.N. Ghosh : Civil Engineering Drawing
- (4) George Omura and B. Robert Callori : Auto-CAD 2000 Instant REFERENCE
- (5) Chakrobari : Civil Engineering Drawing.

National Institute of Technology Raipur (CG)
Civil Engineering Department
Forth Semester

Building Construction

Code: CE- 415

Total Theory Periods per Week: 3 Total Tutorial Periods per Weeks: 1 Total Marks: 120

Teacher's Assessment: 20 First Examination: 15 Second Examination: 15 End Semester Examination: 70

UNIT- 1 Foundations : Brief study of different types of foundations, nature of soil (expansive or non-expansive, alluvial or residual, sandy or clayey for settlement etc.), approximate values of bearing capacities, breadth and depth of foundation, typical cross sections for foundations under walls and R.C.C. Columns. Foundations in black cotton soils, under reamed pile foundations, foundation failures and remedial measures.

UNIT - 2 Masonry : Technical terms in masonry, classification and brief specifications of stone masonry, bonds in brick masonry, general principles to be observed in stone and Brick Masonry Construction.

Walls : Different types (load bearing, cavity-walls and partition walls), thickness considerations.

Doors, Windows And Lintels : Different types based on materials and methods of construction, technical terms, size and locations.

UNIT - 3 Floors: Ground and upper floors, various types, their suitability, construction details of concrete and terrazzo floors, Floor tiles.

Roofs: Technical terms and different types of pitched and flat roofs. Various roof coverings for pitched and flat roofs.

Formwork : Different types of formwork, stripping times.

UNIT- 4 Damp Proofing : Causes and effect of Dampness, parts of a building likely to be affected most, methods of damp proofing in different locations including roofs.

Plastering And Pointing : Types and considerations during plastering and pointing.

Joints : Construction, Contraction and Expansion Joints.

UNIT- 5 Stairs : Types based on geometry and material, suitability, proportioning of stairs, lifts and escalators.

Sound Proofing : Materials and Methods of sound proof construction.

Fire Proofing : Materials and Methods of fire proof construction.

Name of Text Books:

Building Construction – B.C. Punmia (Laxmi Publication Pvt. Ltd.)

Building Construction – Sushil Kumar (Standard Publication Distributors)

Building Construction – S. C. Rangwala (Charotar Publishing House, Anand, Gujarat)

Building Construction – Gurucharan Singh (Standard Publication Distributors)

National Institute of Technology Raipur (CG)
Civil Engineering Department
Forth Semester

Transportation Engineering - I

Code: CE- 416

Total Theory Periods per Week: 3 Total Tutorial Periods per Weeks: 1 Total Marks: 120

Teacher's Assessment: 20 First Examination: 15 Second Examination: 15 End Semester Examination: 70

Unit 1 PRINCIPAL OF HIGHWAY PLANNING

Road development and planning in India Highway alignment, Requirements. Engineering Surveys for highway location Maps and Drawing. Planning of the rural roads – Pradhan Mantri Gram Sadak Yojana, Bharat Nirman.

Geometric Design: Cross Section elements of horizontal and vertical Alignment. Highway drainage, Surface and subsoil drainage.

Unit 2 TRAFFIC ENGINEERING

Traffic characteristics, studies such as volume Speed. 'O' and 'D' parking etc. and their uses. Traffic Control and signal Devices, Prevention of road accidents, rotary intersection, highway lighting, Mass transit systems, accessibility, networking.

Highway Materials: Behaviour of highway materials, properties of Subgrade and pavement component materials. Tests on subgrade soil, Aggregate and bituminous materials.

Unit 3 PAVEMENT DESIGN

Factors in design of flexible and rigid pavements, Group index and C. B. R. methods, Westergoard analysis of wheel loads. Stresses in rigid pavements. I.R.C. recommendations. Design of rural roads.

Unit 4 Pavement Construction Techniques and Quality Control

Types of Pavements water bound macadam, bituminous and cement concrete pavements. Joints in cement concrete pavements, pavement failures

Unit 5 AIRPORT PLANNING

Definition of terms related to airport engineering, factors affecting site, selection, obstructions, various surveys for site selection, zoning laws. Classification of Obstructions, Helipads, hangers, service equipment

Runways

Orientation, Basic runway length and its corrections. Geometric design, runway configuration taxiways layout geometric, Standards, exit taxiways fillets separation.

Name of Text Books:

Principle and Practices of Highway Engineering – Kadiyali & Lab (Khanna Publishers, Delhi)
Highway Engineering – S. K. Khanna & C.E.G. Justo (Khanna Publishers, Delhi)

Name of Reference Books:

Principles of pavement Design – Yoder and witzak
Air-port planning and Design – Khanna and Arora (Khanna Publishers, Delhi)
Highway Engineering – Rangawala S.C. (Charotar Publishers)

Specifications for Road and Bridge Works – MOST (IRC Publishers)
Manual for Survey, Investigation and Preparation of Road Projects – IRC Publication 2001.
SP:20-2002 Rural roads manual.

National Institute of Technology Raipur (CG)
Civil Engineering Department
Forth Semester

Fluid Mechanics-II Lab

Code: CE- 422

Total Periods per Week: 3

Total Marks: 50

Teacher's Assessment: 30

End Semester Examination: 50

Experiments to be performed (Minimum 10 experiments)

1. To study the transition from laminar to turbulent flow and to determine the lower critical Reynold's number.
2. To study the velocity distribution in pipe and to compute the discharge by integrating velocity profile.
3. To study the variation of friction factor for pipe flow.
4. To determine the roughness coefficient of a open channel.
5. To determine the coefficient of discharge of a weir.
6. To determine the coefficient of discharge of a venturiflume.
7. Study of the hydraulic jump in a open channel.
8. To determine the coefficient of discharge of a spillway.
9. To study the performance characteristics of Pelton wheel turbine.
10. To study the performance characteristics of Francis turbine.
11. To study the performance characteristics of Kaplan turbine.
12. To study the performance characteristics of variable speed centrifugal pump.
13. To study the performance characteristics of rated speed centrifugal pump.
14. To study the performance characteristics of multistage pump.
15. To study the performance characteristics of reciprocating pump.

List of Equipments / Machine Required:

1. Pipe Flow Apparatus
2. Tilting Flume
3. Pelton Wheel Turbine
4. Francis Turbine
5. Kaplan Turbine
6. Variable Speed Centrifugal Pump
7. Rated Speed Pump
8. Multistage Pump
9. Reciprocating Pump

Recommended Books:

Hydraulics Laboratory Manual - S.K. Likhi (New Age International Ltd.) Fluid
Mechanics - Jagdish Lal (Metropolitan Educational, New Delhi)

National Institute of Technology Raipur (CG)
Civil Engineering Department
Forth Semester

Surveying Field Work II Lab

Code: CE- 423

Total Periods per Week: 3

Total Marks: 50

Teacher's Assessment: 30

End Semester Examination: 50

Experiments to be performed (Minimum 10 experiments)

1. Determination of Tacheometric constants.
2. To find the most probable value of angle for combined triangle by method of difference.
3. To find the most probable value of triangles of a quadrilateral shapes by method of correlates.
4. To find the most probable value of triangles by the method of Gauss rule.
5. Determination of elevation and height by tangential method when both angles are angles of elevation.
6. Adjustment of two connected triangles.
7. Adjustment of quadrilateral by method of least square.
8. Adjustment of geodetic triangles with central station by method of least square.
9. To perform the experiment for reduction to centre from different positions of a satellite station when: (i) Satellite station in north position, (ii) Satellite station in left position.
10. To perform the experiment for reduction to centre from different positions of a satellite station when: (i) Satellite station in south position, (ii) Satellite station in right position.
11. Determination of elevation and distance when line of sight inclined upward.
12. Determination of elevation and distance when line of sight inclined downward.
13. Study of Electronic Digital Theodolite.
14. Study of Total Station.
15. Study of Auto level.

List of Equipments / Machine Required:

1. Metric Chain (30 m), 2. Tape (15m, 30 m), 3. Ranging Rod (2m, 3m), 4. Plumb bob, 5. Arrows
6. Theodolite, 7. Electronic Digital Theodolite, 8. Auto level, 9. Total Station, 10. Leveling Staff (Folding and Non-folding), 11. Wooden Pegs, 12. Cross Staff

Recommended Books:

Surveying (Vol. I & II) – Punmia, B.C. (Laxmi Publications, New Delhi, 1996)

Surveying (Vol. I & II) – Kanetkar T.P. (Pune Vidyarthi Griha Prakashan, Pune)

National Institute of Technology Raipur (CG)
Civil Engineering Department
Forth Semester

Transportation Engineering I Lab

Code: CE- 426

Total Periods per Week: 3

Total Marks: 50

Teacher's Assessment: 30

End Semester Examination: 50

Experiments to be performed (min 10 experiments)

1. Determination of crushing value of aggregates.
2. To determine 10 percent finer value.
3. Determination of abrasion value by Los Angle's Machine.
4. Determination of abrasion value by Deval's Abrasion Machine.
5. Determination of Impact Value of aggregates.
6. Determination of Specific Gravity and Water Absorption of aggregate.
7. Determination of Softening Point of Bitumen.
8. Determination of Ductility Value of Bitumen.
9. Determination of Viscosity Value of Bitumen.
10. Determination of Elongation Index of Aggregate.
11. Determination of Flakiness Index of aggregate.
12. Determination of Penetration Value of Bitumen.
13. Flash and Fire Point Test.
14. Study of Marshal Stability Test.
15. Study of Benkelman Beam.
16. Study of bump Integrator
17. Study of Field CBR

List of Equipments / Machine Required:

Ring and Ball Apparatus, Standard Penetrometer, Los Angles Abrasion Machine, Deval's Abrasion Machine, Ductility Testing Machine, Tar Viscometer, Sieve Shaker, Standard I.S. Sieves for Fine and Coarse Aggregate, Length Gauge, Thickness Gauge, Crushing Value Cylinder and Mould with Plunger, Aggregate Impact, Testing Machine, Flash and Fine Point Apparatus, Benkelman Beam, Hot Air Oven, Water Bath, Marshall Stability Machine and with Mould, Proving Ring and Dial Gauge, Weighing Balance up to 10 kg capacity

Name of Text Books:

Highway Engineering – Justo & Khanna (Khanna Publishers)

Highway Engineering Manual – Justo & Khanna (Khanna Publishers)