Department of Civil Engineering

The Department of Civil Engineering has been in existence since the inception of its parent, MIT Manipal in 1957, and has blossomed into a center of excellence in Civil Engineering. In addition to the undergraduate programme (B.Tech. in Civil Engg.), the department offers three post graduate programmes: M.Tech. in Structural Engineering, M. Tech in Construction Engineering and M.Tech. in Environmental Engineering and the Doctoral programme (Ph.D) and Quality improvement programme (Q.I.P).

A highly qualified and dedicated faculty, well trained and experienced supporting staff, backing of a progressive management, state of the art laboratories, classrooms, library facilities and infrastructure provide a conducive environment for the pursuit of academic excellence. The department lays emphasis on educating and equipping students to manage the challenges of a professional engineering career. The department has an excellent track record for placement of its graduates too: reputed companies routinely visit the campus for recruitment and nearly all eligible students are absorbed.

The department frequently organizes continuing-education-programmes, technical lectures and talks from experts in emerging areas of Civil Engineering. The department takes pride in the achievement of its distinguished alumni, who hold prestigious positions in private and government organizations, industry and academia, across the globe.

Academic Program Offered

- B.Tech. in Civil Engineering (since 1957)
- M.Tech. in Structural Engineering (since 1992)
- M.Tech. in Construction Engineering (since 1989)
- M.Tech. in Environmental Engineering (since 2010)
- MSc. in Geology (since 2015)
- Ph.D

Facilities and Resources

The department is well equipped with following well established laboratories: Strength of Materials, Concrete and Highway material testing, Environmental Engineering, Soil Mechanics, Structural Engineering, Engineering Geology, Irrigation, Hydraulic Mechanics and Survey.

The department has a strong research focus on Soil Stability and Mechanics, Environmental Science and Pollution Abatement, Concrete Technology, Environmental Geochemistry, Earthquake Engineering and Structural Dynamics. The faculty regularly participates in several academic activities by presenting research papers at national and international levels. The department offers consultancy and testing services for structural analysis, cement, building materials, steel and water samples to private and government organizations, builders and the local populace.

Faculty List

Professor & Head
Dr Mohandas Chadaga, Ph.D (Manipal University)

Professor
Dr A. Krishnamoorthy, Ph.D (Mangalore University)
Dr Narayan Sabhahit, Ph.D (IIT Kanpur)
Dr Udayashankar H. N., Ph.D (Mangalore University)
Dr Gicy M. Kovoor, Ph.D (NITK, Suratkal)
Dr Narayan Shenoy K., Ph.D (Mangalore University)
Dr K. Balakrishna Rao, Ph.D (NITK, Suratkal)
Dr Kiran Kamath, Ph.D (NITK, Suratkal)
Dr Kiran Kumar Shetty M., Ph.D (Manipal University)

Associate Professor - Senior Scale
Mr N. S. Ananda Rao, M.Tech
Mr B. H. Venkatrama Pai., Ph.D (Manipal University)
Mr Prakash Rao B., M.Tech
Dr K. Balakrishna, Ph.D (Mangalore University)
Dr Purushotham G. Sarvade, Ph.D (NITK, Suratkal)
Dr Asha Udaya Rao, Ph.D (Manipal University)

Associate Professor
Mr Srinivasa Raghavan, M.Tech
Mr K. Phaniraj, B.E., ME
Dr Jagadeesh Pai B., Ph.D (NITK, Suratkal)
Dr Gopinatha Nayak, Ph.D (NITK, Suratkal)

Assistant Professor - Selection Grade
Mr Ravindranatha, M.Tech
Mr K. Ganesh Kini, M.Tech
Ms Shambhavi Kamath M., M.Tech
Ms Shilpa S. Ratnoji, M.Tech

Assistant Professor - Senior Scale
Mr Balakrishna S. Maddodi, M.Sc.
Ms Lathashri U. A., M.Tech
Mr Raghavendra K. Holla B., M.Tech
Mr Girish M. G., M.Tech
Mr Shriharsha, M.Tech
Mr Anup Wilfred Sebastian., M.Tech

Assistant Professor
Ms Sridevi H., M.Tech
Mr Arun Kumar Y. M., M.Tech
Mr Lakshman Kudva P., M.Tech
Ms H K Sugandhini, M.Tech
Mr Prasanna Kumar M., M.Tech
Ms Suja T. P., M.Tech
Mr Avinash A. R., M.Tech
Ms Dhanalakshmi, M.Tech
Ms Radhika Bhandary P., M.Tech
Ms Vidya Dodwad, M.Tech
Mr Sandeep G. S., M.Tech
Ms Ashwini P. P., M.Tech
Ms Sowmya Rao G. S., M.Tech
Mr Kiran Bhat P., M.Tech
Mr Nirmal Nayaka, M.Tech
Mr Praveen Kumar P., M.Tech
Dr Shreelaxmi Prashanth, Ph.D (NITK, Suratkal)
Mr Sandesh Upadhyaya K., M.Tech
Ms Ramya R. Pai, M.Tech
Mr Vishnu Unnikrishnan, M.Tech
Mr Poornachandra Pandit, M.Tech
Ms Teena Thomas, M.Tech
Ms Indu Nair, M.Tech
Mr Shaurya Rahul Narlanka, M.Tech
Ms Sheeka Subramani B., M.Tech
Ms Chaitra M., BE. (on contract)
Mr Udaya Kumar K. S., BE. (on contract)
Mr Deeapak Nayak, BE. (on contract)
## B Tech in CIVIL ENGINEERING

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14

References:

CIE 2101: FLUID MECHANICS - I [3 1 0 4]

References:

CIE 2102: MECHANICS OF STRUCTURE [3 1 0 4]
Introduction, Analysis of Determinate Trusses, Bending and shear stresses, Torsion of circular, Stability of columns, Stress on inclined planes, Analysis of Arches and suspension bridge, Strain Energy, Deflection, Rolling Loads and Influence Lines

References:

**CIE 2103: BUILDING SCIENCE & TECHNOLOGY [4 0 0 4]**


**References:**

**CIE 2104: BASIC SURVEYING [2 1 0 3]**

Introduction, Compass Survey, Plane Table survey, Levelling, Simple leveling, Differential leveling, Errors in Levelling, Reciprocal Levelling, Contours, Application and uses, Methods in Contouring, Characteristics of contours, Theodolite Survey, Repetition and Reiteration methods Temporary adjustments of theodolite, Trigonometric levelling using height and distance formulae

**References:**

**CIE 2105: ENGINEERING GEOLOGY [3 0 0 3]**

Introduction, Geology and Civil Engineering, Seismology: Earthquakes and tsunamis, Case studies, Physical Geology, Weathering (deterioration) of rocks, Structural Geology, Petrology, crystallography, Minerals, Rock as building material, Engineering Geology, Remote sensing and GIS, Geological considerations in selection of sites for dams & reservoirs, tunnels, bridges & highways and Landslides.

**References:**

**CIE 2111: BUILDING DESIGN AND DRAWING [0 0 3 1]**

Introduction to AutoCAD, Foundations and Footings, Doors and Windows, Designing and Drawing of Residential Buildings, Designing and Drawing of Public Buildings:

**References:**

**CIE 2112: MATERIAL TESTING LAB - I [0 0 3 1]**

Determination of specific gravity of fine and coarse aggregate, grading of coarse aggregate and fine aggregate, Bulking of sand, Aggregate impact value and abrasion value (Los Angeles Test). Cement - determination of specific gravity, Fineness, Standard consistency, Setting times, Soundness and Strength. Concrete - Determination of workability, Mix Design as per IS 10262-1982, Compressive strength and tensile strength, flexural strength and modulus of elasticity, Permeability of concrete.

**References:**
4. Relevant IS Codes
FOURTH SEMESTER

MAT 2205: ENGINEERING MATHEMATICS - IV [2 1 0 3]

References:
4. P.L. Meyer, "Introduction to probability and Statistical Applications".

CIE 2201: WATER RESOURCES ENGINEERING [3 1 0 4]

References:

CIE 2102: ANALYSIS OF INDETERMINATE STRUCTURES [3 1 0 4]
Analysis of two hinged parabolic arches, Analysis of Simple Statically Indeterminate Beams, Analysis of statically indeterminate beams, bent and frames, Kani's method of Analysis, Influence Lines for Bridge Trusses and Statically Indeterminate Beams, Plastic Analysis- Ductility, Behaviour in the plastic range, concept of plastic hinge, plastic moments, shape factor for different shapes of cross - section, redistribution of moment, collapse mechanism.

References:

CIE 2203: BASIC REINFORCED CONCRETE DESIGN [3 1 0 4]

References:

Code books:

CIE 2204: APPLIED SURVEYING [2 1 0 3]
Tacheometry, Curves- simple curve, compound curve, reverse curve, transition curve, Lemniscate curve and vertical curve, Construction Surveying, Photogrammetric Surveying, Aerial Photogrammetry, Under Ground Surveys, Hydrographic Survey, Electronic Distance Measurement, Total station Instruments - computing distance from the phase differences.

References:

CIE 2211: SURVEYING PRACTICE - I [0 0 3 1]
Chain survey, Compass Survey, Distance between two inaccessible points, Plane table surveying- Radiation and intersection methods, Solving three point problem by Bessel's solution, Plane table traversing. Levelling- Simple and reciprocal, Theodolite -Single plane method, Double plane method, Distance between inaccessible points

References:

CIE 2212: GEOLOGY LAB [0 0 3 1]
Identification and description of Rock forming Minerals: Quartz group, Ore minerals, Megascopic study of texture, structure, and engineering importance, Interpretation of geologic maps with horizontal inclined, folded, faulted and unconformity. Determination of thickness of strata on horizontal ground, Dip and strike problems, Borehole problems and their uses in dams, tunnels and reservoir site.

References:

FIFTH SEMESTER

CIE 3101: GEOTECHNICAL ENGINEERING [3 1 0 4]
Introduction, Soil structure, Clay minerals, Index properties of soil, Total, effective and neutral stresses, Flow Through Soil, Seepage Through Soils, Compaction of Soil, Stress Distribution in Soil, Consolidation of Soil, Shear Strength of Soil, Direct shear, Triaxial, Unconfined compression and Vane shear tests, Drained, Undrained and consolidated undrained tests and their applications.

References:

CIE 3102: BASIC STRUCTURAL STEEL DESIGN [3 1 0 4]
Introduction, Limit state method of design and Allowable stress design, Structural fasteners and joints, Design of Tension members, Compression member, Design of flexural members, Welded Plate, Roof Trusses

References:

Code books:

CIE 3103: WATER SUPPLY ENGINEERING [3 0 0 3]
Introduction, Quantity of water, Sources of water, Quality of water, Treatment of water, Filtration, Other treatment methods, Distribution of water, Pipe appurtenances, wastage of water - Leakage detection & prevention, corrosion and its prevention.

References:
CIE 3104: HIGHWAY ENGINEERING [2 1 0 3]

References:

CIE 3105: ELEMENTS OF EARTHQUAKE ENGINEERING [3 0 0 3]
Introduction, seismic zoning map of India, seismic waves, seismograms, earthquake magnitude and intensity, Introduction to theory of vibrations, Primary and secondary effects of earthquake, Lesson learnt from the past earthquakes, Equivalent static method (IS 1893), Ductile detailing of RC frames as per IS 13920 (1993), Restoration and retrofitting of exciting structures.

References:

Code books:

CIE 3111: SOIL MECHANICS LABORATORY [0 0 3 1]
Determination of moisture content, specific gravity, Atterberg's limits, in-situ unit weight, Sieve analysis, coefficient of permeability by constant head and variable head permeameter, Standard Compaction test, use of proctor needle, Triaxial shear test, Unconfined compression test, Direct shear test, Vane shear test, Determination of CBR, Demonstration of Plate load test, Cone penetration test, Modified compaction test and hydrometer analysis.

References:
1. Relevant IS codes
3. Lambe T. W., “Soil testing for Engineers”, John Wiley and Sons, INC.

CIE 3112: FLUID MECHANICS LAB [0 0 3 1]
Calibration of Triangular Notch, Rectangular Notch, Cippoletti Notch, Venturimeter, Orifices, Mouth pieces, Orifice meter, Broad crested weir, Curved weir, Ogee weir, Plug Sluice, Determination of Friction factor of pipes, Experiment on Venturi flume, Standing wave flume, Demonstration of Parshall Flume.

References:

SIXTH SEMESTER

HUM 4002: ENGINEERING ECONOMICS AND FINANCIAL MANAGEMENT [2 1 0 3]

References:

**CIE 3201: APPLIED SOIL ENGINEERING [3 0 0 3]**

Soil Exploration, Earth pressure at rest, active and passive conditions, Stability of slopes - finite and infinite slopes, Bearing capacity of shallow footings, Pile foundations, Pile driving, Load carrying capacity of a single pile by dynamic formulae, static formula, Group action and Negative skin friction, under-reamed piles and Bored compaction piles.

**References:**

**CIE 3202: WASTE WATER MANAGEMENT [3 0 0 3]**

Introduction, Unit Operations, Unit Processes, Stabilization Ponds Aerobic, Facultative & Anaerobic Lagoons, Septic tanks and their Design Aspects, Sludge Treatment, Sludge Digestion- Aerobic and Anaerobic, Energy recovery from digestes, Operation and Maintenance of treatment units, Disposal of wastes from various units.

**References:**

**CIE 3203: RAILWAY ENGINEERING AND AIRPORT PLANNING [3 0 0 3]**

Railway Engineering- Tractive resistance, Permanent way, Alignment Details, Points and crossing, Track Junctions, Miscellaneous Topics-Railway Station and Yards Triangle, Turn Table, Scotch Block, Fouling marks, Buffer Stops. Signals Airport Engineering- Factors to be considered in Airport Planning, Geometric Design, Airport Capacity and Designing of Terminal Area, Visual aids and Air traffic control system

**References:**
4. Relevant I S Codes.

CIE 3213: SURVEYING PRACTICE - II [0 0 3 1]
Tacheometric surveying, Curve Surveying: (Using Chain and Tape), Setting out simple curves, Curve Surveying (Using theodolite), Setting out a compound curve, reverse curve, transition curve (Bernoullis Leminscante), combined curve, Total Station Method, Study of Instruments: Hand level, Clinometers, Abney level, Use of Planimeter, Box sextants, Nautical sextants, Ceylonghat tracer.

References:

SEVENTH SEMESTER

HUM 4001: ESSENTIALS OF MANAGEMENT [2 1 0 3]

References:

CIE 4101: ESTIMATION AND CONSTRUCTION MANAGEMENT [3 1 0 4]

References:
4. IS 1200: Part 1 to 16: “Method of measurement of building and civil engineering work”.

CIE 4111: COMPUTER AIDED ANALYSIS AND DESIGN LAB [0 0 3 1]
Introduction to STAAD software package. Analysis of continuous beams using STAAD, Analysis of plane trusses, plane frames, and space frames using STAAD, Design of frames using STAAD package, Introduction and application of ETABS.

References:
1. STAAD Pro software tutorial.
2. ETABS software tutorial.

CIE 4112: ENVIRONMENTAL ENGINEERING LAB [0 0 3 1]
Determination of solids, Turbidity determination and Jar test, Determination of Alkalinity, Acidity and Ph, Calcium, Magnesium and total Hardness, Chlorides, dissolved oxygen and BOD, Residual chlorine and chlorine demand, Determination of Iron and Fluorides, Determination of C.O.D., Ammonial Nitrogen and Nitrates, Demonstration of High volume sample and sound lever meter, determination of oil, grease and Sulphates.

References:
1. “Standard Methods for the Examination of Water and Waste Water”, ALPHA AWWA WPCF.
CIE 4113: ESTIMATION AND COSTING PRACTICE [0 0 3 1]
Definition, types, principles, detailed specification for different components of building, Quantity estimation of Foundation, Masonry work, Doors, Windows, RCC work and different types of roofs, Rate analysis for different items of work, Quantity and cost estimation of buildings, Measurement of earth work using leveling data, Quantity and cost estimation of roads and culverts.

EIGHTH SEMESTER

CIE 4297: SEMINAR
> Each student has to present a seminar individually, on any technical topic of current interest / latest advancement / topics not covered in the syllabus.
> The topic has to approved by the Department and a report of the same has to be submitted a week before the day of the presentation.

CIE 4298: INDUSTRIAL TRAINING
> Each student has to undergo industrial training for a minimum period of 4 weeks. This may be taken in a phased manner during the vacation starting from the end of third semester.
> Student has to submit to the department a training report in the prescribed format and also make a presentation of the same. The report should include the certificates issued by the industry.

CIE 4299: PROJECT WORK / PRACTICE SCHOOL
> The project work may be carried out in the institution/industry/research laboratory or any other competent institutions.
> The duration of the project work shall be a minimum of 16 weeks which may be extended up to 24 weeks.
> A mid-semester evaluation of the project work shall be done after about 8 weeks.
> An interim project report on the progress of the work shall be submitted to the department during the mid-semester evaluation.
> The final evaluation and viva-voice will be conducted after submission of the final project report in the prescribed form.
> Student has to make a presentation on the work carried out, before the department committee as part of project evaluation.

MINOR SPECIALIZATION

I. BUILDING CONSTRUCTION AND MANAGEMENT

CIE 4001: BUILDING CODE AND REQUIREMENTS [3 0 0 3]
General building requirements, Fire and Safety: fire prevention, life safety, fire protection, Soil and foundation, Types of foundations, settlement, depth and thickness of foundation, flexible foundations, determination of modulus of elasticity of soil, Earthquake resistant of masonry wall, Lighting and ventilation, Water supply, drainage and sanitation, Plumbing system, Building Repairs and Maintenances.

References:
2. Prentice Hall India, New Delhi
3. Jaico Publishing House, Bombay

CIE 4002: PRECAST TECHNOLOGY [3 0 0 3]
Introduction, Suitability of precast construction, Advantages and Limitations, Materials Used.

References:
3. Hubert Bachmann & Alfred Steinle, “Precast Concrete Structures”, Published by Ernst & Sohn GmbH & Co. KG., 2011.

CIE 4003: RECENT ADVANCES IN CONCRETE TECHNOLOGY [3 0 0 3]
Microstructure and Properties of Hardened Concrete, Introduction, Microstructure of Concrete, Strength, Dimensional Stability, Durability, Hydraulic Cements, Aggregates, Admixtures, Proportioning Concrete Mixtures, Concrete at Early Age, Nondestructive Methods, Concrete Materials, Mix Proportioning, and Early-Age Properties, Advances in Concrete Technology, Special Types of Concrete, Concrete Mechanics.

References:

CIE 4004: RESOURCE MANAGEMENT [3 0 0 3]

References:
II. ENVIRONMENTAL ENGINEERING AND HYDRAULICS & WATER RESOURCES ENGINEERING

CIE 4005: GROUND WATER ENGINEERING [3 0 0 3]

References:

CIE 4006: HYDROLOGICAL ANALYSIS [3 0 0 3]

References:

CIE 4007: HYDRAULICS & HYDRAULIC MACHINES [3 0 0 3]

References:

CIE 4008: INDUSTRIAL WASTE TREATMENT [3 0 0 3]

References:
2. A. D. Patwardhan, “Industrial Waste treatment”.
4. Mahajan, “Pollution control in process industries”.

III. GEOTECHNICAL ENGINEERING & TRANSPORTATION ENGINEERING

CIE 4009: DESIGN OF FOUNDATIONS AND EARTH RETAINING STRUCTURES [3 0 0 3]
Bearing capacity- Brinch Hansen's, Meyerhoff's, Skempton's and Vesi's bearing capacity equations, Piles subjected to lateral loads-Broms theory, Retaining walls- cantilever, counterfort and soil reinforced retaining walls, Soil nailing, Well Foundation-Bearing capacity, Lateral stability - Terzaghi's method and IRC method, Foundations in expansive soils, Cofferdams, Machine Foundations.

References:

CIE 4010: GROUND IMPROVEMENT TECHNIQUES [3 0 0 3]
Introduction, Mechanical modification, Hydraulic modification, Physical and chemical modification, Thermal modification, Modification by inclusions, Case studies of ground improvement projects in India.

References:

CIE 4011: PAVEMENT MATERIALS AND DESIGN [3 0 0 3]

References:

CIE 4012: SOIL REINFORCEMENT AND GEOSYNTHETICS [3 0 0 3]

References:

IV. STRUCTURAL ENGINEERING

CIE 4013: ADVANCED DESIGN OF STEEL STRUCTURES [3 0 0 3]
Introduction, Unsymmetrical bending, Design of welded plate girders, Design of Gantry Girders, Compression member: Design of compression member subjected combined axial &uniaxial bending, combined axial& biaxial bending. Eccentric and Moment connections, Composite beams and columns, Light guage steel members

References:

Code books:
7. IS 811: 1987 Cold formed light gauge structural steel sections, Bureau of Indian Standards, New Delhi
CIE 4014: ADVANCED REINFORCED CONCRETE DESIGN [3 0 0 3]
Flat slabs, Retaining walls, Design of grid floors and portal frame, Water Tanks: Design of water tanks as per IS 3370 code, Rectangular and circular tanks resting on ground, Overhead tanks - Intze type with supporting structures, Silos and Bunkers, Shells and Folded plates

References:

Code books:

CIE 4015: FINITE ELEMENT METHOD OF ANALYSIS [3 0 0 3]
Brief general description of the method, theory of elasticity, Concept of an element, displacement models, Variational method of formulation, Application of Finite element method to pin jointed and rigid jointed structures, Application to plane stress and plane strain problems.

References:

CIE 4016: PRESTRESSED CONCRETE DESIGN [3 0 0 3]
Basic Concepts of Prestressing, Basic principles of prestressing, Losses of prestress, Analysis of sections for flexure, Camber and deflections, Limit state of collapse and serviceability, Transmission of pre-stress in pre-tensioned members, Design of pre-tensioned and post-tensioned.

References:

Code books:

V. BUSINESS MANAGEMENT

HUM 4011: FINANCIAL MANAGEMENT [2 1 0 3]
Introduction to financial management, Principle of accountancy, Sources of long term finance, Valuation of securities, Leverages, Working capital management, Capital budgeting, Cost of capital, Cash management, and Dividend decisions.

References:

HUM 4012: HUMAN RESOURCE MANAGEMENT [2 1 0 3]

References:
HUM 4013: MARKETING MANAGEMENT [2 1 0 3]

References:

HUM 4014: OPERATIONS AND SYSTEMS MANAGEMENT [2 1 0 3]

References:

OTHER PROGRAM ELECTIVES

CIE 4017: AIR POLLUTION AND CONTROL [3 0 0 3]
Air pollution, Meteorology variables, primary and secondary pollutants, Effects of air pollution on - human health, animals, plants and materials, Industrial plant location and planning, Ambient and stack sampling, Air pollution control devices, Global effects of air pollution - Acid rain, Green house effect, Ozone layer depletion, Air quality and emission standards, Air pollution index, Air pollution act.

References:
3. “Air Pollution - Sampling and Analysis”, APHA.

CIE 4018: APPLIED GEOLOGY [3 0 0 3]
Introduction, interior of the earth, geological processes, geological hazards, natural resources, minerals, rocks, water, soil, engineering properties of rocks, structural geology, stratigraphy, hydrogeology, artificial recharge structures, rain water harvesting, ground water exploration, geophysical exploration, remote sensing and GIS applications, economic geology, process of formation of mineral deposits, ore genesis, ore dressing, Indian mineral deposits, environmental geology, application of geology in Civil Engineering projects like Dams, tunnels, bridges etc.

References:

CIE 4019: BRIDGE ENGINEERING [3 0 0 3]
Investigation for bridge, Site selection, data drawing, design discharge linear water way, Standard specification for Road Bridge, IRC Bridge code, Culverts, Concrete Bridges, Types, components, Tbeam reinforced concrete bridges, Pre[]stressed concrete bridges, Continuous bridges, cantilever bridges, Sub structure, Piers and Abutments, Caissons, scour, bridge bearings, wing walls, Liquefaction assessment of bridge site.

References:
5. Indian Road Congress Codes No. 5, 6, 18, 21, 24, Jamnagar House, Shah Jahan Road, New Delhi.

CIE 4020: COASTAL ENGINEERING [3 0 0 3]
Coastal process, Origin of coasts, wind, waves, Coastal erosion and Coastal protection work erosion, littoral drift, Sea walls and bulkheads, Groins, Jetties, off-shore breakwaters, artificial beach nourishment, Environmental impact assessment, Port Planning, Harbour structures: Berthing structures, Breakwaters: types.
References:

CIE 4021: ENVIRONMENTAL IMPACT ASSESSMENT AND AUDITING [3 0 0 3]
Environmental Impact Assessment, Impact identification, Prediction and assessment of impacts on air, surface water, soil, noise, biological, cultural and socio-economic environment, Public participation in environmental decision making, Environmental monitoring and its importance, EIA case study on a developmental project / activity, Environmental audit - meaning, benefits, procedure and case studies.

References:
2. CIRIA special publication 96, “Construction Industry”, Research and Information Association.

CIE 4022: GEONENVIRONMENTAL ENGINEERING [3 0 0 3]

References:

CIE 4023: NON DESTRUCTIVE TESTING OF MATERIALS [3 0 0 3]

References:

CIE 4024: REMOTE SENSING AND GIS [3 0 0 3]
Introduction, Basic concepts of Remote sensing, Physics of Remote sensing Orbits, Concept of Spatial, spectral, radiometric and temporal resolution, Remote sensing data product and its purchase, Visual interpretation, Fundamentals of GIS, Objects, Components of GIS, contributing disciplines and technologies, Raster, Vector, Exercise on Remote sensing and GIS application. Definitions of Triangular irregular network (TIN) and Digital Elevation Model (DEM), Indian satellite program, Launch vehicles, Exercise on Remote sensing and GIS application

References:

CIE 4025: SOLID WASTE MANAGEMENT [3 0 0 3]

References:
References:

CIE 4027: URBAN MASS TRANSPORTATION SYSTEM [3 0 0 3]
Introduction, Transit, Mass transportation characteristics, Public Transport, travel characteristics, trip chaining, technology of bus, rail, rapid transit systems, Transit Network Planning, transit lines types, geometry and characteristics, Transit Scheduling, marginal ridership, crew scheduling, Terminals and Depot.

References:

CIE 4026: TRAFFIC SYSTEMS AND ENGINEERING [3 0 0 3]

References:

CIE 4025: URBAN TRANSPORTATION PLANNING [3 0 0 3]

References:

OPEN ELECTIVES

CIE 3281: ENVIRONMENTAL MANAGEMENT [3 0 0 3]
Environment Management and Sustainable, Environmental Policies, Environmental Protection, EIA (Environmental Impact Assessment), Environmental Audit, Life cycle assessment (LCA) and environmental design (ED), Environmental management system and Techniques, Environmental Safety and ISO 14000 series of standards, Total quality Management (TQM) and Total safety Management (TSM), ISO 9000, and 18000 series of standards.

References:

CIE 3282: INTRODUCTION TO REMOTE SENSING AND GIS [3 0 0 3]
Introduction, Basic concepts of Remote sensing, Physics of Remote sensing Orbits, Concept of Spatial, spectral, radiometric and temporal resolution, Remote sensing data product and its purchase, Visual interpretation, Fundamentals of GIS, Objectives, Components of GIS, contributing disciplines and technologies, Raster, Vector, Exercise on Remote sensing and GIS application. Definitions of Triangular irregular network (TIN) and Digital Elevation Model (DEM), Indian satellite
program, Launch vehicles, Exercise on Remote sensing and GIS application

References:

CIE 3283: STRENGTH OF MATERIALS [3 0 0 3]
Review of Basic Mechanics of Solids, Stresses due to bending, Stresses due to shearing force, Slope and deflection of beams, Torsion, solid and hollow circular shafts, power transmitted by shafts, stepped shafts, Variation of stress at a point, Bi-axial state of stress and strain, Cylinders, Stability of columns, Slenderness ratio, failure by buckling, Euler's formula, Rankine's empirical formula.

References: