DEPARTMENT OF CIVIL ENGINEERING
Syllabi for BTech MINOR Course Structure
(To be applicable for 2010-batch onwards).

Semester	Course Code	Course Title	L-T-P-C
3rd	CE 251M	Ecology and Environment	3 - 0 - 0 - 6
4th	CE 252M	Infrastructure and Transportation Systems Planning	3 - 0 - 0 - 6
5th	CE 351M	Fundamentals of Structural Analysis and Design	3 - 0 - 0 - 6
6th	CE 352M	Introduction To Geotechnical Engineering	3 - 0 - 0 - 6
7th	CE 451M	Water Resources Engineering and Management	3 - 0 - 0 - 6
		Total credits	**15 -0 -0 -30**

CE 251M ECOLOGY AND ENVIRONMENT (3 0 0 6)

Preamble:

This course tries to give comprehensive coverage of various aspects relating to environmental science, natural resources, ecosystem, environmental pollution and environmental management. It describes the uses and effects of overexploitation of natural resources i.e. forest, water, mineral, food, energy and land. It provides an overview of different ecosystems, their functions and characteristics. It describes the importance and value of biodiversity and its conservation. It deals with the various types of pollution and hazards and their management, taking into account the technical and social aspects. It describes the sources, effects and control of global environmental threats i.e. acid rain, greenhouse effects and global warming. It also covers the environmental laws and legislations. The course facilitates the understanding of the subject matter to student of all disciplines.

Course contents:

Introduction: Environment, definition, scope and importance, Introduction to biosphere, hydrosphere, atmosphere and natural cycle, Natural resources, renewable and nonrenewable resources, conservation and environmental sustainability. Ecosystems and biodiversity: ecosystem, structure and function, energy flow, ecological succession, food chain, Types of ecosystem- forest, grassland, desert, aquatic, Biodiversity- threats and conservation, Introduction to socio-environment. Environmental pollution: Air, water, soil, marine environment, noise, thermal, nuclear, municipal solid waste, hazardous waste, biomedical wastes, pollution prevention, disaster management, Environmental standards, Environmental laws & legislations, Environmental issues: water conservation, rainwater harvesting, watershed management, resettlement and rehabilitation, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents, holocaust, wasteland reclamation, environmental impact assessment studies.

Texts:

1. G. M. Masters, *Introduction to Environmental Engineering and Science*, 2nd Ed., Prentice hall India, 2005
2. P. D. Sharma, *Ecology and Environment*, Rastogi Publication, 2009.

References:

1. P. Meenakshi, *Elements of Environmental Science and Engineering*, Prentice-Hall of India Pvt. Ltd. New Delhi, 2008.
2. E. Bharucha, *Textbook of Environmental Studies for Undergraduate Courses*, Universities Press, 2005.
3. R. Rajagopalan, *Environmental Studies*, Oxford publisher, 2008.

CE 252M INFRASTRUCTURE AND TRANSPORTATION SYSTEMS PLANNING (3 0 0 6)

Preamble:

This course has been designed, firstly, to introduce the undergraduate students, who have opted for minor in civil engineering, to the key concepts of planning and management of infrastructure projects. Secondly, the course has focused on engineering and management of one of the key infrastructure sectors, transportation projects. Critical issues relating to highway infrastructure projects starting from fixing of alignment to highway design, pavement evaluation and traffic engineering are dealt in detail in this course.

Course contents:

Definitions of infrastructure; Relationships between infrastructure and development; Typical infrastructure planning steps; Goals and objectives; Planning and appraisal of major infrastructure projects: Sequence of studies, Preliminary study, Feasibility study, Contract documents preparation and final design, Formulation and cost estimates; Screening of project ideas; Life cycle analysis; Multi-criteria analysis for comparison of infrastructure alternatives; Project delivery methods; Economic Analysis – Concepts and Applications: Principles of methodologies for economic analysis of public works; Benefit-cost ratio and internal rate of return; Shadow pricing; Accounting for risk and uncertainty; Financial evaluation of infrastructure projects; Project risk analysis. System's Definition; Planning of transportation Systems; Development of Formal planning process; Planning studies and methods; Transportation and land use. Demand, Supply and Equilibrium; Sensitivity of Travel demand; Factors affecting Elasticities; Direct and Cross elasticities; Consumer Surplus. Trip Generation Models; Trip Distribution models; Modal Split Models; Traffic Assignment models. Application of GPS in travel and transport network data collection.

Texts:

1. P. Chakroborty, and A. Das, *Principles of Transportation Engineering*, New Delhi: Prentice Hall of India, 2005.
2. A.S. Goodman, and M. Hastak, *Infrastructure planning handbook - Planning, engineering, and economics*. New York: McGraw Hill, 2006.

References:

1. C. J. Khisty, and B.K. Lall, *Transportation Engineering: An Introduction*, 3rd ed., Englewood Cliffs, NJ: Prentice Hall, 2002.
2. C.S. Papacostas, and P.D. Prevedouros, *Transportation Engineering and Planning*, 3rd ed., Englewood Cliffs, NJ: Prentice Hall, 2000.

CE 351M FUNDAMENTALS OF STRUCTURAL ANALYSIS AND DESIGN (3-0-0-6)

Preamble:

The course aims to provide an overview of structural analysis and design for students from disciplines other than Civil Engineering. It starts from the basics of structural mechanics and relates the structural design philosophy with the analysis aspects. The emphasis is laid on examples of structural analysis relevant to students of other specializations.

Course contents:

Introduction, Fundamentals of statics; Concepts of solid mechanics: stress and strain, bending stress, shear stress, axial stress; Analysis of determinate structures: beams, trusses, frames, cables and arches, stability Concept of structural design, material characteristics, strength, ductility and brittleness; design philosophies (working stress method and limit state method); introduction to design of steel and reinforced concrete structures.

Texts:

1. Daniel L. Schodek, “Structures”, Prentice Hall India, 3rd edition, 1998.
2. E.P. Popov, “Engineering Mechanics of Solids”, Dorling Kindersley (India) Pvt Ltd, 2nd edition, 2006.

References:

1. S.U. Pillai and D. Menon, Reinforced Concrete Design, Tata McGraw-Hill, 3rd edition, 2009.
2. T.H.G. Megson, “Structural and Stress Analysis”, Elsevier, 2nd edition, 2005.
3. Harry H. West and Louis F. Geschwinder, “Fundamentals of Structural Analysis”, John Wiley and Sons, 2nd Edition, 2002.
4. Ray Hulse and Jack Cain, “Structural Mechanics”, Palgrave, 2nd edition, 2000.
5. Barry Onouye, “Statics and Strength of Materials Foundations for Structural Design”, Prentice Hall, 2005.
6. N. Krishna Raju, “Structural Design and Drawing Reinforced Concrete and Steel”, Universities Press, 1997.
7. N. Subramaniam, Design of Steel Structures, Oxford University Press, 2008.
8. James Ambrose and Patrick Tripeny, “Simplified Design of Steel Structures”, John Wiley & Sons, 8th Edition, 2007.
9. S.K. Duggal, “Design of Steel Structures”, McGraw Hill Education (India) Pvt Ltd, 2004.

CE 352M INTRODUCTION TO GEOTECHNICAL ENGINEERING (3 0 0 6)

Preamble:

This course intends to acquaint the students with the basics of geotechnical engineering leading to a general understanding of design and construction of geotechnical structures such as foundations, retaining walls etc.

Course contents:

Origin of soils; Phase relationships; Identification and classification of soils; Effective stress principle; Permeability of soils, Seepage and flow nets; Compressibility of soils; Terzaghi's one-dimensional consolidation theory; Shear strength of soils; Effective stress and total stress strength parameters; Compaction of soils. Types of retaining walls; Earth pressure theories; Shallow foundations, Terzaghi's bearing capacity theory; Deep foundations, Load capacity of piles, Settlement of piles; Stability of slopes; Site investigation and subsoil exploration.

Texts:

1. G. Ranjan and A.S.R. Rao, *Basic and Applied Soil Mechanics*, New Age International, 2000.
2. S.R. Kaniraj, *Design Aids in Soil Mechanics & Foundation Engineering*, Tata McGraw-Hill, 1988.

References:

1. T.W. Lambe and R.V. Whitman, *Soil Mechanics*, John Wiley & Sons, 1969.
2. K. Terzaghi, R. B. Peck and G. Mesri, *Soil Mechanics in Engineering Practice*, John Wiley & Sons, 1996.
3. J.E. Bowles, *Foundation Analysis and Design*, McGraw Hill, 1996.
4. P.N. Kurian, *Design of Foundation Systems: Principles & Practices*, Narosa, 1994.

CE 451M WATER RESOURCES ENGINEERING AND MANAGEMENT (3-0-0-6)

Preamble:

The course is designed to explain the students with the basic knowledge of water resources and management. After completion of the course, the student will have the understanding of surface water hydrology, groundwater hydrology and open channel hydraulics as well as also will have the basic knowledge of watershed management and sediment transport.

Course contents:

Hydrology: hydrologic cycle, rainfall and its measurement, mean rainfall, runoff, flow measurements, infiltration losses; Storm hydrology: unit hydrograph, storm hydrograph, flood estimation and routing, flood forecasting. Surface and sub-surface drainage, water logging, remedial measures. Ground water hydrology: introduction, types of aquifers, wells, well yield. Soil-Water-Plant relationships, crop water requirement. Layout of canal system, types and methods of irrigation. Open channel hydraulics, uniform flow, critical flow, gradually varied flow, hydraulic jump. Introduction to watershed management and sediment transport.

Texts/References:

1. V.T. Chow, D.R. Maidment, and L.W. Mays, *Applied Hydrology*, McGraw Hill, 1998.
2. V.P. Singh, *Elementary Hydrology*, Prentice Hall, 1993.
3. V.T. Chow, *Open Channel Flow*, McGraw Hill, 1975.
4. H.M. Chaudhry , *Open Channel Flow*, Prentice Hall of India, 1998.
5. J.V.S. Murty, *Watershed management*, 2nd Edition, New Age Publishers, New Delhi, 1999 .
6. I. W. Heathcote, *Integrated Watershed Management: Principles and Practice*, 2nd Edition John Wiley and Sons, New York, 2009.
7. E.M. Tideman, *Watershed Management – Guidelines for Indian Conditions*, Omega Scientific Publishers, New Delhi, 1996.

8. FAO, *Watershed management and Field manual*, 13/1, 13/2,13/3,13/4,13/5 FAO, UN, Rome, 1988.
Hydraulics of sediment transport-Walter Hans Graf, Water Resources Publication, 1984.
9. C T. Yang, *Sediment Transport: Theory and Practice*, Krieger Publishing Company, 2003.
10. M. S. Yalin, *Mechanics of sediment transport*, Pergamon Press, 1972.