UNIVERSITY OF CALICUT

SCHEME AND SYLLABI

FOR

SIXTH SEMESTER

OF

BACHELOR OF TECHNOLOGY

IN

CIVIL ENGINEERING

FROM 2004 ADMISSION ONWARDS

CALICUT UNIVERSITY (P.O), THENHIPALAM

SIXTH SEMESTER

Code	Subject	Hours/week			Internal Marks	University Examination	
		L	T	P/D		Hours	Marks
CE04 601	ENGINEERING ECNOMICS AND PRINCIPLES OF MANAGEMENT	4	-	-	50	3	100
CE04 602	STRUCTURAL MECHANICS II	3	1	-	50	3	100
CE04 603	STRUCTURAL DESIGN II	3	1	-	50	3	100
CE04 604	GEOTECHNICAL ENGINEERING II	3	1	-	50	3	100
CE04 605	TRANSPORTATION ENGINEERING II	3	1	-	50	3	100
CE04 606	HYDROLOGY AND IRRIGATION ENGINEERING	3	1	-	50	3	100
CE04 607 (P)	**GEOTECHNICAL ENGINEERING LAB**	-	-	3	50	3	100
CE04 608 (P)	**MINI PROJECT**	-	-	3	50	-	-
	TOTAL	**19**	**5**	**6**	**400**		**700**

SYLLABI OF SIXTH SEMESTER

CE 04 601 ENGINEERING ECONOMICS AND PRINCIPLES OF MANAGEMENT
(common for CE, AI, BM, EE, EC, IC, AM Branches)

4 hours lecture per week

PART A : ENGINEERING ECONOMICS

Module I (13 Hours)

Introductory Background – Nature and scope of Economics, Science, Engineering and Technology, their relationship with economic development

Basic Economic Concepts – Wants and utility, Demand and supply, Elasticity of demand and supply, concept of cost and revenue, concept of equilibrium and margin, wealth and capital.

Money and Banking – Functions of money – Functions of banks – Commercial and Central Banks. Monetary policy of the Reserve Bank of India

Module II (13 Hours)

Industrialisation and Economic Planning in India – Need for industrialization, Development of Indian Industry since independence, Role of public sector in India, Industrial Policy of the Government of India. A brief study of Five Year Plans of India

Agriculture – Role of Agriculture in Indian Economy – Problems of Indian Agriculture – Green Revolution in Indian Features and effects.

Foreign exchange and International Trade – Determination of rate of exchange – Balance of payments and Trade – India's Foreign Trade Policy – A short note on International Monetary Fund (I.M.F.).

PART B : PRINCIPLES OF MANAGEMENT.

Objective: an elementary level exposure of management principles relevant for industrial sector.

Module III (13 hours)

Need for management – principles of management – management functions – span of control – delegation – directing – leadership and motivation (basic concepts only)

Theories of scientific management (an overview only expected) - Fredric Taylor's theory – Frank Gilbreth's theory – Henry Foyal's theory – present concepts of management.

Financial management – objectives and functions – time value of money (numerical examples included) – basics of financial accounting (problem solving not required) – profit and loss account – balance sheet (only introduction) – sources of industrial finance – shares – debentures – public deposits – bank loans – financial institutions.

Module IV (13 hours)

Marketing management –concept of market and marketing – marketing mix – market research – advertising and sales promotion.

Scope and objective of Human Resource Management – manpower recruitment analysis – recruitment and training – job analysis – job evaluation – wages and incentives.

Decision making – Introduction and definition – techniques of decision making – decision making process – under certainty, uncertainty and risk (problems not included).

Operations management - project scheduling – bar charts - network techniques - basic concepts of network construction – concept of CPM and PERT- Examples of simple networks (Detailed network analysis not contemplated).

Text books:

1. Mazda F, Engineering management, Low priced edition, Addison Wesley.
2. O.P.Khanna, Industrial Management.
3. Kotler. P, Marketing Management: Analysis, Planning, Implementation and Control, Prentice Hall.

4. Venkata Ratnam C.S & Srivastva B.K, Personnel Management and Human Resources, Tata McGraw Hill.
5. Prasanna Chandra, Financial Management: Theory and Practice, Tata McGraw Hill.
6. K.K.Dewett, Modern Economic Theory
7. Ishwar.C.Dhingra, The Indian Economy (Resources Planning development and Problem)

Reference books.

1. Koontz H, O'Donnel C & Weihrich H, Essentials of management, McGraw Hill.
2. Satya Raju R & Parthasarathy A, Management: Text & Cases, Prentice Hall.
3. Ramaswamy V.S & Namakumari S, Marketing Management : Planning, Implementation and Control, MacMillan.

Internal assessment:

Assignments		=	15 Marks
Economics: Assignment should help students to appreciate necessity of economics in engineering			
Management: Individual documentation of best management practices by various organisations			
2 Tests	2 x 15	=	30 Marks
Regularity		=	5 marks
Total		=	50 Marks

University examination pattern:

(Part A and Part B should be written on separate answer books)

Part A

Q I -4 short type questions of 5 marks each, 2 from module I and II.
Q II -2 questions A and B of 15 marks each from module I with choice to answer any one
Q III -2 questions A and B of 15 marks each from module II with choice to answer any one

Part B

Q IV -4 short type questions of 5 marks each, 2 from module III and IV.
Q V -2 questions A and B of 15 marks each from module III with choice to answer any one
Q VI -2 questions A and B of 15 marks each from module IV with choice to answer any one

CE 04 602 STRUCTURAL MECHANICS III

3Hours lecture and 1hour tutorial per week

Objective :-

To enable the students to have a comprehensive idea of matrix structural analysis with emphasis on the relative advantages of the flexibility method and the stiffness method

To enable the students to visualize structural dynamics problems with a proper blend of structural analysis and vibration theory

Module I (20 hours)

Matrix analysis of structures: static and kinematic indeterminacy-force and displacement method of analysis-definition of flexibility and stiffness influence coefficients-development of flexibility matrices by physical approach

Flexibility method: flexibility matrices for truss and frame elements-load transformation matrix-development of total flexibility matrix of the structure-analysis of simple structures (limited to two storey, two bay)-plane truss and plane frame-nodal loads and element loads-lack of fit and temperature effects.

Module II (17 hours)

Stiffness method: Development of stiffness matrices by physical approach-stiffness matrices for truss and frame elements-displacement transformation matrix-analysis of simple structures (limited to two storey, two bay) -plane truss and plane frame-nodal loads and element loads-lack of fit and temperature effects

Introduction to direct stiffness method-Rotation of axes in two dimensions, stiffness matrix of elements in global co- ordinates from element co-ordinates, solution of two span continuous beam.

Module III (15 hours)

Structural dynamics-introduction-degrees of freedom-single degree of freedom-linear systems-equation of motion, D'Alembert's principle-damping-free response of damped and undamped systems-logarithmic decrement-transient response- Base excited single degree freedom systems– Vibration isolation – Introduction to two degree of freedom systems

Text books:

1.Gere J.M.& William Weaver Matrix Analysis of framed structures,CBS Publishers
2.Clough R.W.&Penzein J.,Dynamics of structures,Tata Mc Graw Hill
3.Anil.K.Chopra, Dynamics of structures, Pearson Education/ Printice Hall India
4.Beaufait.F.W., Basic concepts of structural analysis,
5.Denhartog,Mechanical Vibrations
6.Rajasekharan.S.&Sankarasubramanian G.,Computational structural mechanics,PHI
7.Reddy C.S..Basic Structural Analysis,Tata Mc Graw Hill
8. Pandit.G.S. and Guptha. S.P., Structural Analysis-A Matrix Approach, Tata McGraw Hill.

Reference books:

1.Wang C.K., Matrix method of structural analysis, International Text book company
2.Przemeineicki J.S.,Theory of Matrix structural analysisTata Mc Graw Hill
3.Meivovitch L.,Elements of vibration analysis
4Thimoshenko.,Vibration problems in Engineering
5.Biggs,Structural Dynamics
6.Coates.R.C,Coutie M.G. ,Structural Analysis

Internal work assessment:

2 tests		15x2=30 marks
Assignments	(minimum 2)	15 marks
Regularity		5 marks
Total marks		= 50 marks

Assignments on development of computer program for analysis of simple structures using stiffness method may be given

University Examination Pattern:

Q I -8 short type questions of 5 marks, 3 from module I, 3 from module II and 2 from module III
Q II -2 questions A and B of 20 marks from module I with choice to answer any one
Q III -2 questions A and B of 20 marks from module II with choice to answer any one
Q IV -2 questions A and B of 20 marks from module III with choice to answer any one

CE 04 603 STRUCTURAL DESIGN II

3 Hours lecture and 1 hour tutorial per week

Objective :

To familiarize the fundamental aspects of analysis and design of steel structures and to discuss practical requirements such as safety, feasibility and economy of steel structures

Module I (12 hours)

Introduction to structural steel sections, material property, stresses, loads, types of design-rigid, semi rigid Analysis and design of riveted and welded connections to resist direct force – Bolted connection, Principle of high strength friction grip bolt-design of single and double angle ties-design of struts.

Module II (17 hours)

Solid and built-up columns for axial loads-design of battens and lacings. Design of eccentrically loaded solid & built-up columns

Analysis and Design of laterally restrained & unrestrained simple & compound beams- Design for flexure, shear, deflection, bearing.

Module III (12 hours)

Column bases, column –beam connections-moment resistant connections (in plane, out of plane)

Design of roof trusses-types of roof trusses-selection-design loads and load combinations-assessment of forces due to wind-design principles-design of purlins, design of joints.

Module IV (11hours)

Design of timber structures-allowable stresses-design of beams-flexure, shear, bearing and deflection considerations. Design of composite beam sections with timber and steel.

Design of columns.

Note:

All designs shall be done as per current I.S. specifications
Special importance shall be given to detailing in designs
S.I. units shall be followed
IS 800, IS 883, IS 875 & SP 6 shall be permitted in the examination hall.

Text Books:

1.Ram Chandra., Design of steel Structures., Vol I & II Standard Book House
2.Arya & Ajmani.,Design of Steel Structures., Nemchand

Reference Books:

1.S.K.Duggal.,Design of steel Structrures.,Tata Mcgraw-Hill
2.P.Dayaratnam.,Design of Steel Structures ,Wheeler Publishing
3.Lin& Bresler.,Design in Structural Steel.,John Wiley
4.M.A.Kazimi & R.S. Jindal.,Design of Steel Structures.,Prentice-Hall of India
5.Raghupathi, Steel Structures,Tata McGraw Hill.
6 Punmia -Design of steel structures, Laxmi Publications.

Internal work assessment:

2 tests		15x2=30 marks
Assignments	(minimum 2)	15 marks
Regularity		5 marks
Total marks		= 50 marks

University Examination Pattern:

Q I -8 short type questions of 5 marks, 2 from module I and II, 3 from module 2 and 1 from module 4
Q II -2 questions A and B of 15 marks from module I with choice to answer any one
Q III -2 questions A and B of 15 marks from module II with choice to answer any one
Q IV -2 questions A and B of 15 marks from module III with choice to answer any one
Q V -2 questions A and B of 15 marks from module IV with choice to answer any one

IS 800, IS 883, IS 875 & SP 6 shall be permitted in the examination hall.

CE 04 604 GEOTECHNICAL ENGINEERING II

3 hours lecture and 1 hour tutorial per week

Module I (11 hours)

1. Site investigation and soil exploration: objectives - planning - reconnaissance - methods of subsurface exploration - test pits - Auger borings - rotary drilling - depth of boring - boring log - soil profile- location of water table - S.P.T. - field vane shear test - geophysical methods (in brief) - sampling - disturbed and undisturbed samples - hand cut samples - Osterberg piston sampler

2. Bearing capacity: ultimate and allowable bearing capacity - Terzaghi's equation for bearing capacity for continuous - circular and square footings - bearing capacity factors and charts - Skemption's formulae - effect of water table on bearing capacity – plate load test - bearing capacity from building codes - net bearing pressure.

Module II (13 hours)

3. Stress distribution: Boussinesque's and Westergaard's equations for vertical pressure due to point loads and uniformly distributed loads - assumptions and limitations - pressure bulb - newmark charts and their use - line loads and strip loads

4. Settlement analysis: distribution of contact pressure - immediate and consolidation settlement - estimation of initial and final settlement under building loads - limitations in settlement computation - causes of settlement - permissible, total and differential settlements - cracks and effects of settlement

Module III (13 hours)

5. Foundation - general consideration: functions of foundations - requisites of satisfactory foundations - different types of foundations - definition of shallow and deep foundation - selection of type of foundation - advantages and limitations of various types of foundations

6. Footings: types of footings - individual, combined and continuous - design considerations - footings subjected to eccentric loading - conventional procedure for proportioning footings for equal settlements

7. Raft foundations: bearing capacity equations - design considerations - conventional design procedure for rigid mat - uplift pressures - methods of resisting uplift - floating foundations

Module IV (15 hours)

8. Pile foundations: uses of piles - classification of piles based on purpose and material - determination of type and length of piles - determination of bearing capacity of axially loaded single vertical pile - (static and dynamic formulae) - determination of bearing capacity by penetration tests and pile load tests (IS methods) - negative skin friction - group action and pile spacing - analysis of pile groups

9. Caissons: open (well) caissons - box (floating) caissons - pneumatic caissons - construction details and design considerations of well foundations - types of drilled caissons and their construction details.

Introduction to foundation on expansive soil-identification of expansive soil- problems associated with expansive soil- design considerations.

Note: Structural designs of foundations are not contemplated in this course.

Text Books:

1. Joseph E. & Bowles, *Foundation Analysis & Design*, McGraw Hill
2. Arora K.R., *Soil Mechanics & Foundation Engg.*, Standard Publications
3. Murthy V.N.S., *Soil Mechanics & Foundations*

Reference books

1. Leonards G.A., *Foundation Engineering*, McGraw Hill
2. Gopal Ranjan and Rao A.S.R., *Basic and applied soil mechanics*, New Age International Publishers
3. Venkatramiah, *Geotechnical Engineering*, New Age International Publishers

4. Teng W.C., *Foundation Design*, PHI
5. Tomlinson M.J., *Foundation Design & Construction*, Pitman
6. Terzaghi & Peck, *Soil Mechanics in Engineering Practice*, Asia Publishing
7. Coduto, *Geotechnical Engineering Principles and Practices*, Pearson Education

Internal assessment

Assignments (minimum 2)		= 15 marks
2 Tests	2x15	= 30 marks
Regularity		= 5 marks
Total		= 50 marks

University examination pattern

Structural designs of foundations are **not** contemplated in this course

Q I -8 short type questions of 5 marks each, 2 from each module
Q II -2 questions A and B of 15 marks each from module I with choice to answer any one
Q III -2 questions A and B of 15 marks each from module II with choice to answer anyone
Q IV -2 questions A and B of 15 marks each from module III with choice to answer anyone
Q V -2 questions A and B of 15 marks each from module IV with choice to answer any one

CE 04 - 605 : TRANSPORTATION ENGINEERING II

3 hours lecture and 1 hour tutorial per week

Objective*:*
The objective of this subject is to build a strong, stable and deep concept in different means of transportation, evaluation of various transportation projects and also to have a clear picture in the details of design, construction and maintenance of structures coming under this field.

Module I (15 hours)
Permanent way: functions and requirements of permanent way - components - typical cross sections - gauges - functions and requirements of components of permanent way - sleeper density - coning of wheels creep and wear in rails - rail fasteners - defects, failures and joints in rails - material assessment for unit length of track –
Geometric design of railway track - horizontal curves - super elevation - cant deficiency - negative super elevation - safe speed on curves - gradients and grade compensation - worked out problems -

Module II (14 hours)
Signaling and interlocking - signal control systems - points and crossings - track junctions - track circuiting - track alignment - construction of railway track - railway stations and yards.
Railway construction and maintenance
Construction of railway track- earth work plate laying and packing-maintenance of track - alignment - gauge-renewal of component parts-drainage - modern methods of track maintenance.
Tunneling: -
Location survey and factors to be considered - different sections - shafts - transferring of centre line - methods of tunneling in hard rocks and soft soils - different methods for lining, ventilation, lighting and drainage

Module III (10 hours)
Elements of harbour - ports - various design considerations of a harbour - classifications - site selection factors - wet and dry docks - lock and lock gates - site selection, configuration and types of breakwaters - details of quays, piers, fenders, dolphins, slipways - transit shed and warehouse - navigational aids

Module IV (13 hours)
Transportation Planning and Economics:-
Classification of transport technologies-inter modal co-ordination - ITS and automated highways - salient features of first, second and third and forth road development plans in India - planning surveys and master plan preparations - Expressways - case studies-
Highway Economics- Principles of economic evaluation – road user benefits - highway cost - economic evaluation by annual cost, benefit cost ratio and net present value method - worked out problems

Text books:
1. Antia K.F., Railway Track, New Book Company Pvt.Ltd.
2. Khanna.S.K and Justo.C.E.G., Highway Engineering, Nemchand and Bros., Roorkee, 1991
3 Quinn A.D., Design and Construction of Ports and Marine Structures, McGraw Hill.

References:
1. Kadiyali.L.R., Traffic Engineering and Transportation planning, Khanna Publishers, New Delhi
2. Kadiyali.L.R., Principles of Highway Engineering, Khanna Publishers, New Delhi
3. Agarwal.M.M., Railway Engineering, Prabha & Co. New Delhi, 1998
4 National Transport Policy Committee Report, Planning Commission, New Delhi
5 Vision 2021-Road development plan , IRC, New Delhi
6. V.N.Vazirani & S.P.Chandola., Transportation Engineering Vol.I, Khanna Publishers, New Delhi, 1994
7. JF Mundrey Railway track Engg. Tata Mc Graw Hill, New Delhi

Internal assessment:			
Assignments (minimum 2)		=	15 marks
(One of the assignments may be field oriented)			
2 Tests	2x15	=	30 marks
Regularity		=	5marks
Total			50 marks

University examination pattern:	
Q. 1	8 short type questions, 2 from each module, carries 5 marks each
Q. 2	2 questions of 15 marks each, from module 1, with choice to answer any one
Q. 3	2 questions of 15 marks each, from module 2, with choice to answer any one
Q. 4	2 questions of 15 marks each, from module 3, with choice to answer any one
Q. 5	2 questions of 15 marks each, from module 4, with choice to answer any one

CE 04 606 HYDROLOGY AND IRRIGATION ENGINEERING

3 hours lecture and 1 hour tutorial per week

Objective:
Students are expected to realize the importance of water resources and its application in irrigation engineering

Module I (13 hours)
Introduction: hydrologic cycle - application of hydrology in engineering - water balance equation - water resources of India.
Precipitation: Types, forms and measurement of precipitation –network design- presentation of data - average precipitation over an area - mass curve and hyetograph –consistency and continuity - depth-area-duration curve and intensity - duration-frequency analysis - probable maximum precipitation.
Runoff - Characteristics of runoff - factors affecting runoff -.Hydrograph-components of hydrograph - base flow separation - rainfall- run off relations - unit hydrograph theory - derivation of unit hydrograph - applications and limitations of unit hydrograph -yield from a catchment – Concepts of watershed and its use.

Module II (13 hours)
Floods - estimation of peak discharge - rational method - unit hydrograph method.
River training and flood control works- river behaviour- control and training of rivers- objectives of river training- types of training works. Flood control by regulating reservoirs - flood storage basin - levees - flood banks - flood warning and flood plain zoning.
Reservoir-types -investigation and planning - selection of site - fixation of storage capacity - flow duration curves - flow mass curve - reservoir sedimentation

Module III (13 hours)
Irrigation - necessity - advantages - disadvantages – types- flow and lift irrigation - perennial and inundation irrigation –methods of irrigation-flooding, furrow, sprinkler and drip irrigation- important crops and crop seasons - duty and delta - water requirement - irrigation efficiency - direct and storage irrigation - multipurpose projects
Head works:- storage and diversion works-selection.
Diversion head works: components and layout - silt excluder and silt extractor -selection of site - weirs - types of weirs- seepage theories – Biligh's and Khosala's theory –method of independent variables.

Module IV (13 hours)
Distribution works: classification of canals - alignment of canals - considerations for fixing longitudinal slopes of canals - cross section of canals - burrow pits - spoil banks - maintenance of irrigation canals - service roads - back berm - counter berm - offtake alignment - design of canals - erodible canals - canals in alluvial soils - regime theory - Kennedy's theory and Lacey's theory - silting in canal and prevention - losses in irrigation canals - water logging - causes of water logging - measures for prevention of water logging - drainage - benefits of drainage - types of drains - design and maintenance of open drains - tile drains - layout of tile drain system -lining of irrigation canals - necessity and advantages of lining - disadvantage of lining - types of lining.

Text books
I & II module
Subramanya K., *Engineering Hydrology*, Tata McGraw Hill
III &IV module
Asawa, Irrigation Engineering, Wiley Eastern
Punmia B.C. & Lal P.B., Irrigation and Water Power, Laxmi Publications.
Dr. Modi P.N., *Irrigation Water Resources & Water Power*, Standard publications

Reference books

1. Regunath H.M., *Hydrology,* Prentice Hall
2. Chow V.T et. al., *Applied Hydrology,* McGraw Hill
3. Priyani V.B., *The Fundamentals Principles of Irrigation* Engineering, Charotar
4. Sahasrabudhe S.R., *Irrigation Engineering & Hydraulic Structures*
5. Varshney R.S., *Theory & Design of Irrigation structures Vol. I &* II, Nem Chand
6. Michael, *Irrigation - Theory & Practice,* Vikas
7. S.K Garg Irrigation Engineering and Hydraulic structures, Khanna publishers
8. IS: 5968 (1987) – Guide for the planning and layout of canal system for irrigation

Internal assessment

Minimum 2 Tests	2x15 = 30 marks
Assignments (minimum 2)	= 15 marks
Regularity	= 5 marks
Total marks	= 50 marks

University examination pattern

Q I -8 short type questions of 5 marks each, 2 from each module

Q II -2 questions A and B of 15 marks each from module I with choice to answer any one (20 to 40% numerical questions)

Q III -2 questions A and B of 15 marks each from module II with choice to answer any one (20 to 50% numerical questions)

Q IV -2 questions A and B of 15 marks each from module III with choice to answer any one (0% to 40% numerical questions)

Q V -2 questions A and B of 15 marks each from module IV with choice to answer any one (Minimum 20% numerical questions)

CE 04 - 607 (P) : GEOTECHNICAL ENGINEERING LAB

3 hours practical per week

1. Specific gravity of coarse and fine grained soils
2. Grain size analysis (a) Sieve analysis (b) Pipette analysis
3. Atterberg limits and indices
4. Determination of field density (a) sand replacement method (b) core cutter method
5. Determination of coefficient of permeability by
   (a) Constant head method
   (b) variable head method
6. Consolidation test
7. Compaction test (a) IS light compaction test (b) IS heavy compaction test
8. California bearing ratio test
9. Direct shearing test
10. Unconfined compressive strength test
11. Triaxial shear test
12. Laboratory vane shear test
13. Tests on aggregates , Impact test, Abrasion test, Attrition test, Shape test.
14. Tests on bitumen : Penetration test, Ductility and Softening point test.

Internal Assessment :

Laboratory practicals and record	= 25 marks
Test/s	= 20 marks
Regularity	= 5 marks
Total Marks	= 50 marks

CE 04 - 608(P) : MINI PROJECT

3 hours per week

The project work can be a design project, experimental project or field surveying on any of the topics of civil engineering interest or survey camp, industrial or construction site training. It can be allotted as a group project with groups consisting of three or four students

The assessment of all the mini projects should be done by a committee consisting of three or four faculty members specialised in the various fields of civil engineering. The students will present their project work before the committee. Each group will prepare the project report and submit to the department through the guide. The head of the department will certify the copies and keep in the departmental library

Internal assessment	
Guide (technical content, involvement, report)	: 30
Assessment committee (technical content, report, presentation)	: 20
Total marks	: 50

***Important Note**:- Topic for **CE 04 707(P) Seminar** to be finalised before the commencement of 7th semester class.*