### **Advanced Construction Material**

### **COURSE OBJECTIVES:**

The course provides basic knowledge of the properties of essential construction materials, especially steel, concrete, heat insulation materials, composites procedure & uses, components of Construction Industry, principles and methods to be followed in constructing various components of a building.

#### **Course Content**

Branch	Subject Title	Subject Code			ject wise
M.E.(CTM)	Advanced	MECTM-2211	L	T	Р
	Construction Material		3	_	

### Unit I. Material Science:

Classification, Standardization, Codification and Variety. Details of Micro Structure of Different construction Materials, Different effects on materials of construction.

### Unit 2. Properties of Materials:

Environmental Influences: Thermal effects: Effect of Chemicals, Fire resistance, Corrosion and Oxidation, Radiation. Properties of fresh & hardened concrete. Shrinkage & creep of concrete.

### Unit 3. Concrete:

Design and production of concrete ingredients, Additives and admixtures. Special concretes e.g., light weight, Heavy weight, Ready mix concrete, Fiber Reinforced concrete etc.

### **Unit 4. New Construction Materials:**

Polymer materials, Thermo - Plastic, Polymer Concrete, Composite materials, Ferrocement, Ferroconcrete, Building materials from Agricultural & Industrial wastes.

### Unit 5. Quality control in construction:

Various aspects, Principle of statistical quality control. Different techniques of materials and process Quality control, Destructive and non-destructive Testing of Materials, I.S. and international procedures of testing.

#### **COURSE OUTCOMES:**

After completion of this course, the student will be able to:

1. To identify various building materials and select suitable type of building material for given situation and also the emerging materials in the field of Civil Engineering construction.

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- Describe types of concrete, their composition, physical properties of fresh concrete, mechanical properties of hardened concrete and standard specification for quality control; Identify tests to determine workability of plane and selfcompacting concretes, mechanical properties of hardened concrete and interpret results for its use in construction.
- 3. Discuss the comparative advantages, disadvantages and suitability of precast concrete structures.

### Reference Books:

1. Ammer, D.A. Material Management Irwin Publishers Illionis, 1972.

2. White A.H. Engineering materials, MC Graw - Hill.

3. Deb. A., Engineerig materials, world press.

4. Billmeyer Jr. F.W. Text Book of Polymer Science, Interscience Publishers Inc.

5. Golding Brage Polymers and Resins Nortrand.

- Schmidt A.X. & Marties CA "Principle of High Polymer Theory & Practice" MC Graw - Hill.
- 7. Stille, J.K. "Introduction to Polymer Chemistry" Johwiley.

8. Winding C.C. & Hiatt G.D. "Polymetric".

9. W. D. Callister, "Materials Science and Engineering

10. Elements of Material Science And Engineering

11. V.R. Gowariker, "Polymer science", New age international Publishers,

12.T.N. Gupta "Building Materials In India:50 Years", bmtpc

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### **Foundation Design**

### **COURSE OBJECTIVES:**

Equip with abilities to evaluate bearing capacity and settlement failure conditions for shallow and deep foundations. Equip students with modern instrumentation for foundation design and correct selection of soil parameters for foundation design.

### **Course Content**

Branch	Subject Title	Subject Code	Credit allotted sul		oject wise
M.E.(CTM)	Equadation Desir	MECTM- 2212	L	T	Р
IVI.E.(CTIVI)	Foundation Design		3	-	

#### Unit I.

**Art of Foundation engineering**: Bearing Capacity - Theories of Terzaghi, Meyerhof, Brinch Hansen, Vesic and Skempton, Penetration tests, Plate load tests, Factors; Settlement Analysis - Stresses in soil, Immediate and consolidation settlement, control of excessive settlement, Types and causes of failures, Remedial measures, Shoring and Underpinning.

#### Unit II.

**Shallow Foundations:** Foundation classification; Choice of foundations; Isolated Foundations – individual and combined foundations, Raft foundations - Necessity; Types

of rafts; Bearing capacity and settlement of rafts - Beams on elastic foundations.

#### Unit III.

**Pile Foundations**: Classification and Uses, Carrying capacity of Single pile, Pile load tests, cyclic pile load test, pull out resistance, laterally loaded Piles; Pile groups – Group efficiency, Settlement of single pile and pile groups, Negative skin friction, sharing of loads

#### Unit IV.

**Well Foundations: Caissons –** Types, advantages and disadvantages, Shapes and component parts, Grip length, Bearing capacity and settlement, Forces acting, Sinking of

wells, Rectification of Tilts and Shifts, Lateral stability - Terzaghi's method and IRC method.

#### Unit V.

Design of Shallow and Deep Foundations: Limit state design of reinforced concrete in

foundations; Soil pressure for structural design; Conventional structural design of continuous footings, individual footings – Eccentrically loaded footings; combined footings; Pile foundations - Structural design of piles including pile caps; Design of pile groups.

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### **COURSE OUTCOMES:**

After completion of this course, the student will be able to:

- 1. Select different types of foundations based on site conditions and suggest remedial measures against foundation failures.
- 2. Analyze bearing capacity and settlement of foundations.
- 3. Design shallow and deep foundations

#### Reference Books:

- J. E. Bowles, "Foundation Analysis & Design", Mc.Graw Hill Book Co. 1.
- W. C. Teng, "Foundation Design", Prentice Hall of India Ltd. 2.
- Tomlinson, "Foundation Design and Construction", ELBS, Longman Group Ltd.
- Winterkorn and Fang, "Foundation Engineering Hand Book", Van Nostrand 4. Reinhold Co, New York.
- Kurian, N.P. Modern Foundations, Tata McGraw Hill, 1982. 5.
- Fang H.Y. Foundation Engineering Handbook, Van Nostrand Reinhold, 23, 1991. 6.
- Kaniraj Shenbaga R, Design Aids in Soil Mechanics and Foundation Engineering, 7. Tata McGraw Hill.
- Fleming etal, Piling Engineering, Surrrey Univ. Press/John Wiley and Sons, 8.
- Chellis, Robert D, Pile Foundations, MCGraw Hill, 1961 9.
- 10. Tomlinson MJ, Pile Design and Construction Practice, a view point publication, 3e,
- 11. IS: 6403 Determination of bearing capacity of Shallow foundations
- 12. IS 8007- Part -I Calculation of Settlement of Foundation

## **Advanced Concrete Technology**

### **COURSE OBJECTIVE:**

The objective of this course is to define and understand concept related concrete. Proportioning of concrete including principle for fresh and hardened concrete.

To Basic concept of fibre reinforce concrete, To identify and comprehend ideas connected to concrete technology which include the various type and properties of concrete as well as various adhesive materials and their critical application in the construction of safe and cost effective structure. To knowledge of pre-stressed concrete.

### **Course Content**

Branch M.E.(CTM)	Subject Title	Subject Code MECTM- 2213	Credit a	llotted sub	oject wise
	Advanced		L	T P	
	Concrete Technology		3	-	

#### Unit 1

Principles of concrete mix design: concrete materials, mix proportioning and early age properties, strength, permeability and durability.

Concrete mix design procedures by: IS/ACI British Standards, mix design procedures using fly ash, fibers and design of high-performance concrete.

#### Unit 2.

Concreting operations - practices and equipment, batching; mixing; transporting; shuttering and staging; placing and compacting; curing, accelerated curing; finishing and jointing.

Properties and techniques of construction for concrete, admixtures, polymers, epoxy resins, pozzolanic materials and fly ash, fibre reinforced concrete, light weight concrete, heavy weight concrete, foam concrete, high performance concrete.

#### Unit 3.

Special concrete operations, shotcrete, grouting, guniting, under water concreting, hot and cold weather concrete, pumpable concrete, ready mixed concrete.

#### Unit 4.

Construction techniques for reinforced concrete elements - materials, principles and procedures for beams, slabs, columns, foundations, walls and tanks, design and fabrication of formwork for R.C.C elements, features of slip forming and precautions, details of special shuttering required for lining of tunnel, procedures and precautions.

#### Unit 5.

Pre-stressed concrete construction-principle, methods, materials, tools and equipment for the construction of a pre-stressed concrete.

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Inspection and quality control of concrete construction - stages, principles, checklist, statistical controls, and procedures.

### **COURSE OUTCOMES:**

After completion of this course, the student will be able to:

- Students will be able to learn mix proportion principle to design a concrete mix for field application.
- 2. Students will be able to learn the concrete operation.
- 3. Students will be able to learn the special concrete operation shotcrete, grouting, grunting, light weight concrete, heavy weight concrete foam concrete, pump able concrete.
- 4. Student will be able to understand the mixing of admixture, polymers, epoxy resins, pozzolanic material & fly ash.
- 5. Students will be able to understand the construction techniques for pre-stressed concrete.

#### **Reference Books**

- 1. Gambhir, M.L., Concrete Technology, Tata McGraw Hill, New Delhi
- 2. Orchard, Concrete Technology, Applied Science Publishers Ltd. London
- 3. Neville, Brooks, Concrete Technology, Addison Wesley, England
- 4. Neville A.M., Properties of Concrete, The English Language Book Society and India Publishing , London
- 5. Raina V.K., Concrete for Construction, Tata-McGraw Hill Publishing Co. Ltd. New Delhi.
- 6. Swamy, . New Concrete Materials, Surrly University Press, London
- 7. Young, Concrete, Prentice Hall Inc. New Jersey.
- 8. Waddell, et.al: Concrete Construction Handbook, McGraw Hill Inc.
- 9. Sood, Hemant et al.; Laboratory manual in Concrete technology M/S CBS
- 10. Publications and Distributors, New Delhi.
- 11. Sood, Hemant; Jyoti P.M.; Software on Concrete Mix Design ConMD 2000, NITTTR, Chandigarh.
- 12. Shetty, M.S.' Concrete Technology, M/S S. Chand & Co. Ltd. New Delhi
- 13. Mehta P. Kumar & Monteiro, Paulo J.M., Concrete Microstructure, Properties and Materials, M/S Indian Concrete Institute, Chennai.
- 14. Malier, Yves, High Performance Concrete, E&FN SPON, London

15. Ramachandran, Concrete Admixture Handbook, Standard Publishers, and Distributors, Delhi.

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### **Cost Effective Building Technology**

#### COURSE OBJECTIVE:

To Understand the Definition, Concept & Objectives of the terms cost effective construction and green building. Apply cost effective techniques in construction. Apply cost effective Technologies and Methods in Construction.

#### **Course Content**

Branch	Subject Title	Subject Code MECTM-	Credit a	oject wise	
AA E (OTAA)	Cost Effective Building		L	- T-	Р
M.E.(CTM)	Technology	2214	3	_	-

#### Unit 1.

#### Concepts of low-cost materials

Soil, Fly ash, Ferrocement, Lime, Fibres, Stone Dust, Boulders and over size metal, Bitumen etc.

#### Unit 2.

### Low-cost building material products: -

- (a) Walls Stabilized and sun dried, soil blocks & bricks, Hollow concrete blocks, stone masonry blocks, Ferrocement partitions.
- (b) Roofs Precast R.C. Plank & Joists roof, Precast channel roof, Precast L-panel roof, Precast Funicular shells, Ferrocement shells, Filler Slab, Seasal Fiber roof, Improved country tiles, Thatch roof.

#### Unit 3.

### Low-cost construction Techniques and Equipment: -

- (a) Techniques: Rat trap bond construction, Precast R.C. and Ferrocement technique, Mud Technology.
- (b) Equipment's: Brick moulding machine, Stabilized soil block making machine and plants for the manufacturing of concrete blocks.

#### Unit 4.

#### Low-cost sanitation: -

- (a) Waste water disposal system
- (b) Low-cost sanitation for rural and urban areas
- (c) Ferrocement Drains

Unit 5.

#### Cost analysis and comparison: -

(a) Low-cost materials

(b) Low-cost techniques

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### **COURSE OUT COMES:**

After completion of this course, the student should be able to:

- 1. Understand the Definition, Concept & Objectives of the terms cost effective construction and green building.
- 2. Apply cost effective techniques in construction.
- 3. Apply cost effective Technologies and Methods in Construction.

#### Reference books:

- 1. Alternative Building Materials and Technologies K S Jagadeesh, B V Venkatta Rama Reddy & K S Nanjunda s Rao –New Age International Publishers
- 2. Integrated Life Cycle Design of Structures AskoSarja CRC Press
- 3. Non-conventional Energy Resources -D S Chauhan and S K Sreevasthava -
- 4. New Age International Publishers
- 5. Buildings How to Reduce Cost Laurie Backer Cost Ford
- Lynne Elizabeth, Cassandra Adams Alternative Construction: Contemporary Natural Building Methods", Softcover, Wiley & Sons Australia, Limited, John,2005
- 7. Givoni, "Man, Climate, Architecture, Van Nostrand, New York, 1976.
- 8. Charles J. Kibert, Sustainable Construction: Green Building Design and Delivery, John Wiley & Sons, 2005.
- 9. Eugene Eccli- Low Cost, Energy efficient shelter for owner & builder, Rodale Press, 1976

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### ELECTIVE- I (A)

## **Rural Construction Technology**

### **COURSE OBJECTIVE:**

To learn about the construction process of building and other important infrastructure.

#### **Course Content**

Branch M.E.(CTM)	Subject Title	Subject Code	Credit a	llotted sub	oject wise
	Rural Construction Technology	MECTM- 2215(A)	L	T	Р
			3	-	_

#### Unit 1.

Rural Development Planning and Concept of Appropriate Technology:

Scope; development plans; various approaches to rural development planning; concept of appropriate technology; role of civil engineering in rural development; organizational structures & management rural development programme/projects.

#### Unit 2

**Type of Rural Housing:** Brief study about rural housing and design of RCC, pattern of bamboo house, mud house, wooden house, and other low-cost housing structure. Govt. schemes for rural housing.

#### Unit 3.

Rural Road – Type of rural road, condition of rural roads, manufacturing process of rural road, Practices adopted for construction of rural roads. Culverts- Types of culverts, design, construction, piers, types of piers, bridges, types of bridges, waterway.

#### Unit 4.

Water harvesting structures: Gabian structure, percolation tank, Contour trench, check dam, stop dam, Bench Terracing, Zing terracing, trenching, Gully control.

#### Unit 5.

Rural Sanitation, health and hygiene: Design of low-cost rural toilets, design of pan, selection of site and disposal of waste. Sanitation and govt. Schemes like, Swachh Bharat Mission, Nirmal Bharat Abhiyan.

### **COURSE OUTCOMES:**

Students get to know about the various constructions related skills that are necessary for self-employment and job opportunity.

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#### **Reference Books:**

- A.G.Madhov Rao, D.S.Rama chandra Murthy, Appropriate Technologies for low cost Housing Oxford and IBH Publishing Co. Pvt .Ltd.
- 2. CBRI, Roorkee, Advances in Building Mat erials and Construction.
- 3. C. Satyanarayana Murthy, Design of Minor Irrigation and Canal Structures. Wiley Eastern Ltd.,
- 4. Yash Pal Bedi, A Hand book of Preventive and Social Medicine; Atam Ram & Sons, Delhi.
- 5. Document on Rural Road Development in India Volume 1& 2; Central Road Research Institute, New Delhi.
- 6. SB Watt, "Ferro cement Water Tanks and their Construction"; Intermediate Technology Publications Ltd., London.
- 7. Ariane Van Bureu," A Chinese Biogas Manual" I.T Publications, London.
- 8. GB Rai, Non-Conventional Energy Sources; Khanna Publishers, New Delhi.
- 9. Biogas Slurry Utilisation; Consortium on Rural Technology (CORT), New Delhi.
- 10. Sandy Chairn cross and Richard G Feachen Environmental Health Engineering in the topics; John Wiley & Sons, New York.
- 11. Bindeshwas Pathak, Sulabh Shauchalays-Hand Flush Water Seal Latrine; Sulabh Internationa, Patna.
- 12. Bindeshwari Pathak, Sulabh Shauchalaya-Astudy of Directed Chough; Sulabh International; Gandhi Marg, Patna.
- 13. Fores tg B. Wright, "Rural Water Supply & Sanitation; Wiley Eastern Private Ltd. New Delhi.

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#### ELECTIVE- I (B)

### Computer programming and applications

#### **Course Content**

Branch	Subject Title	Subject Code	Credit allotted subject w		
MAT (OTA)	Computer programming	MECTM- 2215(B)	L	T	Р
M.E.(CTM)	and applications		3	-	-

#### Unit 1.

### **Introduction to Computers:**

An overview of the functioning of computer, block diagram of computer system, I/O and auxiliary storage devices, machine, assembly and high-level languages, assemblers, compliers, interpreters.

Representation of information: Number systems-binary, octal, hexadecimal systems, character and codes-ASCII and EBCDIC.

Need for operating system, concepts of operating system, disk storage and its characteristics.

#### Unit 2.

### **Programming Language C:**

Introduction: History of C, Variable, Constants & Keywords in C, Operators in C, data types in C, instruction in C., Control Structures-Decision control structures, Loop control structures, case control structures., Functions - Scope rule of functions, parameter passing techniques.

Storage Classes in C, Introduction to C preprocessor-features of C, preprocessor, macro expansion, file inclusion, conditional compilation., Introduction to Pointers, Arrays - Initialization, arrays in terms of pointers, passing array to a function, multidimensional arrays, array of pointers., Strings- standard library string functions, two-dimensional array of characters., Structures - accessing structure elements, representation of structures in memory.

Enumerated data types, Fundamentals computer graphics, Points plotting, lines, curves, circles, fill in C.

#### Unit 3.

#### Simulation:

Basic concepts of simulation and modelling. Types of simulations - deterministic and stochastic and continuous and discrete simulations and their application. Monte-Carlo simulations, design methodology of a simulation system. Overview of simulation languages.

#### Unit 4.

#### Measurement and Control:

Overview of measurement system- transducer, signal conditioning and display/recording sub-systems. Output standards of signal conditioning systems. basic principles of digitizing the analog signals, facilities available and specifications of analog

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to digital converter cards in PC environment, programming for data acquisition and processing, outlines of digital control.

#### Unit 5.

#### CAD:

Familiarization with the use of drafting tool.

### Laboratory work:

- 1. Exercises on C programming.
- 2. Exercise on Graphics programming.
- 3. Design of Simulation for an Engineering System
- 4. Interfacing equipment for measurement of standard physical parameters.
- 5. Programming for data acquisition and analysis.

#### Reference Books:

- 1. P.K.Sinha; Computer Fundamentals -, BPB Publications
- 2. P.K.Sinha; Let Us C P.K.Sinha, BPB Publications
- 3. Byron S.Gottfried; Programming with C Schaum's Outline Series, Tata McGraw Hill
- 4. Geoffrey Gordon; System Simulation -
- 5. Mikell T.Groover; CAD/CAM -

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# ELECTIVE- I (C) Advanced Mathematics

#### **Course Content**

Branch	Subject Title	Subject Code MECTM-	Credit allotted subject wise		
M.E.(CTM)	Advanced Mathematics		L	T	Р
	Advanced Mathematics	2215(C)	3	-	-

#### Unit 1.

Numerical solution of Partial Differential Equation (PDE): Numerical solution of PDE of hyperbolic, parabolic and elliptic types by finite difference method.

#### Unit 2.

Integral transforms: general definition, introduction to Mellin, Hankel and Fourier transforms and fast Fourier transforms, application to transforms to boundary value problems in engineering.

#### Unit 3.

Integral equations: Conversion of Linear Differential equation (LDE) to an integral equation (IE), conversion of boundary value problems to integral equations using green's function, solution of Integral equation, IE of convolution type, Abel's IE, Integra differential equations, IE with separable variable, solution of Fredholm Equation with separable kernels, solution of Fredholm and Volterra equations by method of successive approximations.

#### Unit 4.

Calculus of Variation: Functionals and their Variational, Euler's equation for function of one and two independent variables, application to engineering problems.

#### Unit 5.

FEM: Variational functional, Euler Lagrange's equation, Variational forms, Ritz methods, Galerkin's method, descretization, finite elements method for one dimensional problem.

#### Reference Books:

- 1. CF Froberg, Introduction to numerical analysis.
- 2. SS Sastry, Introductory methods of numerical analysis
- 3. Krasnove, Kiselevanded Makarenho, Integral equations
- 4. Buchanan, Finite element Analysis (Schaum Outline S), TMH
- 5. Krishnamurthy, Finite element analysis, TMH
- 6. Higher Engineering Mathematics by B.V. Ramana, Tata Mc Hill.
- 7. Advance Engineering Mathematics by Ervin Kreszig, Wiley Easten Edd.
- 8. Applied Numerical Methods with MATLAB by Steven C Chapra, TMH
- 9. Numerical Methods in Engineering, Salvadori and Baron
- 10. Theory and problems of Numeric analysis (Schaum Outline S), TMH

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Lab. I

### **Course Content**

Branch	Subject Title	Subject Code	Credit allotted subject w		
M.E.(CTM)		MECTM- 2216	L	T	Р
	Lab. I		-	-	4

- Auto-CAD
- STAAD-Pro.
- Primavera
- Other Related Software's

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