ANNAMALAI UNIVERSITY

DEPARTMENT OF CIVIL AND STRUCTURAL ENGINEERING

M.E. (CONSTRUCTION ENGINEERING AND MANAGEMENT)

HAND BOOK

2017-18

DEPARTMENT OF CIVIL & STRUCTURAL ENGINEERING

VISION

The Department of Civil and Structural Engineering came into existence in the year 1978 with a vision to serve the industry, the profession and the society in general. The prime focus is to bring into limelight the inborn and untapped potential of the student fraternity and prepare them to face challenges of the future with confidence, courage and faith.

MISSION

The ultimate goal of the Department of Civil and Structural Engineering is to provide quality education to prepare nationally competitive students and trend setters for the future generation in the realm of technical education. The student should be able to assimilate the available theories, explore new frontiers to propound new theories which will result in improving the quality of the life of the people. It will also to develop their personality in a healthy way and to provide opportunity to acquire knowledge in state-of-the-art research; and to provide service to the university, engineering profession, and the public through consultancy services.

M.E. (CONSTRUCTION ENGINEERING AND MANAGEMENT)

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

The following program educational objectives are consistent with the university, college and department missions.

1. To prepare learner's with a sound foundation in the mathematical, scientific Engineering and Management fundamentals.
2. To prepare learner's to use effectively modern method and tools to solve the real life project management problem.
3. To prepare learner's for successful career in multinational organisation to excel in research.
4. To encourage motivate learner's for self-learning.

PROGRAMME OUTCOMES (PO)

On successful completion of the programme, the students will

PO 1: Identify the roles of individuals, companies and agencies involved in the construction process.

PO 2: Demonstrate an understanding of the contribution of the design disciplines processes.

PO 3: Employ appropriate practices to organize and image personnel, materials, equipment, cost, time and quality control and assurance of a construction project.

PO 4: Apply appropriate state-of-art electronic based technology to manage the construction process.

PO 5: Recognise the importance of implementing construction project safety strategies and jobsite procedures and create a construction project safety plan .

PO 6: Apply scheduling techniques to project planning activities and calculate necessary resource requirement throughout a construction projects.

PO 7:Analyse construction documents for planning and management, materials and equipment used to construction process.

PO 8: Identify the basic principles of mechanical, electrical and plumbing systems

PO 9: Understand the legal implications of contract, common and regulatory law to manage a construction projects and evaluate construction disputes based upon case facts and contract context.

PO10: Understand construction accounting and cost control techniques and risk management techniques

PO11: Demonstrate a method to plan measure and evaluate the facilities operational performance.

Mapping PO with PEO											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
PEO1	✓	✓	✓		✓	✓	✓			✓	
PEO2		✓	✓		✓	✓	✓	✓	✓	✓	
PEO3	✓	✓	✓	✓	✓		✓	✓		✓	✓
PEO4	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓

M.E. / M. Tech (Two-Year Full Time & Three-year Part Time)

DEGREE PROGRAMME

CHOICE BASED CREDIT SYSTEM (CBCS)

REGULATIONS

1. **Condition for Admission**
   Candidates for admission to the first year of the four-semester **M.E / M.Tech Degree programme in Engineering** shall be required to have passed B.E / B.Tech degree of Annamalai University or any other authority accepted by the syndicate of this University as equivalent thereto. They shall satisfy the condition regarding qualifying marks and physical fitness as may be prescribed by the syndicate of the Annamalai University from time to time. The admission for part time programme is restricted to those working or residing within a radius of **90 km** from Annamalainagar. The application should be sent through their employers.
2. **Branches of Study in M.E / M.Tech**
   The Branch and Eligibility criteria of programmes are given in **Annexure 1**
3. **Courses of study**
   The courses of study and the respective syllabi for each of the M.E / M. Tech programmes offered by the different Departments of study are given separately.
4. **Scheme of Examinations**
   The scheme of Examinations is given separately.
5. **Choice Based Credit System (CBCS)**
   The curriculum includes three components namely Professional Core, Professional Electives and Open Electives in addition to Thesis. Each semester curriculum shall normally have a blend of theory and practical courses.
6. **Assignment of Credits for Courses**
   Each course is normally assigned one credit per hour of lecture / tutorial per week and one credit for two hours or part thereof for laboratory or practical per week. The total credits for the programme will be 65.
7. **Duration of the programme**
   A student of **M.E / M.Tech** programme is normally expected to complete in four semesters for full-time / six semesters for part-time but in any case not more than four years for full-time / six years for part-time from the date of admission.
8. **Registration for courses**
   A newly admitted student will automatically be registered for all the courses prescribed for the first semester, without any option. Every other student shall submit a completed registration form indicating the list of courses intended to be credited during the next semester. This registration will be done a week before the last working day of the current semester. Late registration with the approval of the Dean on the recommendation of the Head of the Department along with a late fee will be done up to the last working day. Registration for the Thesis Phase - I and II shall be done at the appropriate semesters.

9. Electives

The student has to select two electives in first semester and another two electives in the second semester from the list of Professional Electives. The student has to select two electives in third semester from the list of Open Electives offered by the department/ allied department. A student may be allowed to take up the open elective courses of third semester (Full Time program) in the first and second semester, one course in each of the semesters to enable them to carry out thesis in an industry during the entire second year of study provided they should register those courses in the first semester itself. Such students should meet the teachers offering those elective courses themselves-for clarifications. No specific slots will be allotted in the time table for such courses.

Further, the two open elective courses to be studied in III semester (Full Time programme) may also be credited through the SWAYAM portal of UGC with the approval of Head of the Department concerned. In such a case, the courses must be credited before the end of III Semester.

10. Assessment

The break-up of continuous assessment and examination marks for theory courses is as follows:

First assessment (Mid-Semester Test-I)	:	10 marks
Second assessment (Mid-Semester Test-II)	:	10 marks
Third Assessment	:	5 marks
End Semester Examination	:	75 marks

The break-up of continuous assessment and examination marks for Practical courses is as follows:

First assessment (Test-I)	:	15 marks
Second assessment (Test-II)	:	15 marks
Maintenance of record book	:	10 marks
End Semester Examination	:	60 marks

The thesis Phase I will be assessed for 40 marks by a committee consisting of the Head of the Department, the guide and a minimum of two members nominated by the Head of the Department. The Head of the Department will be the chairman. The number of reviews must be a minimum of three per semester. 60 marks are allotted for the thesis work and viva voce examination at the end of the third semester. The same procedure will be adopted for thesis Phase II in the fourth semester.

11. Student Counsellors (Mentors)

To help the students in planning their course of study and for general advice on the academic programme, the Head of the Department will attach a certain number of students to a member of the faculty who shall function as student counsellor for those students throughout their period of study. Such student counsellors shall advise the students, give preliminary approval for the courses to be taken by the students during each semester, monitor their progress in SWAYAM courses / open elective courses and obtain the final approval of the Head of the Department.

12. Class Committee

For each of the semesters of M.E / M.Tech programmes, separate class committees will be constituted by the respective Head of the Departments. The composition of the class committees from first to fourth semesters for Full time and first to sixth semesters for Part-time will be as follows:

- Teachers of the individual courses.
- A Thesis coordinator (for Thesis Phase I and II) shall be appointed by the Head of the Department from among the Thesis supervisors.
- A thesis review committee chairman shall be appointed by the Head of the Department
- One Professor or Associate Professor, preferably not teaching the concerned class, appointed as Chairman by the Head of the Department.
- The Head of the Department may opt to be a member or the Chairman.
- All counselors of the class and the Head of the Department (if not already a member) or any staff member nominated by the Head of the Department may opt to be special invitees.

The class committee shall meet **three** times during the semester. The first meeting will be held within two weeks from the date of class commencement in which the type of assessment like test, assignment etc. for the third assessment and the dates of completion of the assessments will be decided.

The second meeting will be held within a week after the completion of the first assessment to review the performance and for follow-up action.

The third meeting will be held after all the assessments but before the University semester examinations are completed for all the courses, and at least one week before the commencement of the examinations. During this meeting the assessment on a maximum of 25 marks for theory / 40 marks for practical and project work will be finalized for every student and tabulated and submitted to the Head of the Department for approval and transmission to the Controller of Examinations.

13. Temporary Break Of Study

A student can take a one-time temporary break of study covering the current semester and / or the next semester with the approval of the Dean on the recommendation of the Head of the Department, not later than seven days after the completion of the mid-semester test. However, the student must complete the entire programme within the maximum period of **four years for Full time / six years for Part time.**

14. Substitute Assessments

A student who has missed, for genuine reasons accepted by the Head of the Department, one or more of the assessments of a course other than the end of semester examination may take a substitute assessment for any one of the missed assessments. The substitute assessment must be completed before the date of the third meeting of the respective class committees.

A student who wishes to have a substitute assessment for a missed assessment must apply to the Head of the Department within a week from the date of the missed assessment.

15. Attendance Requirements

The students with 75% attendance and above are permitted to appear for the University examinations. However, the Vice Chancellor may give a rebate / concession not exceeding 10% in attendance for exceptional cases only on Medical Grounds.

A student who withdraws from or does not meet the minimum attendance requirement in a semester must re-register and repeat the same semester in the subsequent academic years.

16. Passing and declaration of Examination Results

All assessments of all the courses on an absolute marks basis will be considered and passed by the respective results passing boards in accordance with the rules of the University. Thereafter, the controller of examinations shall convert the marks for each course to the corresponding letter grade as follows, compute the grade point average (GPA) and cumulative grade point average (CGPA) and prepare the mark sheets.

90 to 100 marks	Grade 'S'
80 to 89 marks	Grade 'A'
70 to 79 marks	Grade 'B'
60 to 69 marks	Grade 'C'
55 to 59 marks	Grade 'D'
50 to 54 marks	Grade 'E'
Less than 50 marks	Grade 'RA'
Withdrawn from the Examination	Grade 'W'

A student who obtains less than 30 / 24 marks out of 75 / 60 in the theory / practical examinations respectively or is absent for the examination will be awarded grade RA.

A student who earns a grade of S, A, B, C, D or E for a course is declared to have successfully completed that course and earned the credits for that course. Such a course cannot be repeated by the student.\

A student who obtains letter grade RA / W in the mark sheet must reappear for the examination of the courses.

The following grade points are associated with each letter grade for calculating the grade point average and cumulative grade point average.

S - 10; A - 9; B - 8; C - 7; D - 6; E - 5; RA - 0

Courses with grade RA / W are not considered for calculation of grade point average or cumulative grade point average.

A student can apply for re-totaling of one or more of his examination answer papers within a week from the date of issue of mark sheet to the student on payment of the prescribed fee per paper. The application must be made to the Controller of Examinations with the recommendation of the Head of the Department.

After the results are declared, mark sheets will be issued to the students. The mark sheet will contain the list of courses registered during the semester, the grades scored and the grade point average for the semester.

GPA is the sum of the products of the number of credits of a course with the grade point scored in that course, taken over all the courses for the semester, divided by the sum of the number of credits for all courses taken in that semester.

CGPA is similarly calculated considering all the courses taken from the time of admission.

17. Awarding Degree

After successful completion of the programme, the degree will be awarded with the following classifications based on CGPA.

For First Class with Distinction the student must earn a minimum of 65 credits within four semesters for full-time / six semesters for Part time from the time of admission, pass all the courses in the first attempt and obtain a CGPA of 8.25 or above.

For First Class, the student must earn a minimum of 65 credits within two years and six months for full-time / three years and six months for Part time from the time of admission and obtain a CGPA of 6.75 or above.

For Second class, the student must earn a minimum of 65 credits within four years for full-time / six years for Part time from the time of admission.

18. Ranking Of Candidates

The candidates who are eligible to get the M.E /M.Tech degree in First Class with Distinction will be ranked on the basis of CGPA for all the courses of study from I to IV semester for M.E / M.Tech full-time / I to VI semester for M.E / M.Tech part-time.

The candidates passing with First Class and without failing in any subject from the time of admission will be ranked next to those with distinction on the basis of CGPA for all the courses of study from I to IV semester for full-time / I to VI semester for M.E / M.Tech part-time.

19. Transitory Regulations

If a candidate studying under the old regulations M.E. / M.Tech could not attend any of the courses in his/her courses, shall be permitted to attend equal number of courses, under the new regulation and will be examined on those subjects. The choice of courses will be decided by the concerned Head of the department. However he/she will be permitted to submit the thesis as per the old regulations. The results of such candidates will be passed as per old regulations.

The University shall have powers to revise or change or amend the regulations, the scheme of examinations, the courses of study and the syllabi from time to time.

ANNEXURE - 1

S.No.	Department		Programme (Full Time & Part time)	Eligible B.E./B.Tech Programme *
1	**Civil Engineering**	i.	Environmental Engineering	B.E. / B.Tech – Civil Engg, Civil & Structural Engg, Environmental Engg, Mechanical Engg, Industrial Engg, Chemical Engg, BioChemical Engg, Biotechnology, Industrial Biotechnology, Chemical and Environmental Engg.
		ii.	Environmental Engineering & Management	
		iii.	Water Resources Engineering & Management	B.E. / B.Tech – Civil Engg, Civil & Structural Engg, Environmental Engg, Mechanical Engg, Agricutural anf irrigation Engg, Geo informatics, Energy and Environmental Engg.
2	**Civil & Structural Engineering**	i.	Structural Engineering	B.E. / B.Tech – Civil Engg, Civil & Structural Engg.
		ii.	Construction Engg. and Management	
		iii.	Geotechnical Engineering	
		iv.	Disaster Management & Engg.	
3	**Mechanical Engineering**	i.	Thermal Power	B.E. / B.Tech – Mechanical Engg, Automobile Engg, Mechanical Engg (Manufacturing).
		ii.	Energy Engineering & Management	B.E. / B.Tech – Mechanical Engg, Automobile Engg, Mechanical (Manufacturing) Engg, Chemical Engg

4	**Manufacturing Engineering**	i.	Manufacturing Engineering	B.E. / B.Tech – Mechanical Engg, Automobile Engg, Manufacturing Engg, Production Engg, Marine Materials science Engg, Metallurgy Engg, Mechatronics Engg, Industrial Engg.
		ii.	Welding Engineering	
		iii.	Nano Materials and Surface Engineering	B.E. / B.Tech – Mechanical Engg, Automobile Engg, Manufacturing Engg, Production Engg, Marine Materials science Engg, Metallurgy Engg, Chemical Engg
5	**Electrical Engineering**	i.	Embedded Systems	B.E. / B.Tech – Electrical and Electronics Engg, Electronics & Instrumentation Engg, Control and Instrumentation Engg, Information technology, Electronics and communication Engg, Computer Science and Engg
		ii.	Smart Energy Systems	B.E. / B.Tech – Electrical and Electronics Engg, Electronics and Instrumentation Engg, Control and Instrumentation Engg.
		iii.	Power System	B.E. / B.Tech – Electrical and Electronics Engg,
6	**Electronics & Instrumentation Engineering**	i	Process Control & Instrumentation	B.E. / B.Tech – Electronics and Instrumentation Engg, Electrical and Electronics Engg, Control and Instrumentation Engg, Instrumentation Engg
		ii.	Rehabilitative Instrumentation	B.E. / B.Tech – Electronics and Instrumentation Engg, Electrical and Electornics Engg, Electronics and communication Engg, Control and Instrumentation Engg,

				Instrumentation Engg, Bio Medical Engg, Mechatronics.
		iii.	Micro Electronics and MEMS	B.E. / B.Tech – Electronics and Instrumentation Engg, Electrical and Electronics Engg, Electronics and communication Engg, Control and Instrumentation Engg, Instrumentation Engg, Bio Medical Engg, Mechatronics, Telecommunication Engg
7	**Chemical Engineering**	i.	Chemical Engineering	B.E. / B.Tech – Chemical Engg, Petroleum Engg, Petrochemical Technology
		ii.	Food Processing Technology	B.E. / B.Tech - Chemical Engg, Food Technology, Biotechnology, Biochemical Engg, Agricultural Engg.
		iii.	Industrial Bio Technology	B.E. / B.Tech - Chemical Engg, Food Technology, Biotechnology, Leather Technology
		iv.	Industrial Safety Engineering	B.E. / B.Tech – Any Branch of Engineering
8	**Computer Science & Engineering**	i.	Computer Science & Engineering	B.E. / B.Tech - Computer Science and Engineering, Information Technology, Electronics and Communication Engg, Software Engineering
9	**Information Technology**	i	Information Technology	B.E. / B.Tech - Computer Science and Engineering, Information Technology, Electronics and Communication Engg, Software Engineering
10	**Electronics & Communication Engineering**	i.	Communication Systems	B.E. / B.Tech - Electronics and Communication Engg, Electronics Engg.

*** AMIE in the relevant discipline is considered equivalent to B.E**

M.E DEGREE PROGRAMME IN CONSTRUCTION ENGINEERING AND MANAGEMENT (FULL TIME) - (TWO YEAR DEGREE PROGRAMME)

COURSES OF STUDY AND SCHEME OF EXAMINATIONS

Sl. No	Category	Subject Code	Subject	L	T	P	CA	FE	Total	Credits
Semester – I										
1	PC - I	CEMC101	Mathematics for Engineers	4	-	-	25	75	100	3
2	PC - II	CEMC102	Modern Construction Materials	4	-	-	25	75	100	3
3	PC - III	CEMC103	Construction Project Management	4	-	-	25	75	100	3
4	PC - IV	CEMC104	Quality Control and Assurance in Construction	4	-	-	25	75	100	3
5	PE - I	CEME105	Elective-I	4	-	-	25	75	100	3
6	PE - II	CEME106	Elective-II	4	-	-	25	75	100	3
7	PC Lab - I	CEMP107	Advanced Construction Materials and Engineering Laboratory	-	-	3	40	60	100	2
			Total	**24**	**-**	**3**	**190**	**510**	**700**	**20**

Sl. No	Category	Subject Code	Subject	L	T	P	CA	FE	Total	Credits
Semester – II										
1	PC - V	CEMC 201	Computer Application in Construction Engineering and Planning	4	-	-	25	75	100	3
2	PC - VI	CEMC 202	Construction Equipment and Management	4	-	-	25	75	100	3
3	PC - VII	CEMC 203	Advanced Construction Methods for Special Structures	4	-	-	25	75	100	3
4	PC – VIII	CEMC 204	Safety in Construction	4	-	-	25	75	100	3
5	PE - III	CEME 205	Elective-III	4	-	-	25	75	100	3
6	PE - IV	CEME 206	Elective-IV	4	-	-	25	75	100	3
7	PC Lab – II	CEMP 207	Computing Techniques Laboratory	-		3	40	60	100	2
8	Seminar	CEMS 208	Seminar	-	-	2	100	-	100	1
			Total	**24**	**-**	**5**	**290**	**510**	**800**	**21**

Sl. No	Category	Subject Code	Subject	L	T	P	CA	FE	Total	Credits
S e m e s t e r – III										
1	OE - I	CEME 301	Open Elective – I	4	-	-	25	75	100	3
2	OE- II	CEME 302	Open Elective – II	4	-	-	25	75	100	3
3	Thesis	CEMT 303	THESIS Phase - I	-	4	-	40	60	100	4
4	Ind.T rain	CEMI 304	Industrial Training	-	-	*	100	-	100	2
			Total	**8**	**4**	**-**	**190**	**210**	**400**	**12**

*** Four weeks during the Summer vocation at the end of IInd Semester**

Sl. No	Category	Subject Code	Subject	L	T	P	CA	FE	Total	Credits
S e m e s t e r – IV										
1	Thesis	CEMT 401	THESIS Phase - II	-	8	-	40	60	100	12
			Total	**-**	**8**	**-**	**40**	**60**	**100**	**12**

L - Lecture; P - Practical; T – Thesis; CA – Continuous Assessment; FE – Final Examination

M.E DEGREE PROGRAMME IN CONSTRUCTION ENGINEERING AND MANAGEMENT (PART TIME) - (THREE YEAR DEGREE PROGRAMME)

COURSES OF STUDY AND SCHEME OF EXAMINATIONS

Sl. No	Category	Subject Code	Subject	L	T	P	CA	FE	Total	Credits	Equivalent course code in M.E. Full time
Semester – I											
1	PC - I	PCEMC 101	Mathematics for Engineers	4	-	-	25	75	100	3	CEMC 101
2	PC - II	PCEMC 102	Modern Construction Materials	4	-	-	25	75	100	3	CEMC 102
3	PC - III	PCEMC 103	Construction Project Management	4	-	-	25	75	100	3	CEMC 103
			Total	**12**	**-**	**-**	**75**	**225**	**300**	**9**	

Sl. No	Category	Subject Code	Subject	L	T	P	CA	FE	Total	Credits	Equivalent course code in M.E. Full time
Semester – II											
1	PC - IV	PCEMC 201	Quality Control and Assurance in Construction	4	-	-	25	75	100	3	CEMC 104
2	PC - V	PCEMC 202	Computer Application in Construction Engineering and Planning	4	-	-	25	75	100	3	CEMC 201
3	PC - VI	PCEMC 203	Construction Equipment and Management	4	-	-	25	75	100	3	CEMC 202
			Total	**12**	**-**	**-**	**75**	**225**	**300**	**9**	

Sl. No	Category	Subject Code	Subject	L	T	P	CA	FE	Total	Credits	Equivalent course code in M.E. Full time
Semester – III											
1	PC - VII	PCEMC 301	Advanced Construction Methods for Special Structures	4	-	-	25	75	100	3	CEMC 203
2	PE-I	PCEME 302	Elective-I	4	-	-	25	75	100	3	CEMP105
3	PE-II	PCEME 303	Elective-II	4	-	-	25	75	100	3	CEME106
4	PC Lab - I	PCEMP 304	Advanced Construction Materials and Engineering Laboratory	-	-	3	40	60	100	2	CEME107
			Total	**12**	**-**	**3**	**115**	**285**	**400**	**11**	

Sl. No	Category	Subject Code	Subject	L	T	P	CA	FE	Total	Credits	Equivalent course code in M.E. Full time
Semester – IV											
1	PC - VIII	PCEMC 401	Safety in Construction	4	-	-	25	75	100	3	CEMC 204
2	PE - III	PCEME 402	Elective-III	4	-	-	25	75	100	3	CEME 205
3	PE - IV	PCEME 403	Elective-IV	4	-	-	25	75	100	3	CEME 206
4	PC Lab - II	PCEMP 404	Computing Techniques Laboratory	-	-	3	40	60	100	2	CEMT 207
5	Seminar	PCEMS 405	Seminar	-	-	2	100		100	1	CEMS 208
			Total	**12**	**-**	**5**	**215**	**285**	**500**	**12**	

Sl. No	Category	Subject Code	Subject	L	T	P	CA	FE	Total	Credits	Equivalent course code in M.E. Full time
Semester – V											
1	OE - I	PCEME 501	Open Elective – I	4	-	-	25	75	100	3	CEME 301
2	OE- II	PCEME 502	Open Elective – II	4	-	-	25	75	100	3	CEME 302
3	Thesis	PCEMT 503	THESIS Phase - I	-	6	-	40	60	100	6	CEMT 303
4	Ind.T rain	PCEMI 304	Industrial Training	-	-	*	100	-	100	2	CEMI 304
			Total	**8**	**6**	**-**	**90**	**210**	**300**	**12**	

Sl. No	Category	Subject Code	Subject	L	T	P	CA	FE	Total	Credits	Equivalent course code in M.E. Full time
Semester – VI											
1	Thesis	PCEMT 601	THESIS Phase - II	-	8	-	40	60	100	12	CEMT401
			Total	**-**	**8**	**-**	**40**	**60**	**100**	**12**	

L - Lecture; P - Practical; T – Thesis; CA – Continuous Assessment; FE – Final Examination

PROFESSIONAL ELECTIVES (PE)

1. Forensic Engineering and Retrofitting of Structures
2. System Integration in Construction Engineering
3. Project Formulation and Appraisal
4. Contract Laws and Regulations
5. Construction Economics and Finance Management
6. Resource Management and Control in Construction
7. Construction Planning, Scheduling and Control
8. Advanced topics in Acoustics, Lighting and Ventilation
9. Information Technology for Construction Managers
10. Construction Workplace and Employees Behaviour
11. Advanced Concrete Technology

OPEN ELECTIVES (OE)

1. Geographic Information System in Construction Engineering and Management
2. Shoring, Scaffolding and Formwork
3. Value Engineering and Valuation
4. Energy Conservation Techniques in building Construction
5. Composite Construction
6. Advanced Construction Engineering Techniques
7. Prefabricated Structures
8. Public Health Engineering Structures
9. Research Methodology
10. Construction Personnel Management
11. Industries Organizational Psychology

CEMC101	MATHEMATICS FOR ENGINEERS	L	T	P
		4	0	0

COURSE OBJECTIVES:

- This course will provide the state – of – the - art knowledge about the theoretical background for modelling the real problems of construction management.

Basic Concepts of Probabilistic
Theory Probability - Random variables - Moments - Moment Generating Function - Standard distributions - Functions of Random variables - Two dimensional random variables - Correlation – Regression.

Estimation Theory
Principles of least squares - Multiple and partial Correlation – Regression - Estimation of parameters – Maximum likelihood Estimates - Method of moments.

Testing of Hypothesis
Sampling distributions - Tests based on Normal, t , Chi-square and F distributions - Analysis of variance - One way and Two way classifications.

Design of Experiments
Completely Randomised Design - Randomised Block Design - Latin Square Design – 22 Factorial Design

Queueing Theory
Single and Multiple server- Markovian Queueing models - Customer impatience – M/G/1 Queueing system - Queueing applications.

REFERENCES:

1. Taha, H.A., *Operations Research - An Introduction*, Prentice Hall of India Ltd. 1997.
2. Irwin Miller, John E Freund, *Probability and Statistics for Engineers*, Englewood Cliffs, Prentice-Hall, 1994
3. S C Gupta, V K Kapoor, *Fundamentals of Mathematical Statistics-A Modern Approach*, New Delhi, Sultan Chand, 1999.
4. Goel, Brahms, *Operations research*, 4th ENL and revised Edition Pragati Prakashan, 2000

COURSE OUTCOMES:

At the completion of the course students will be able to

1. Determinate probability and estimation of variables.
2. Determine the statistics value of each variable by using sampling techniques
3. Find the block design by using various design of Experiment method.
4. Determine the queue system using queuing theory.

Course objectives	Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	✓	✓				✓	✓				
CO2			✓		✓			✓	✓	✓	
CO3	✓	✓			✓				✓	✓	
CO4		✓		✓		✓				✓	✓

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CEMC102	MODERN CONSTRUCTION MATERIALS	L	T	P
		4	0	0

COURSE OBJECTIVES:

- To study and understand the properties of modern construction materials used in construction such as special concretes, metals, composites, water proofing compounds, non weathering materials, and smart materials.

Special Concretes
Concretes, Behaviour of concretes – Properties and Advantages of High Strength and High Performance Concrete – Properties and Applications of Fibre Reinforced Concrete, Self compacting concrete, Alternate Materials to concrete on high performance & high Strength concrete.

Metals
Types of Steels – Manufacturing process of steel – Advantages of new alloy steels – Properties and advantages of aluminium and its products – Types of Coatings & Coatings to reinforcement – Applications of Coatings.

Composites
Types of Plastics – Properties & Manufacturing process – Advantages of Reinforcedpolymers – Types of FRP – FRP on different structural elements – Applications of FRP- Cellular Cores – Geo-synthetics-. Polymers - Fibre reinforced plastic in sandwich panels – Adhesives and sealants. Structural elastomeric bearings, Moisture barriers Applications in civil engineering.

Other Materials
Thermal insulation and acoustic absorption materials- Recycled materials- Water Proofing Compounds – Non-weathering Materials – Flooring Materials – surface preparation materials.

Smart and Intelligent Materials
Types & Differences between Smart and Intelligent Materials – Special features – Case studies showing the applications of smart & Intelligent Materials.

REFERENCES:

1. Shan Somayaji, *Civil Engineering Materials*, 2nd Edition, Prentice Hall, 2001.
2. Michael S Mamlouk, John P Zaniewski, *Materials for Civil and Construction*

Engineers, Pearson Prentice Hall, 2006.
3. Kenneth N Derucher, George Panayiotis Korfiatis, A Samer Ezeldin, *Materials for Civil and Highway Engineers*, Prentice Hall, 1999.
4. Pierre-Claude, Aitkens, *High Performance Concrete*, E. & F.N. Spon, 1998.
5. Brain Culshaw, *Smart Structures and Materials*, ArtechHouse, London.
6. Adam M. Neville, *Properties of Concrete*, 5th Edition, Longman Sc and Tech Publishers, 2011.
7. Kumar Mehta. P. and Paulo J.M. Monteiro, *Concrete Microstructure, Properties and Materials*, McGraw Hill, 2006.

COURSE OUTCOMES:

At the completion of the course students will be able to

1. Know about the characteristics of new materials and application of field.

Course objectives	Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	✓	✓	✓			✓			✓		

CEMC103	CONSTRUCTION PROJECT MANAGEMENT	L	T	P
		4	0	0

COURSE OBJECTIVES:

- Student will be able to identify, analyze and implement suitable planning and management techniques create network, calculate project duration and optimize the time and minimize the cost implement resource allocation and control techniques plan and implement.

Basics of Management
Introduction to construction industries, concepts and need of management in construction. Modern scientific management, Management Functions, Management Styles.

Construction Project Planning
Project life cycle, identification, preparation, appraisal, detailed planning, implementation, Project delivery system, Leader ship and motivation for the project team- effect of project risk on organization role and responsibilities of project Manager, Role of Project Management Consultants, Web based project management, monitoring and control.

Project Scheduling
Construction Scheduling, Work break down structure, activity cost and time estimation in CPM, PERT, RPM (Repetitive Project Modelling) techniques. LOB technique, Mass haul diagrams. Precedence Network Analysis, software in Construction scheduling (MSP, primavera, Construction manager).

Project Controlling

Monitoring and Control, Crashing, Resource Levelling, Updating.

Construction Management

Site Mobilization: Demobilization aspects, various Resources management based on funds availability. Co-coordinating, communicating & reporting techniques. Application of MIS to construction. Training of Construction Managers.

Material Management: Scope, importance, objectives, functions of material management classification and codification of material, inventory control: need, function, economic order quantity.

Labour Management: Labour laws for construction projects, welfare measures for labours.

Equipment Management: Types of equipment and factors affecting selection, Functions of equipment management, owning and operating costs, Time-value of money concept, Economic life, safety, maintenance and repair of equipment.

REFERENCES:

1. Chitakara, *Construction Project Management Planning, Scheduling and Controlling*, Tata McGraw Hill, New Delhi, 2009.
2. Kumar Neeraj Jha, *Construction Project Management Theory & Practice*, Pearson, 2012.
3. Charles Patrick, *Construction Project planning & Scheduling*, Pearson, 2012
4. Chris Hendrickson, Tung Au, *Project Management Construction – Fundamental Concepts for Owners, Engineers, Architects and Builders*, Prentice Hall Inc, 2000.

COURSE OUTCOMES:

At the completion of the course students will be able to

1. Know about identify, analyze and implement suitable planning and management techniques and different delivery method of project.
2. Find project duration and optimize the time and minimize the cost implement resource allocation and control techniques plan and implement.

Course objectives	**Mapping with Programme Outcomes**										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	✓	✓	✓		✓	✓	✓				✓
CO2		✓	✓	✓		✓	✓			✓	

CEMC104	QUALITY CONTROL AND ASSURANCE IN CONSTRUCTION	L	T	P
		4	0	0

COURSE OBJECTIVES:

- This subject provides the organization of the construction activities with quality assurance

Introduction
Definition-Concept of quality-meaning of quality-design-conformance-performance-dimensions-factors influencing construction quality.

Quality Management
Fundamentals of quality management—function-inspection, control and enforcement-quality management system and method-quality circle-total quality management-quality management guidelines-responsibilities and authority

Quality Planning
Quality policy, objectives and methods- consumers' satisfaction-time completion-documents- process and products- quality cost- Taguchi's concept-codes and standards

Quality Control And Assurance
Objectives of quality control-appraisals- needs and techniques of quality control- critical, major failure aspects-failure mode and effect analysis-statistical process control-quality systems-quality audit- responsibilities and authorities in quality control and assurance

Quality Improvement Techniques
Selection of new materials-influencing drawings, detailing, specification, standardization-bid preparation- construction activity, environmental safety, social and environmental factors-natural causes and speed of construction-life cycle costing- value engineering and value analysis.

REFERENCES:

1. James, J.O.Brain, *Construction Inspection Handbook-Quality Assurance and Quality control*, Van Nostrand, New York, 1989.
2. SP 28: *Hand Book of Statistical Quality Control, Bureau of Indian Standards*, New Delhi.
3. Frank M Gryna, *Quality Planning and Analysis*, McGraw-Hill 2001
4. *International Standards Organization* – ISO 9001 and ISO 9004
5. Steven McCabe, *Quality Improvement Techniques in Construction*, Addison Wesley Longman Ltd, 1998
6. John L. Ashford, *The Management of Quality in Construction*, E &F.N.Spon, 1989.

COURSE OUTCOMES:

At the completion of the course students will be able to

1. Know about the quality system application of system
2. Implement ISO methods in company standards.

Course objectives	Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	✓	✓	✓		✓		✓		✓	✓	
CO2			✓				✓		✓		✓

CEMP107	ADVANCED CONSTRUCTION MATERIALS AND ENGINEERING LABORATORY	L	T	P
		0	0	3

COURSE OBJECTIVES:

This course provides a thorough knowledge of construction materials properties and selection by doing various tests on materials, based on IS standards and specifications.

Test Methods to cover the syllabus of CEMC 102 – Modern Construction Materials.

1) Concrete Mix Design by ACI, IS and BS methods.
2) Use of water reducing admixtures.
3) Use of accelerating/retarding admixtures in concrete
4) Non-Destructive Testing Methods - use of Rebound Hammer and Ultrasonic Pulse Velocity tester.
5) Preparation of reinforcement grill and casting of RCC beams (under-reinforced and over reinforced) and RCC columns.
6) Testing of reinforcement (Mild Steel, HYSD, and High Tensile) and prestressing strands.
7) Testing of masonry specimen (as per IS 1905)
8) Test on clear specimen of timber.
9) Bituminous Mix Design
10) Methods of sampling of construction material (as per IS Code)

COURSE OUTCOMES:

At the completion of the course students will be able to

1. Know about the material selection through the material testing.

Course objectives	Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	✓	✓				✓	✓				

CEMC201	COMPUTER APPLICATION IN CONSTRUCTION ENGINEERING AND PLANNING	L	T	P
		4	0	0

COURSE OBJECTIVES:

- This course introduces the preliminaries of the computer applications to planning the project.

Introduction
Overview of IT Applications in Construction – Construction process – Computerization in Construction – Computer aided Cost Estimation – Developing application with database software.

Optimization Techniques
Linear, Dynamic and Integer Programming - Branch and Bound Techniques – Application to Production Scheduling, Equipment Replacement, Material Transportation and Work Assignment Problems – Software applications.

Inventory Models
Deterministic and Probabilistic Inventory Models - Software applications.

Scheduling Application
PERT and CPM - Advanced planning and scheduling concepts – Computer applications – Case study.

Other Problems
Sequencing problems – Simulation – Enterprises – Introduction to ERP systems.

REFERENCES:

1. Boyd C Paulson, *Computer Applications in Construction*, McGraw-Hill, ©1995
2. Billy E Gillett, *Introduction to Operations Research-A Computer-Oriented Algorithmic Approach*, McGraw-Hill, ©1990.
3. Leslie Feigenbaum, *Construction Scheduling with Primavera Project planner*, Prentice Hall, © 2002.

COURSE OUTCOMES:
At the completion of the course students will be able to

1. Know about the preliminaries of the computer applications to planning and Scheduling, Simulation techniques in construction project.

Course objectives	**Mapping with Programme Outcomes**										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	✓	✓		✓		✓	✓			✓	

CEMC202	**CONSTRUCTION EQUIPMENT AND MANAGEMENT**	**L**	**T**	**P**
		4	**0**	**0**

COURSE OBJECTIVES:
- To study and understand the equipment management methods and equipment functional operation.

- To learn the applications of the equipment in construction projects. To enable the students familiarize with modern construction equipment and their applications.

Construction Equipment Cost

Introduction - Role of Construction Equipment - From Tools to Machines - Development of Earthmoving, Excavating, and Lifting Machines - Future of Heavy Construction Equipment. Cost of Owning and Operating Construction Equipment - Ownership Cost - Initial Cost - Depreciation - Investment (or Interest) Cost - Insurance Tax and Storage Costs - Total Ownership Cost - Cost of Operating Construction Equipment - Maintenance and Repair Cost - Tire Cost - Consumable Costs - Mobilization and Demobilization Cost - Equipment Operator Cost - Special Items Cost - Methods of Calculating Ownership and Operating Cost - Caterpillar Method - Corps of Engineers Method - Associated General Contractors of America (AGC) Method –Peurifoy/Schexnayder Method - Comparison of Costs Calculated by Different Methods.

Construction Equipment Management

Acquiring Construction Equipment - Financing Methods - Outright Cash Purchase - Conventional Financing Purchase – Leasing – Renting - Rent-to-Own (Rental Purchase) - Equipment Financing Comparison - Acquisition Comparison - Rental and Lease Contract - The Buy, Lease, or Rent Decision. Equipment Life and Replacement Procedures - Equipment Life - Physical Life - Profit Life - Economic Life - Replacement Analysis - Theoretical Methods - Practical Methods - Sensitivity Analysis on Theoretical Methods - Comparison and Discussion of Sensitivity Analysis Results - Replacement Equipment Selection - Replacement Decision Making.

Equipment for Earthwork

Introduction to Earthmoving - Earthmoving Materials -Soil Identification and Classification – SoilVolume-Change Characteristics - Spoil Banks - Estimating Earthwork Volume - Construction Use of the Mass Diagram – Problems. Selection of construction equipment – Tractors – Classification of equipment – Excavating and Lifting -Introduction - Hydraulic Excavators – Shovels – Draglines – Clamshells - Trenching and Trenchless Technology – Cranes – Problems. Loading and Hauling - Estimating Equipment Travel Time – Dozers – Loaders – Scrapers - Trucks andWagons – Problems. Compacting and Finishing - Principles of Compaction- Compaction Equipment and Procedures - Ground Modification - Grading and Finishing – Problems. Rock Excavation - Introduction - Drilling–Blasting– Rock Ripping - Estimating Production and Cost – Problems.

Equipment for Other Works

ProductionofAggregate, Concrete,andAsphalt Mixes - Production ofAggregate - Crushers – Feeders - Screening Equipment - Handling Equipment. Production of Concrete - Batching and Mixing Equipment - Hauling, Pouring and Pumping Equipment - Production ofAsphalt Mixes – Problems. PavingandSurfaceTreatments- Concrete Paving –Asphalt Paving and SurfaceTreatments - Pavement Repair and Rehabilitation - Problems. Compressed AirandWaterSystems - Introduction – CompressedAir Systems - Water Supply Systems – Problems. Drilling, Blasting And Tunnelling Equipment- Definition of terms, bits, Jackhammers, Drifters, wagon drills, che drills, piston drills, blast hole drills, shot drills, diamond drills, tunnelling equipment, selecting the drilling method equipment; selecting drilling pattern; Rates for drilling rock, compressors. Pile driving equipment: Pile hammers, selecting a pile hammer, loss of energy due to impact, Energy losses due to causes other than impact.

Equipment Scheduling

Horizontal Construction Projects – Introduction – Background - Precedence Diagramming Method - Determining the Critical Path - Critical Resource Identification - Resource Loading the Schedule - Cost Loading the Schedule -Linear Scheduling Method - Identifying Production-Driven Activities - Establishing Production Rates - Lines, Bars, and Blocks - Converting to PDM - Developing Equipment Resource Packages (Crews) - Rules for Developing Crew Sizes - Developing Crew Costs - Establishing Project Management Assessment Parameters - Minimum Required Daily Production - Expected Daily Production - Allowable Cycle Time Variation - Cost and Unit Targets.

Vertical Construction – Introduction- Lifting and Vertical Constructions - Lifting Productivity - Scheduling Lifting for High-Rise Work - Lifting Strategy - Typical Lifting Activities for High-Rise Construction - Concrete-Placing Cranes - Bucket Pouring – Pumping - Scheduling and Ordering Concrete -Tower Crane Erection and Dismantling.

REFERENCES:

1. Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C., *Construction Planning, Equipment and Methods*, 6th Edition, Tata McGraw-Hill, New Delhi, 2003
2. Sharma S.C., *Construction equipment and management*, Khanna Publishers, New Delhi, 2011.
3. Douglas D. Gransberg, Calin M. Popescu,Richard C. Ryan, *Construction Equipment Management for Engineers, Estimators, and Owners*, Taylor & Francis Group, New York, 2006.
4. S. W. Nunnally, *Construction Methods and Management*, Pearson Prentice Hall, New Jersey, 2007

COURSE OUTCOMES:

At the completion of the course students will be able to

1. Know about the equipment in construction projects with modern construction equipment and their applications.

Course objectives	Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	✓	✓	✓		✓	✓	✓				

CEMC203	ADVANCED CONSTRUCTION METHODS FOR SPECIAL STRUCTURES	L	T	P
		4	0	0

COURSE OBJECTIVES:

- This course provides a thorough knowledge about the construction methods and techniques for various kinds of special structures.

Introduction

Types of Special Structures: According to - location/environment, design, strength, radiation shielding, shape, aesthetic appearance, type of construction methods and techniques

Bridge Structures
Bridges, steel bridges, arch bridges, cantilever bridges, box girders. Construction of special type of bridges - cable stayed bridge, suspension and pre-stressed bridge. Segmental construction, cantilever construction, incremental construction, successive launching and pushing of box decks.

Underground Structures
Pipe lines, bedding of conduits. Trenchless technology. Tunnelling methods – mechanical boring, cut and cover construction, drilling and blasting, tunnel driving in hard & soft strata and TBM tunnelling. Tunnel forming components, safety in tunnelling operations.
Construction of Metro Railway structures - Underground and over ground structures, Viaduct Ground anchoring & diaphragm walls, launching gantry crane. Problems and solutions – during maintenance and up-keep of structures. Fire, Ventilation, Dewatering, power supply, Subsidence, Vibration.

Marine Structures
Off shore structures - beacons, oil drilling platforms, jetties and break water structures. Dredging equipments and techniques for construction of channels and islands. Laying operations for built up off-shore system. Underwater concreting using tremie method, underwater construction- problems encountered, caisson well sinking methods – conventional and jack down methods.

High Rise Structures and Power Plant Structures
Construction methods and techniques for high-rise buildings, continuous concreting erection of prefabricated components on tall structures, tunnel form, launching techniques for heavy decks, Slip form, jump form, dry wall technology. Fire fighting and safety. Construction Sequence and methods in Cooling towers, Silos, Chimney.
Construction methods for power generating structures. Thermal power stations, Atomic power stations. Windmills, chimneys (single and multi-flue). Cooling towers - Natural Draft Cooling Towers (NDCT) & Induced Draft Cooling Tower (IDCT). Ash handling system, containment structure, Electro Static Precipitator (ESP). Installing major components inside the reactor and containment building.
Energy management - power factor, management of maximum demand, energy savings in(pumps & equipments, compressed air systems, fans, lighting system, air conditioning system) construction projects.

REFERENCES:

1. Jerry Irvine, *Advanced Construction Techniques*, California Rocketry, 1984.
2. Illingworh. J R, *Construction Methods and Planning*, E& FN Spon, 2000.
3. Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C., *Construction Planning, Equipment and Methods*, McGraw Hill, Singapore, 2006.
4. Sankar.S.K and Saraswati.S *Construction Technology* Oxford University Press, NewDelhi 2008.
5. *National Building Code of India*, *Part-IV and VII* – 2006.

COURSE OUTCOMES:
At the completion of the course students will be able to

1. Know about the advanced construction methods with special structures and their applications.

Course objectives	Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	✓	✓				✓	✓				

CEMC204	SAFETY IN CONSTRUCTION	L	T	P
		4	0	0

COURSE OBJECTIVES:

- This course provides a thorough knowledge about the organization of safety in construction.

Construction Accidents
Accidents and their Causes – Human Factors in Construction Safety - Costs of Construction Injuries – Occupational and Safety Hazard Assessment – Legal Implications

Construction Safety Management
Role of various parties, duties and responsibilities of top management, site managers, supervisors etc. role of safety officers, responsibilities of general employees, safety committee, safety training, incentives and monitoring. Writing safety manuals, preparing safety checklists and inspection reports.

Safety in Construction Operations
Safety of accidents on various construction sites such as buildings, dams, tunnels, bridges, roads, etc. safety at various stages of construction. Prevention of accidents. Safety measures. Safety in use of construction equipment e.g. vehicles, cranes, hoists and lifts etc. safety of scaffolding and working platforms. Safety while using electrical appliances. Explosives used.

Various Safety Equipment And Gear Used On Site
First aid on site, Safety awareness program. Labour laws, legal requirement and cost aspects of accidents on site, Incentive for safety practices.

Study Of Safety Policies
Methods, equipment, training provided on any ISO approved construction Company, safety in office, working on sites of high rise construction, deep excavation.

REFERENCES:

1. *Construction safety manual* published by National Safety Commission of India.
2. *Safety Management in Construction Industry – A manual for project managers*. NICMAR Mumbai.
3. Davies V.S.Thomasin K, *Construction Safety Handbook*, Thomas Telford, London.
4. *ISI for safety in Construction* – Bureau of Indian Standards.

5.Girimaldi and Simonds, "*Safety management*" –, AITBS, New Delhi.
6. Jimmie Hinze, *Construction safety*, Prentice-Hall, ©1997.
7. Herbert William Heinrich*, Industrial Accident Prevention*, McGraw-Hill, 1950

COURSE OUTCOMES:
At the completion of the course students will be able to

1. Students can able to know about the safety in and their applications.

Course objectives	Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	✓	✓			✓					✓	

CEMP207	COMPUTING TECHNIQUES LABORATORY	L	T	P
		0	0	3

COURSE OBJECTIVES:

- This course provides a thorough knowledge various computer application apply in construction Projects.

1. Quantity takeoff, Preparation and delivery of the bid or proposal of an Engineering construction project.
2. Design of a simple equipment information system for a construction project.
3. Scheduling of a small construction project using Primavera scheduling systems including reports and tracking.
4. Scheduling of a small construction project using tools like MS project scheduling systems including reports and tracking.
5. Simulation models for project risk analysis.

COURSE OUTCOMES:
At the completion of the course students will be able to

1. Know about the Computer application of estimation of quantity, Planning, Scheduling, Resource allocation and levelling and simulation techniques in construction projects

Course objectives	Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	✓			✓		✓	✓			✓	

CEMS208	SEMINAR	L	T	P
		0	0	3

COURSE OBJECTIVES:

- To work on a technical topic related to Construction Engineering and Management, acquire the ability of written and oral presentation
- To acquire the ability of writing technical papers for Conferences and Journals

The students will work for two periods per week guided by student counsellor. They will be asked to present a seminar of not less than fifteen minutes and not more than thirty minutes on any technical topic of student's choice related to Construction Engineering and Management to engage in discussion with audience. They will defend their presentation. A brief copy of their presentation also should be submitted. Evaluation will be done by the student counsellor based on the technical presentation and the report and also on the interaction shown during the seminar.

COURSE OUTCOMES:

1. The students will be getting the training to face the audience and to interact with the audience with confidence.
2. To tackle any problem during group discussion in the corporate interviews.

Course objectives	Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	✓	✓				✓	✓				

CEMT303	THESIS PHASE-I	L	T	P
		0	3	0

COURSE OBJECTIVES:

- To identify a specific problem for the current need of the society and collecting information related to the same through detailed review of literature.
- To develop the methodology to solve the identified problem.
- To train the students in preparing project reports and to face reviews and viva-voce examination.

The student individually works on a specific topic approved by the Head of the Department under the guidance of a faculty member who is familiar in this area of interest. The student can select any topic which is relevant to the area of Construction Engineering and Management. The topic may be theoretical or case studies. At the end of the semester, a detailed report on the work done should be submitted which contains clear definition of the identified problem, detailed literature review related to the area of work and methodology for

carrying out the work. The students will be evaluated through a viva-voce examination by a panel of examiners including one external examiner.

COURSE OUTCOMES:

At the completion of the course students will be able to

1. Know about specific problem in construction

Course objectives	Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	✓	✓				✓	✓				

CEMI304	INDUSTRIAL TRAINING	L	T	P
		0	0	3

COURSE OBJECTIVES:

- To train the students in the field work related the Construction Engineering and Management to have a practical knowledge in carrying out Construction Engineering and Management field related works.
- To train and develop skills in solving problems during execution of certain works related to Structural Engineering.

The students individually undergo a training program in reputed concerns in the field of Construction Engineering and Management during the summer vacation (at the end of second semester for full – time / fourth semester for part – time) for a minimum stipulated period of four weeks. At the end of the training, the student has to submit a detailed report on the training he had, within ten days from the commencement of the third semester for Full-time / fifth semester for part-time. The students will be evaluated by a team of staff members nominated by head of the department through a viva-voce examination.

COURSE OUTCOMES:

1. The students can face the challenges in the practice with confidence.
2. The student will be benefited by the training with managing the situation arises during the execution of works related to Construction Engineering and Management.

Course objectives	Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	✓	✓				✓	✓				

CEMT401	THESIS PHASE-II	L	T	P
		0	3	0

COURSE OBJECTIVES:

- To solve the identified problem based on the formulated methodology.
- To develop skills to analyze and discuss the test results, and make conclusions.

The student should continue the phase I work on the selected topic as per the formulated methodology under the same supervisor. At the end of the semester, after completing the work to the satisfaction of the supervisor and review committee, a detailed report should be prepared and submitted to the head of the department. The students will be evaluated through based on the report and the viva-voce examination by a panel of examiners including one external examiner.

COURSE OUTCOMES:
At the completion of the course students will be able to

1. To identify a specific problem for the current need of the society and collecting information related to the same through detailed review of literature.
2. To develop the methodology to solve the identified problem.
3. To train the students in preparing project reports and to face reviews and viva-voce examination.

Course objectives	Mapping with Programme outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	✓	✓				✓	✓				
CO2			√		√			√			
CO3						√			√	√	

PROFESSIONAL ELECTIVES

CEMEXXX	FORENSIC ENGINEERING AND RETROFITTING OF STRUCTURES	L	T	P
		0	0	3

COURSE OBJECTIVES:

- This course provides a thorough knowledge various Repair, Rehabilitation and Maintenance techniques application in construction Projects.

Durability and Deterioration of Concrete
Plastic Shrinkage - Plastic Settlement - Drying Shrinkage - Thermal Movement - Freez and Thaw - Weathering - Carbonation - Sulphate Action - Alkali-Aggregate Reaction.

Acids - Crazing - Honey Combing - Popouts - Creep - Abrasion - Erosion and Cavitation - Fire - Sub-grade Movement - Formwork Movement - Premature Removal of Forms / Shores - Rebar Corrosion - Poor Design Details - Errors in Design.

Investigation and Diagnosis
General Considerations - Observation - Questioning - Field and Laboratory Testing - Destructive Testing - Non-Destructive Testing - Rebound Hammer - Ultrasonic Pulse Velocity - Pachometer - Semi-Destructive Testing - Probe Test - Pull-Out Test - Pull-Off Test - Break-Off Test - Core Test - Half-Cell Potential Measurements - Resistivity Measurements - Dust Sampling - Carbonation Depth Testing - Tests for determining cement content, chloride content and sulphate content.

Repair Materials
Patching Materials - Resurfacing Materials - Sealing Materials - Water-Proofing Materials - Admixtures - Substrate Preparation.

Refurbishment and Protection Techniques
Routing and Sealing - Stitching - External Stressing - Resin Injection - Grouting - Blanketing - Overlays - Sprayed Concrete - Prepacked Concrete – Dry packing - Jacketing - Plate Bonding - Protective Coatings - Autogenous Healing - Vacuum Impregnation - Chloride Extraction - Realkalization of Concrete - Cathodic Protection.

REFERENCES

1. Peter H.Emmons, *Concrete Repair and Maintenance*, Galgotia Publishers, 2001.
2. S.Champion, *Failure and Repair of Concrete Structures*, John Wiley & Sons, 1990.
3. Ted Kay, Assessment and Renovation of Concrete Structures, Longman Scientific & Technical, 1992.
4. R.T.L.Allen and S.C.Edwards, *The Repair of Concrete Structures*, Blackie &Son Ltd.V.K.1987.
5. Sidney M.Johnson, *Deterioration, Maintenance and Repair of Concrete Structures*, McGraw- Hill Book Company, 1992
6. P.H.Perkins, *Repair, Protection and Waterproofing of Concrete Structures*, E & FN Spon, 1997.
7. R.N.Raikar, *Diagnosis and Treatment of Structures in Distress*, Structwel, D & C Pvt. Ltd.
8. N.P.Mailvaganam, *Repair and Protection of Concrete Structures*, CRC Press, 1992.

COURSE OUTCOMES:
At the completion of the course students will be able to

1. Students can able to know about the the organization of safety in construction and their applications.

Course objectives	**Mapping with Programme outcomes**										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1		✓									✓

CEMEXXX	SYSTEM INTEGRATION IN CONSTRUCTION ENGINEERING	L	T	P
		4	0	0

COURSE OBJECTIVES:

- This course provides a thorough knowledge and understand the construction system integration, environmental factors, services, maintenance and safety systems.in construction Engineering.

Structural Integration
Structural System, Systems for enclosing Buildings, Functional aesthetic system, Materials Selection and Specification.

Environmental Factors
Qualities of enclosure necessary to maintain a specified level of interior environmental quality – weather resistance – Thermal infiltration – Acoustic Control – Transmission reduction – Air quality – illumination – Relevant systems integration with structural systems.

Services
Plumbing – Electricity – Vertical circulation and their interaction – HVAC.

Maintenance
Component longevity in terms of operation performance and resistance to deleterious forces - Planning systems for least maintenance materials and construction – access for maintenance – Feasibility for replacement of damaged components – equal life elemental design – maintenance free exposed and finished surfaces.

Safety
Ability of systems to protect fire – Preventive systems – fire escape system design – Planning for pollution free construction environmental – Hazard free Construction execution.

REFERENCES

1. A.J.Elder and MartizVindenBarg, *Handbook of Building Enclosure*, McGraw-Hill Book Company, 1983.
2. David V.Chadderton, *Building Services Engineering*, Taylar and Francis, 2007.
3. Jane Taylor and Gordin Cooke, *the Fire Precautions Act in Practices*, 1987.
4. Peter R. Smith and Warren G. Julian, *Building Services*, Applied Science Publishers Ltd., London, 1993.
5. William T. Mayer, *Energy Economics and Building Design*, McGraw-Hill Book Company, 1983.

COURSE OUTCOMES:
At the completion of the course students will be able to

1. Students can able to know about the system integration, influence of environmental factors, services and maintenance in construction Engineering.

Course objectives	Mapping with Programme outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	✓	✓						✓			

CEMEXXX	PROJECT FORMULATION AND APPRAISAL	L	T	P
		4	0	0

COURSE OBJECTIVES:

- This course provides a thorough knowledge understand the formulation, costing of construction projects, appraisal, finance and private sector participation in construction Industry.

Project Formulation
Project – Concepts – Capital investments - Generation and Screening of Project Ideas - Project identification – Preliminary Analysis, Market, Technical, Financial, Economic and Ecological - Pre-Feasibility Report and its Clearance, Project Estimates and Techno-Economic Feasibility Report, Detailed Project Report – Different Project Clearances required.

Project Costing
Project Cash Flows – Time Value of Money – Cost of Capital.

Project Appraisal
NPV – BCR – IRR – ARR – Urgency – Pay Back Period – Assessment of Various Methods – Indian Practice of Investment Appraisal – International Practice of Appraisal – Analysis of Risk – Different Methods – Selection of a Project and Risk Analysis in Practice.

Project Financing
Project Financing – Means of Finance – Financial Institutions – Special Schemes – Key Financial Indicators – Ratios.

Private Sector Participation
Private sector participation in Infrastructure Development Projects - BOT, BOLT, BOOT - Technology Transfer and Foreign Collaboration - Scope of Technology Transfer.

REFERENCES:

1. Barcus, S.W. and Wilkinson.J.W., *Hand Book of Management Consulting Services*, McGraw Hill, New York, 1986.
2. Joy P.K., Total Project Management - The Indian Context, New Delhi, Macmillan India Ltd., 1992
3. Prasanna Chandra, *Projects – Planning, Analysis, Selection, Implementation Review*, McGraw Hill Publishing Company Ltd., New Delhi. 2006.
4. United Nations Industrial Development Organisation (UNIDO) *Manual for the Preparation of Industrial Feasibility Studies*, (IDBI Reproduction) Bombay, 1987.

COURSE OUTCOMES:
At the completion of the course students will be able to

1. Students can able to know about the formulation, costing of construction projects, appraisal, finance and private sector participation in construction Industry.

Course objectives	Mapping with Programme outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	✓						✓		✓	✓	

CEMEXXX	CONTRACT LAWS AND REGULATIONS	L	T	P
		4	0	0

COURSE OBJECTIVES:

- This course provides a thorough knowledge invarious types of construction contracts and their legal aspects and provisions, tenders, arbitration, legal requirement, and labor regulations in national and internationalconstruction Projects.

Construction Contracts
Indian Contracts Act – Elements of Contracts – Types of Contracts – Features – Suitability – Design of Contract Documents – International Contract Document – Standard Contract Document – Law of Torts.

Tenders
Prequalification – Bidding – Accepting – Evaluation of Tender from Technical, Contractual and Commercial Points of View – Contract Formation and Interpretation – Potential Contractual Problems – World Bank Procedures and Guidelines – Tamilnadu Transparency in Tenders Act.

Arbitration
Comparison of Actions and Laws – Agreements – Subject Matter – Violations – Appointment of Arbitrators – Conditions of Arbitration – Powers and Duties of Arbitrator – Rules of Evidence – Enforcement of Award – Costs.

Legal Requirements
Insurance and Bonding – Laws Governing Sale, Purchase and Use of Urban and Rural Land – Land Revenue Codes – Tax Laws – Income Tax, Sales Tax, Excise and Custom Duties and their Influence on Construction Costs – Legal Requirements for Planning – Property Law – Agency Law – Local Government Laws for Approval – Statutory Regulations.

Labour Regulations
Social Security – Welfare Legislation – Laws relating to Wages, Bonus and Industrial Disputes, Labor Administration – Insurance and Safety Regulations – Workmen's Compensation Act – Indian Factory Act – Tamilnadu Factory Act – Child Labor Act - Other Labor Laws.

REFERENCES:

1. Gajaria G.T., *Laws Relating to Building and Engineering Contracts in India*,
2. Jimmie Hinze, *Construction Contracts*, McGraw Hill, 2001.
3. Joseph T. Bockrath, *Contracts and the Legal Environment for Engineers and Architects*, McGraw Hill, 2000.
4. Kwaku, A., Tenah, P.E. Jose M.Guevara, P.E., *Fundamentals of Construction Management and Organisation*, Printice Hall, 1985.M.M.Tripathi Private Ltd., Bombay, 1982.
5. Patil. B.S, *Civil Engineering Contracts and Estimates*, Universities Press (India) Private Limited, 2006.

COURSE OUTCOMES:

At the completion of the course students will be able to

1. Students can able to know about the contracts and their legal aspects and provisions, tenders, arbitration, legal requirement, and labor regulations in national and internationalconstruction Projects.

Course objectives	**Mapping with Programme outcomes**										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1		✓					✓		✓		

CEMEXXX	**CONSTRUCTION ECONOMICS AND FINANCE MANAGEMENT**	**L**	**T**	**P**
		4	**0**	**0**

COURSE OBJECTIVES:

- This course explores the need for engineering economics and financing and overview the accounting methods.

Economics

Interests and time value consideration-depreciation, tax, inflation-lifecycle cost analysis-approached to asset valuation-resource allocation decision for asset management-cost of construction resources-cost of construction, land and administration-contingencies provisions and management

Financing

Need for financial management-types of financing-short term borrowing-long term borrowing-leasing-equity financing-internal generation of funds-external commercial borrowing-assistance from government budgeting support and international finance corporation.

Analysis of Finance

Analysis of financial statements-balance sheet-profit and loss account-cash flow and fund flow analysis-ratio analysis-investment and financing-financial control-job control and centralized management.

Accounting Method
Basics of accounting method - budget and budgeting - site accounts-joint venture, project financial packaging, fund mobilization - accounting for tax reporting purposes and financial reporting purpose.

Lending to Contractors
Loans to contractors-work package breakdown-subcontracting and purchasing.

REFERENCES:

1. Cormican.D., *Construction Management, Planning and Finance Construction* press, London, 1985.
2. G J Thuesen,W J Fabrycky, *Engineering Economy*, Prentice Hall, ©2001.
3. Anthony J Tarquin, Leland T Blank, *Engineering Economy-A Behavioral Approach,* McGraw-Hill, 1976.
4. R L Peurifoy, *Solutions to Problems in Estimating Construction Costs*, McGraw-Hill, ©1975

COURSE OUTCOMES:
At the completion of the course students will be able to

1. know about the Finance, Economics, Accounting and Leading to contractor in construction industries.

Course objectives	**Mapping with Programme outcomes**										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	✓	✓					✓		✓	✓	

CEMEXXX	**RESOURCE MANAGEMENT AND CONTROL IN CONSTRUCTION**	**L**	**T**	**P**
		4	**0**	**0**

COURSE OBJECTIVES:

- This course provides a thorough knowledge in resource allocation and levelling in construction Projects.

Resource Planning
Resource Planning, Procurement, identification, Personnel, Planning for material, Labour, time schedule and cost control. Types of resources, manpower, Equipment, Material, Money, Time.

Resource Allocation and Levelling
Time-cost trade of, Computer application in resource leveling examples, resource list, resource allocation graph, Resource loading, Cumulative cost ETC – Value Management.

Resources Management
Systems approach in resource management, characteristics of resources, Resources, Utilization, measurement of actual resources required. Tools for measurement of resources-Labour- classes of Labour-Cost of Labour- Labour Schedule- optimum use Labour.

Materials and Equipment
Time of purchase- Quantity of material- sources- Transportation- Delivery and Distribution. Planning and selecting by optimistic choice with respect to cost- Time- Source and handling.

Time

Personnel time- Management and planning - Managing time on the project - forecasting the future - Critical path measuring the changes and their effects.

Cost control: Cash flow and cost control - objectives of cost - Time and Quality.

REFERENCES:

1. Andrew D, Szilagg, *Hand Book of Engineering Management*, 1982.
2. Richard H. Clough, Glenn A. Sears, *Construction Project Management* 2nd Edition, Wiley, © 1979.
3. Harvey A Levine*, Project Management using Microcomputers Osborne*,McGraw-Hill, ©1986
4. James J Adrian, *Quantitative Methods in Construction Management Construction Systems*, Pub. Co., ©1973
5. R Oxley, J Poskitt, *Management Techniques Applied to the Construction Industry* ,Blackwell Science, 1996

COURSE OUTCOMES:

At the completion of the course students will be able to

1. know about the resource planning, allocation and leveling techniques in single and multi-projects.

Course objectives	**Mapping with Programme outcomes**										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	✓	✓			✓	✓	✓				

CEMEXXX	**CONSTRUCTION PLANNING, SCHEDULING AND CONTROL**	**L**	**T**	**P**
		4	**0**	**0**

COURSE OBJECTIVES:

- To study and understand the concept of planning, scheduling, cost in construction, organization and use of project information necessary for construction project.

Construction Planning

Basic Concepts in the Development of Construction Plans – Choice of Technology and Construction Method – Defining Work Tasks – Defining Precedence Relationships among Activities – Estimating Activity Durations – Estimating Resource Requirements for Work Activities – Coding Systems.

Scheduling Procedures and Techniques

Construction Schedules – Critical Path Method – Scheduling Calculations – Float – Presenting Project Schedules – Scheduling for Activity-on-Node and with Leads, Lags, and Windows – Scheduling with Resource Constraints and Precedences

Use of Advanced Scheduling Techniques – Scheduling with Uncertain Durations – Calculations for Monte Carlo Schedule Simulation – Crashing and Time/Cost Tradeoffs – Improving the Scheduling Process.

Cost Control, Monitoring and Accounting
The Cost Control Problem – The Project Budget – Forecasting for Activity Cost Control – Financial Accounting Systems and Cost Accounts – Control of Project Cash Flows –Schedule Control – Schedule and Budget Updates – Relating Cost and Schedule Information.

Organization and Use of Project Information
Types of Project Information – Accuracy and Use of Information – Computerized Organization and Use of Information – Organizing Information in Databases – Relational Model of Databases – Other Conceptual Models of Databases – Centralized Database Management Systems – Databases and Applications Programs – Information Transfer and Flow.

REFERENCES:

1. Calin M. Popescu, ChotchaiCharoenngam, Project Planning, Scheduling and Control in Construction: An Encyclopedia of terms and Applications, Wiley, New York, 1995.
2. Chitkara, K.K. Construction Project Management: Planning, Scheduling and Control, McGrawHill Publishing Company, New Delhi, 1998.
3. Chris Hendrickson and Tung Au, Project Management for Construction – Fundamental Concepts for Owners, Engineers, Architects and Builders, Prentice Hall, Pittsburgh, 2000.

COURSE OUTCOMES:
At the completion of the course students will be able to

1. know the development of construction planning, scheduling procedure and controls.

Course objectives	Mapping with Programme outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	✓	✓				✓	✓			✓	

CEMEXXX	ADVANCED TOPICS IN ACOUSTICS, LIGHTING AND VENTILATION	L	T	P
		4	0	0

COURSE OBJECTIVES:

- To Study acoustics, lighting and ventilation construction industries.

Acoustics
Sound – Velocity of sound – Frequency and intensity of sound – Reflection of sound – Reverberation –Absorption of sound – Sabin's equation – Absorption materials – Conditions for good acoustics – Design of an auditorium – Defects in an auditorium and their remedies

Acoustics of studies – Noise and its effects – Type of noises – Transmission of noise – Sound insulation –Transmission loss – Acceptable noise levels – Method of sound insulation.

Lighting
Day lighting (or) Natural lighting – Design of windows– Orientation of buildings – Lighting for industrial structure – Supplementary illumination – Artificial illumination – Summary.

Ventilation
Ventilation due to wind – Ventilation due to stack effect – Ventilation due to combined effect – Infiltration –Ventilation of industrial building – Calculation of Natural Ventilation

Mechanical Ventilation – Examples –Building regulation – Air Conditioning – Summary.

REFERENCES

1. Percy L. Marks, *A Handbook for Architects and Engineers*, 1940.
2. Leo. L., Beranek, *Music, Acoustics & Architecture,* 1962.
3. Frederick S. Merritt, *Standard Handbook for Civil Engineers* (Third edition), 1986.
4. Hopkinson R.G., *Architectural Physics Lighting*, 1963.
5. George A.Hool S.B & Nathan, *Handbook of Building Construction,* 1929.
6. Andrews F.T., *Building Mechanical Systems,* 1966.

COURSE OUTCOMES:

1. On completion of this course the students will know acoustics, lighting and ventilation construction industries.

Course objectives	Mapping with Programme outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	✓	✓			✓		✓			✓	

CEMEXXX	INFORMATION TECHNOLOGY FOR CONSTRUCTION MANAGERS	L	T	P
		4	0	0

COURSE OBJECTIVES:

- To study the various aspects of information technology for construction managers

Networking and Internet
Introduction to computer networking - Uses of a network - Types of networks - Network topologies, Internet, Intranet, World Wide Web - E Commerce Applications – Emailing, Chatting, Surfing, Blog – Browsers, Search Engines Concepts of Web upload, download – Threats – Spyware, Adware, SPAM

Database Application
Creating Database Using MS Access, Tables, Relationships, Queries, Forms, Reports .Management Information System: Introduction, Responsibilities of a Property Systems Manager, MIS Security Issues, Information Protection and Problems caused by the use of PC‘s - Selecting and Implementing a Computer System – Installation, Introduction to Point of Sale, Computerized Reservation System, Global Distribution System

Information Systems for Strategic Management

Meaning and Role of Information Systems, Types of Information Systems: Operations Support Systems, Management Support Systems, Office Automation System, Decision Support Systems, Expert Systems, and Knowledge Management Systems. Competitive Strategy Concepts, Strategic Role of Information Systems, Integrating Information Systems with Business Strategy, Value Chain Analysis, Computer Applications for cost control, scheduling and time management.

Planning for Information Systems

System Development Process, Identification of Applications, Resource Requirements for Information Systems: Hardware and Capacity Planning, Software Needs, Implementation, Risks in Information Systems. Procurement Options – Make or Buy decisions, IS Outsourcing,

Emerging Concepts and Issues in Information Systems

Enterprise Resource Planning, electronic business, Supply Chain Management, Customer Relationship Management, GIS Applications in Real Estate, Introduction to Data Warehousing, Data Mining and its Applications. Computer aided design and visualization – building engineering application – computer aided cost estimation – planning, scheduling, site management – computer aided facilities management – integration – business and information management

REFERENCES:

1. S.J.Xavier Alphonse, *Computer Made Easy-A textbook on Basic Computing Skills*, ICRDCE Publications. 2011.
2. Peter Norton, *Introduction to computers*, 7th Edition, Tata McGraw Hill,(2010).
3. Henry C.Lucas, *Information Technology for Management*, Tata McGraw – Hill,(2001).
4. Elmasri**.** *R***,** Navathe**.***S*. *Fundamentals of Database systems*, Third Edition, Addison Wesley,2000.
5. Prasanna Chandra. *A management guide to PERT/CPM Project planning , analysis and selection*.2011
6. Tim Pyron, *Using Microsoft Project*,2003
7. David A. Marchman**,** *Construction scheduling with Primavera*,2003

COURSE OUTCOMES:

1. On completion of this course the students will know the application of information technology in construction management.

Course objectives	**Mapping with Programme outcomes**										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	✓	✓	✓				✓				

CEMEXXX	CONSTRUCTION WORKPLACE AND EMPLOYEES BEHAVIOUR	L	T	P
		4	0	0

COURSE OBJECTIVES:

- To Study work place and employer behavior of construction projects.

Industrial Health, Safety

Causes of Accidents - Prevention – Safety Provisions – Industrial Health and Hygiene – Importance – Problems – Occupational Hazards – Diseases – Psychological problems – Counselling.

Stress in the Workplace

Job Stress – Occupational Stresses – Self Assessment Exercise – Organizational Stressors – Individual Stressors in the Workplace – Environmental Stresses.

Common Stress Factors Time and Career Plateauing

Works Related Stress – Individual Stress – Reducing Stress – Burnout - Time Management – Techniques – Importance of planning the day – Time management schedule – Developing concentration – Organizing the Work Area – Prioritizing.

Individual Behaviour

Personality – types – Factors influencing personality – Theories – Types of learners – The learning process – Learning theories – Organizational behavior modification. Misbehavior – Types – Management Intervention. Emotions - Emotional Labour – Emotional Intelligence – Theories.

Group Behaviour

Organization structure – Formation – Groups in organizations – Influence – Group dynamics –Emergence of informal leaders and working norms – Group decision making techniques – Teambuilding - Interpersonal relations – Communication – Control.

REFERENCE:

1. ArunMonappa, RanjeetNambudiri, PatturajaSelvaraj. *Industrial relations and Labour Laws*. Tata McGraw Hill. 2012
2. Fred Luthans, *Organisational Behavior*, McGraw Hill, 11th Edition, 2001.
3. House, New Delhi, 2007.
4. Mamoria C.B. and SathishMamoria, *Dynamics of Industrial Relations*, Himalaya Publishing
5. P.N.Singh, Neeraj Kumar. *Employee relations Management.* Pearson. 2011.
6. P.R.N Sinha, InduBala Sinha, Seema PriyardarshiniShekhar. *Industrial Relations, Trade Unions and Labour Legislation*. Pearson. 2004
7. Srivastava, *Industrial Relations and Labour laws*, Vikas, 2007.

8. Stephen P. Robins, *Organisational Behavior*, PHI Learning / Pearson Education, 11th Edition, 2008.

COURSE OUTCOMES:

1. On completion of this course the students will know workers difficulties in working place and behavior at construction work.

Course objectives	Mapping with Programme outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	✓	✓	✓		✓		✓		✓	✓	

CEMEXXX	ADVANCED CONCRETE TECHNOLOGY	L	T	P
		4	0	0

COURSE OBJECTIVES:

- This course provides the advanced knowledge of concrete technology which covers the properties of fresh and hardened concrete and the concept of durability.

Constituents of concrete - Portland cement – composition – types – codal standards – hydration – structure of hydrated cement paste – factors influencing cement quality – supplementary Cementitious materials and their characterization – admixtures - construction chemicals - classification - mechanism – performance – application – aggregates - shape – properties – absorption – chemical stability – packing characteristics – effect of aggregate on concrete properties – conventional and non-conventional aggregates – light weight and heavy weight aggregates – significance of aggregate characterization.

Concrete mixture proportion - concrete constituents – relevant parameters – relationships of mix Composition and properties of concrete – Principles of concrete mix design, Methods of concrete mix design, IS Method, ACI Method, DOE Method– Statistical quality control– Sampling and acceptance criteria. High Performance – Entropy and Shack lock's Empirical graphs –particle packing theory.

Properties of fresh concrete - Workability – factors influencing – loss of workability – setting – hardening – plastic and thermal cracking – Interfacial Transition Zone – fracture strength – mechanical properties – shrinkage – creep – temperature effects - Durability of concrete - basic considerations – stability of constituents – permeation characteristics – testing – chemical attack – freeze and thaw action – efflorescence - Testing of fresh and hardened concrete – non-destructive testing.

Special concretes -Fibre reinforced concrete – aerated concrete – no fines concrete – SIFCON – SIMCON - spun concrete – polymer concrete – lightweight concrete – high density concrete – high performance concrete (HPC) – self compacting concrete (SCC)– vacuum

concrete. Fly ash concrete, Fibre reinforced concrete, Sulphur impregnated concrete, Polymer Concrete–High performance concrete. High performance fiber reinforced concrete, Self-Compacting-Concrete, Geo-Polymer Concrete, Waste material based concrete–Ready mixed concrete – Testing methods –Codal standards –principle – mechanism – properties – applications

Process of manufacturing of ready mix concrete, methods of transportation, placing and curing. Extreme weather concreting, special concreting methods. Vacuum dewatering– Underwater Concrete.

REFERENCES:

1. Mehta, P.K., and Montero, P.J.M., *Concrete Microstructure, Properties and Materials*, Indian Concrete Institute Chennai, 1999.
2. Neville, A.M., *Properties of Concrete*, 4th Edition, Longman, 1995.
3. Mindess and Young, *Concrete,* Prentice Hall, 1998.
4. John Newman and Ban Seng Choo, *Concrete Technology*, *Vol. I to IV*, Elsevier, 2003.
5. Francois de Larrard, *Concrete Mixture Proportioning – Scientific Approach* E &FN SPON, London, 1999.
6. Jan P. Skalny, *Material Science of Concrete*, *Vol. I to IV*, The American Ceramic Society, Inc. Westerville, OH., 1989.
7. Krishna Raju, N, *Design of Concrete Mixes*, CBS Publishers, Delhi, 2000.

COURSE OUTCOMES:

1. On completion of this course the students will know various tests on fresh and hardened concrete.

Course objectives	**Mapping with Programme outcomes**										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	✓	✓	✓								

OPEN ELECTRIVE

CEMEXXX	GEOGRAPHIC INFORMATION SYSTEM IN CONSTRUCTION ENGINEERING AND MANAGEMENT	L	T	P
		4	0	0

COURSE OBJECTIVES:

- This course provides the details of data collection and field modeling.
- This also provides the management of Natural Resources and their application.

Introduction to GIS

GIS – Definition – Components of GIS -Maps – Definition – Types of Maps – Characteristics of Maps – Map Projections — Hardware, Software and Organizational Context – GIS software

Types of Data

Data Types – Spatial and Non-Spatial – Spatial Data – Points, Lines and areas– Non-spatial data – Types of Map scale- Nominal, Ordinal, Interval and Ratio – Digitizer – Scanner – Editing and Cleaning – Geo reference data- File and data access.

Data Structure

Raster and Vector Data Structure – Raster data storage – Methods of data compression-Run length, Chain and Block Coding – Vector Data Storage – Topology – Topological Models – Arc Node Structure – Surface Data – DEM – Grid DEM and TIN structure Applications of DEM- Database Management system

Data Quality and Output

Reclassification – Measurement – Buffering – Overlaying – SQL for Queries – Neighborhood and Zonal operations – Data Quality – Components of data quality - Sources of errors in GIS – Meta data- Output – Maps, Graphs, Charts, Plots , Reports – Printers – Plotters

Fields of application-construction management Parcel based, AM/FM applications examples – Case study

REFERENCES:

1. Burrough P.A., *Principles of GIS for Land Resources Assessment*, Oxford Publication, 2008.
2. Robert Laurini and Derek Thompson, *Fundamentals of Spatial Information Systems*, Academic Press, 2006.
3. Anji Reddy, *Remote Sensing and Geographical Information Systems*, BS Publications 2001
4. Srinivas M.G. (Edited by), *Remote Sensing Applications*, Narosa Publishing House, 2001.

5. Rhind, D., *Understanding of GIS, the ARC / INFO Method*, ESRI Press. 2000.

COURSE OUTCOMES:

1. On completion of this course the students will know the development of construction planning, scheduling procedure and controls.

Course objectives	Mapping with Programme outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	✓	✓		✓			✓			✓	

CEMEXXX	SHORING, SCAFFOLDING AND FORMWORK	L	T	P
		4	0	0

COURSE OBJECTIVES:

- To study and understand the overall and detailed planning of formwork, plant and site equipment.
- To understand the Design and erection of forms for various elements such as slabs, beams, columns, walls, shells and tunnels.
- To know the latest methods of form construction.

Planning, Site Equipment and Plant for Form Work

Introduction - Forms for foundations, columns, beams walls etc., General objectives of formwork building - Planning for safety - Development of a Basic System - Key Areas of cost reduction - Planning examples. Overall Planning - Detailed planning - Standard units - Corner units - Pass units - Calculation of labour constants - Formwork hours - Labour Requirement - Overall programme - Detailed programme - Costing - Planning crane arrangements - Site layout plan - Transporting plant - Formwork beams - Scaffold frames - Framed panel formwork - Formwork accessories.

Materials Accessories Proprietary Products and Pressures

Lumber - Types - Finish - Sheathing boards working stresses - Repetitive member stress - Plywood - Types and grades - Jointing Boarding - Textured surfaces and strength - Reconstituted wood - Steel - Aluminum - Hardware and fasteners - Nails in Plywood - Allowable withdrawal load and lateral load. Pressures on formwork - Examples - Vertical loads for design of slab forms - Uplift on shores - Laterals loads on slabs and walls.

Design of Forms and Shores

Basic simplification - Beam formulae - Allowable stresses - Deflection, Bending - Lateral stability - Shear, Bearing - Design of Wall forms - Slab forms - Beam forms - Column forms - Examples in each. Simple wood stresses - Slenderness ratio - Allowable load vs length behaviour of wood shores - Form lining Design Tables for Wall formwork - Slab Formwork - Column Formwork - Slab props - Stacking Towers - Free standing and restrained - Rosett Shoring - Shoring Tower - Heavy Duty props.

Building and Erecting the Form Work

Carpentry Shop and job mill - Forms for Footings - Wall footings - Column footings - Sloped footing forms - Strap footing - Stepped footing - Slab form systems - Sky deck and Multiflex

- Customized slab table - Standard Table module forms - Swivel head and uniportal head - Assembly sequence - Cycling with lifting fork - Moving with table trolley and table prop. Various causes of failures - ACI - Design deficiencies - Permitted and gradual irregularities.

Forms for Domes and Tunnels, Slip Forms and Scaffolds

Hemispherical, Parabolic, Translational shells - Typical barrel vaults Folded plate roof details - Forms for Thin Shell roof slabs design considerations - Building the forms - Placing concrete - Form removed -Strength requirements -Tunnel forming components - Curb forms invert forms - Arch forms - Concrete placement methods - Cut and cover construction - Bulk head method - Pressures on tunnels - Continuous Advancing Slope method - Form construction - Shafts. Slip Forms - Principles -Types - advantages - Functions of various components - Planning -Desirable characteristics of concrete - Common problems faced - Safety in slip forms special structures built with slip form Technique - Types of scaffolds - Putlog and independent scaffold -Single pole scaffolds - Truss suspended - Gantry and system scaffolds.

REFERENCES:

1. Austin, C.K., *Formwork for Concrete, Cleaver* -Hume Press Ltd., London, 1996.
2. Hurd, M.K., *Formwork for Concrete*, Special Publication No.4, American Concrete Institute, Detroit, 1996
3. Robert L. Peurifoy and Garold D. Oberlender, *Formwork For Concrete Structures*, McGraw -Hill , 1996.

COURSE OUTCOMES:

1. On completion of this course the students will know the design and erection of forms for various elements such as slabs, beams, columns, walls, shells and tunnels.

Course objectives	Mapping with Programme outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	✓	✓	✓			✓	✓		✓	✓	

CEMEXXX	VALUE ENGINEERING AND VALUATION	L	T	P
		4	0	0

COURSE OBJECTIVES:

- To study the various aspects of value engineering and valuation in construction

Value

Value - Meaning of value, basic and secondary functions, factor contributing to value such as aesthetic, ergonomic, technical, economic: identifying reasons or unnecessary costs :

Value Analysis

10 Commandments of value analysis; value analysis team; principles of value analysis, elements of a job plan viz. orientation, Information, presentation. Implementation, follow up action, benefits of value analysis, various applications; assessing effectiveness of value analysis.

Life Cycle Costing

Life cycle costing – Forecasting of Capital as well as operating & maintenance costs, time value, present worth analysis, DCF methods, ROR analysis, sensitivity analysis. Different methods of performing value engineering.

Valuation

Types of value, purposes of valuation factors affecting value. Different methods of valuation for different types of assets such as land and building, horticulture, historical places.

Valuation Report

Valuation Report, contents, standard formats, Case study of any one Report.

REFERENCES:

1. Del Younke, *Value Engineering: Analysis And Methodology*
2. O.P.Khanna, *Industrial Engg. & Mgt*., DhanpatRai Publ.
3. T.R.Banga, S.C.Sharma, *Industrial Organization &Engg. Economics*, Khanna Publ.
4. B.N Dutta, *Estimating and Costing in Civil Engineering: Theory and Practice*
5. M.Chakraborty, *Estimating, Costing Specifications & valuation in Civil Engineering*
6. G.S.Birdie, *Estimating and Costing*
7. Charotar Rangwala, *Estimating and Costing* Published by Publishing House,
8. P.T.Joglekar, *Practical Information for Quantity Surveyors, Property valuers, Architects Engineers and Builders*, Pune, Vidyarthi Griha Prakashan, 2008 reprint.

COURSE OUTCOMES:

1. on completion of this course the students will know the application of value Engineering and valuation in construction projects.

Course objectives	**Mapping with Programme outcomes**										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	✓	✓	✓			✓	✓			✓	

CEMEXXX	**ENERGY CONSERVATION TECHNIQUES IN BUILDING CONSTRUCTION**	**L**	**T**	**P**
		4	**0**	**0**

COURSE OBJECTIVES:

- This course introduces the use of non conventional energy system and also their management.

Introduction

Fundamentals of energy - Energy Production Systems - Heating, Ventilating and air conditioning - Solar Energy and Conservation - Energy Economic Analysis – Energy

conservation and audits - Domestic energy consumption – savings -Energy use in buildings - Residential - commercial buildings.

Environmental
Energy and Resource conservation – Design of green buildings – Evaluation tools for building energy - Embodied and operating energy - Peak demand – Comfort and Indoor air quality - Visual and acoustical quality - Land, water and materials – Airborne emissions and waste management.

Design
Natural building design consideration - Energy efficient design strategies – Contextual factors - Longevity and process Assessment –Renewable energy sources and design-Advanced building Technologies - Smart buildings - Economies and cost analysis.

Services
Energy in building design - Energy efficient and environment friendly building – Thermal phenomena - thermal comfort - Indoor Air quality - Climate, sun and Solar radiations - Psychometrics - passive heating and cooling systems - Energy Analysis – Active HVAC systems - Preliminary Investigation - Goals and policies - Energy audit – Types of energy audit - Analysis of results - Energy flow diagram – Energy consumption/ Unit production - Identification of wastage - Priority of conservative measures - Maintenance of management programme.

Energy Management
Energy management of electrical equipment - Improvement of power factor - management of maximum demand - Energy savings in pumps - Fans - Compressed air systems - Energy savings in Lighting systems - Air conditioning systems – Applications.

REFERENCES:

1. Fuller Moore, *Environmental Control Systems - Heating, Cooling, Lighting,* Tata McGraw-Hill, © 1993.
2. G Z Brown, Mark DeKay, Sun, Wind & Light , *Architectural Design Strategie*s, Wiley, ©2001
3. Cook, J, Award - *Winning passive Solar Design*, Mc Graw Hill, 1984.

COURSE OUTCOMES:

1. On completion of this course the students will know the use of non-conventional energy system and also their management.

Course objectives	**Mapping with Programme outcomes**										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	✓	✓	✓					✓		✓	

CEMEXXX	**COMPOSITE CONSTRUCTION**	**L**	**T**	**P**
		4	**0**	**0**

COURSE OBJECTIVES:

- This course provides the technique of adopting composite type of constructions and their features in major projects.

Introduction
Introduction to steel - concrete composite construction - theory of composite structures - Introduction to steel - concrete - steel sandwich construction.

Design of Composite Members
Behaviour of composite beams, columns, design of composite beams, steel composite columns - design of composite trusses.

Design of Connections
Types of connections, Design of connections in the composite structures – shear connections- Design of connections in composite trusses.

Composite Box Girder Bridges
Introduction - behaviour of box girder bridges - design concepts.

Case Studies
Case studies on steel-concrete composite construction in buildings – Seismic behaviour of composite structures.

REFERENCES:

1. R. P. Johnson, *Composite Structures of Steel and Concrete: Beams, Slabs, Columns, and Frames for Buildings* - Page 1, Blackwell Publishing 2004.
2. Graham W Owens, P R Knowles, P J Dowling, *Steel Designers' Manual, Steel Construction Institute* (Great Britain), Blackwell Scientific Publications, 1994.

COURSE OUTCOMES:

1. On completion of this course the students will know the technique of adopting composite type of constructions and their features in major projects.

Course objectives	Mapping with Programme outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	✓	✓									

CEMEXXX	ADVANCED CONSTRUCTION ENGINEERING TECHNIQUES	L	T	P
		4	0	0

COURSE OBJECTIVES:

- To study and understand the latest construction techniques applied to engineering construction for sub structure, super structure, special structures, rehabilitation and strengthening techniques and demolition techniques.

Sub Structure Construction
Box jacking - Pipe jacking - Under water construction of diaphragm walls and basement - Tunnelling techniques - Piling techniques - Driving well and caisson - sinking cofferdam -

cable anchoring and grouting - Driving diaphragm walls, Sheet piles - Laying operations for built up offshore system - Shoring for deep cutting - Large reservoir construction - well points - Dewatering for underground open excavation.

Super Structure Construction for Buildings

Vacuum dewatering of concrete flooring – Concrete paving technology – Techniques of construction for continuous concreting operation in tall buildings of various shapes and varying sections – Erection techniques of tall structures, Large span structures – launching techniques for heavy decks – in-situ prestressing in high rise structures, Post tensioning of slab- aerial transporting – Handling and erecting lightweight components on tall structures.

Construction of Special Structures and Demolition

Erection of lattice towers - Rigging of transmission line structures – Construction sequence in cooling towers, Silos, chimney, sky scrapers - Bow string bridges, Cable stayed bridges – Launching and pushing of box decks – Construction of jetties and break water structures – Construction sequence and methods in domes – Support structure for heavy equipment and machinery in heavy industries – Erection of articulated structures and space decks.

Rehabilitation and Strengthening Techniques

Seismic retrofitting - Strengthening of beams - Strengthening of columns - Strengthening of slab - Strengthening of masonry wall, Protection methods of structures, Mud jacking and grouting for foundation – Micro piling and underpinning for strengthening floor and shallow profile - Sub grade water proofing, Soil Stabilization techniques.

Demolition

Demolition Techniques: Demolition by Machines, Demolition by Explosives, Advanced techniques using Robotic Machines, Demolition Sequence, Dismantling Techniques, Safety precaution in Demolition and Dismantling.

REFERENCES:

1. Jerry Irvine, *Advanced Construction Techniques*, CA Rocketr, 1984
2. Patrick Powers. J., *Construction Dewatering: New Methods and Applications*, John Wiley & Sons, 1992.
3. Peter.H.Emmons, "*Concrete repair and maintenance illustrated*", Galgotia Publications Pvt. Ltd., 2001.Press, 2008.
4. Robertwade Brown, *Practical foundation engineering hand book*, McGraw Hill Publications, 1995.
5. Sankar, S.K. and Saraswati, S., *Construction Technology*, Oxford University Press, NewDelhi, 2008.

COURSE OUTCOMES:

1. On completion of this course the students will know the modern construction techniques to be used in the construction of buildings and special structures and also rehabilitation and strengthening techniques and demolition.

Course objectives	**Mapping with Programme outcomes**										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	✓	✓	✓							✓	

CEMEXXX	PREFABRICATED STRUCTURES	L	T	P
		4	0	0

COURSE OBJECTIVES:

- To Study the design principles, analysis and design of elements.

Design Principles

General Civil Engineering requirements, specific requirements for planning and layout of prefabrication plant. IS Code specifications. Modular co-ordination, standardization, Disuniting of Prefabricates, production, transportation, erection, stages of loading and code provisions, safety factors, material properties, Deflection control, Lateral load resistance, Location and types of shear walls.

Reinforced Concrete

Prefabricated structures - Long wall and cross-wall large panel buildings, one way and two way prefabricated slabs, Framed buildings with partial and curtain walls, -Connections – Beam to column and column to column.

Floors, Stairs and Roofs

Types of floor slabs, analysis and design example of cored and panel types and two-way systems, staircase slab design, types of roof slabs and insulation requirements, Description of joints, their behaviour and reinforcement requirements, Deflection control for short term and long term loads, Ultimate strength calculations in shear and flexure.

Walls

Types of wall panels, Blocks and large panels, Curtain, Partition and load bearing walls, load transfer from floor to wall panels, vertical loads, Eccentricity and stability of wall panels, Design Curves, types of wall joints, their behaviour and design, Leak prevention, joint sealants, sandwich wall panels, approximate design of shear walls.

Industrial Buildings and Shell Roofs

Components of single-storey industrial sheds with crane gantry systems, R.C. Roof Trusses, Roof Panels, corbels and columns, wind bracing design. Cylindrical, Folded plate and hyper-prefabricated shells, Erection and jointing, joint design, hand book based design.

REFERENCES:

1. Koncz.T., *Manual of Precast Concrete Construction*, Vol.I II and III & IV Bauverlag, GMBH, 1971.
2. Laszlo Mokk, *Prefabricated Concrete for Industrial and Public Structures*, AkademiaiKiado, Budapest, 2007.
3. Lewicki.B, Building with Large Prefabricates, Elsevier Publishing Company, Amsterdam/ London/New York, 1998.
4. Structural Design Manual, Precast Concrete Connection Details, Society for the Studies in the use of Precase Concrete, Netherland BetorVerlag, 2009.
5. Warszawski, A., Industrialization and Robotics in Building - A managerial approach, Harper and Row, 1990

COURSE OUTCOMES:

1. At the end of this course student will have good knowledge about the prefabricated elements and the technologies used in fabrication and erection.
2. They will be in a position to design floors, stairs, roofs, walls and industrial buildings, and various joints for the connections.

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Course objectives	Mapping with Programme outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	✓	✓				✓	✓		✓	✓	
CO2		✓	✓		✓		✓		✓	✓	

CEMEXXX	PUBLIC HEALTH ENGINEERING STRUCTURES	L	T	P
		4	0	0

COURSE OBJECTIVES:

- The courses provide basic knowledge relating to the analysis and design of public health structures as well as their maintenance.

Introduction

Review of the principle of design in respect of water treatment and waste treatment systems – criteria considered important structurally in the case of each component – consideration of soil bearing capacity under different combinations of soil types.

Factors Relevant to Structural Design

Ultimate load theory – plastic analysis – consideration on impact due to live and dead loads – considerations of corrosion effects on structural aspects – structural designs – construction below ground level.

Design of Overhead Water Tanks

Functional design – structural design – architectural design – cost aspects.

Design of Ground Level Water Retaining Structures

Functional aspects – maintenance factors.

Miscellaneous Structural Works

Design of conduits and appurtenances – foundation and jointing works in pipe lines – prestressed concrete tanks – elevated steel tanks – rectangular and circular framed structures used in water supply and sewage treatment systems – construction of raw water intake towers.

REFERENCES:

1.Gray. C, *Reservoirs and Tanks*
2.Reynolds, R.C. *Designers Hand Book*.
3.Abeles and Turner, *Prestressed Concrete Designers Hand Book.*

4.Proceedings of the Refresher Course on *Public Health Engineering Structures*, Centre for Environmental Studies, Anna University, 1976.

COURSE OUTCOMES:

1. On completion of this course the students will know the design of public health buildings.

Course objectives	Mapping with Programme outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	✓	✓				✓	✓		✓	✓	

CEMEXXX	RESEARCH METHODOLOGY	L	T	P
		4	0	0

COURSE OBJECTIVES:

- To study and understand the research methodology in future research

Introduction to Research

Meaning of research - types of research- process of research- Sources of research problem- Criteria / Characteristics of a good research problem- Scope and objectives of research problem- Significance of Research-Research Methods versus Methodology- Research and Scientific Method -Errors in selecting a research problem- Criteria of Good Research - Problems Encountered- formulation of research hypotheses- Search for causation.

Developing a Research Proposal

Format of research proposal- Individual research proposal- Institutional research proposal- Significance- objectives- methodology- Funding for the proposal- Different funding agencies- Framework for the planning.

Design, Sampling Design, Measurement and Scaling Techniques

Meaning of Research Design- Need for Research Design- Features of a Good Design- Different Research Designs- Steps in Sampling Design -Measuring, -Selecting a Sampling Procedure- Different Types of Sample Designs- How to Select a Random Sample- Complex Random Sampling Designs-Measurement-attitude measurement and scaling- Sources of Error in Measurement-Scale Classification- Important Scaling Techniques-Scale Construction Techniques

Data Collection and Analysis

Collection of Primary Data - Observation Method- Interview Method- Collection of Data through Questionnaires- Collection of Data through Schedules - Difference between Questionnaires and Schedules- Some Other Methods of Data Collection- Collection of Secondary Data- Selection of Appropriate Method for Data Collection- Elements/Types of Analysis - Measures of Dispersion- Approaches to qualitative and quantitative data analysis- Case study.

Report Writing, Presentation of Research

Need of effective documentation- importance of report writing- types of reports- report structure- report formulation- Plagiarisms- Research briefing- presentation styles- impact of presentation- elements of effective presentation- Writing of research paper- presenting and publishing paper-patent procedure.

REFERENCES

1. *Research Methodology: concepts and cases*—Deepak Chawla and Neena Sondhi,Vikas Publishing House Pvt.Ltd.
2. *Research Methodology: Methods and Trends'*, by Dr. C. R. Kothari--- New Age International Publishers.
3. *Research Methodology: An Introduction'* by Wayne Goddard and Stuart Melville

COURSE OUTCOMES:

1. On completion of this course the students will know methodology of research in thesis work.

Course objectives	**Mapping with Programme outcomes**										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	✓	✓				✓	✓				

CEMEXXX	**CONSTRUCTION PERSONNEL MANAGEMENT**	**L**	**T**	**P**
		4	**0**	**0**

COURSE OBJECTIVES:

- To study the various aspects of manpower management such as man power planning, organization, human relations, and welfare and development methods in construction.

Leadership, Interpersonal and Communication

Introduction to Leadership, Leadership Power, Leadership Styles, Leadership in Administration. Introduction to Interpersonal Relations, Analysis Relations of different ego states, Analysis of Transactions, Analysis of Strokes, Analysis of Life position. Introduction to Communication, Flow of Communication, Listening, Barriers of Communication, How to overcome barriers of communication. Group Dynamics - Importance of groups in organization, and Team Interactions in group, Group Building Decision Taking, Team Building, Interaction with the Team, How to build a good team.

Stress, Conflict, Performance, Time and Motivation

Introduction to Stress, Causes of Stress, Impact Management Stress, Managing Stress- Introduction to Conflict, Causes of Conflict, Management Managing Conflict- Introduction to Performance Appraisal, Appraisal Vertical Appraisal, Horizontal Appraisal, 360º Performance Appraisal, Methods of improving Techniques of Performance Appraisal.

Time as a Resource - Identify Important Time Management Wasters - Individual Time Management Styles - Techniques for better Time Management - Introduction to Motivation, Relevance and types of Motivation - Motivating the subordinates - Analysis of Motivation.

Manpower Management

Human Resources Management- Importance of Human Resources, Sources of Personnel Staffing & Recruitments: Job Analysis, Job Specification, Recruitments Tests, Selection & Placement, Training: Need For Training, Training Objectives, Strategies and Methods Training Assessment, Performance Appraisal Compensation, Basic Pay, Variable Pay, Merit Rating, Job Evaluation. Human resources planning - Importance - HRP Process-Manpower - Evolution–difference between Personnel Management and HRM- Strategic HRM- role of a HR Manager - Estimation-Job analysis-Job Description-Job Specification. Recruitment-Sources of Recruitment-Selection Process-Placement and Induction-Retention of Employees.

Relations and Compensation Management

Strikes, Lockouts, Lay-offs, Grievance Functions, Meaning, Grievance Redressal Procedures, Collective Bargaining, Trade Unions. Overview of Statutory Measures for Labour Welfare-Grievance Procedure-collective Bargaining-Settlement of Disputes. Compensation Management –Concepts and Components-Job Evaluation-Incentives and Benefits

Training and Development

Training and Development- Objectives and Needs-Training Process-Methods of Training–Tools and Aids -Evaluation of Training Programs. Labour Issues and Career Planning - Labour: Definition Of Labour And Labour Welfare, Contract Labour& Temporary Labour, Various Theories, Historical Development, Agencies For Labour Welfare. Career Planning-Succession Planning.

REFERENCES:

1. Carleton Counter II and Jill Justice Coulter, *The Complete Standard Hand Book of Construction Personnel Management*, Prentice Hall, Inc., New Jersey, 1989.
2. Memoria, C.B., *Personnel Management*, Himalaya Publishing Co., 1992.
3 .Josy. J. Familaro, *Handbook of Human Resources Administration*, McGraw Hill International Edition, 1987.
4. Andrew Dainty, Martin Loosemore, *Human Resource Management in Construction Projects*, Routledge,2012
5. Sanjay Kumar and PushpaLata , *Communication Skills* , Oxford University Press.2011
6. Krishna Mohan, MeeraBanerji, *Basic Managerial Skills*, E. H. McGrath, Eastern Economy Edition, Prentice hall India.2014

COURSE OUTCOMES:

1. On completion of this course the students will know the personnel manpower management such as man power planning, organization, human relations, and welfare and development methods in construction.

Course objectives	Mapping with Programme outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	✓	✓				✓	✓				

CEMEXXX	INDUSTRIES ORGANIZATIONAL PHSYCOLOGY	L	T	P
		4	0	0

COURSE OBJECTIVES:

- To provide conceptual understanding amongst the upcoming managers of industrial & organizational psychology.
- To understand the types of psychology and its effect on the efficiency and productivity.

Conceptual Awareness of Industrial Organizational Psychology

Introduction of the terms 'Industry' 'Organization' and 'Psychology.' Definition & Nature – Industrial Organizational Psychology - Importance & Scope of its application - How I/O Psychology is different - Psychological factors responsible for behavior of an individual at work place Industrial-Organizational Psychology on the job and in Everyday Life.

Characteristics Psychology

Types and characteristics of psychology Impacting factors and their effects on the behavior - Human psychology - Differentiating male & female psychology - Determining factors impacting work efficiency and productivity.

Organizational Psychology

Monitoring Industrial Organizational Psychology - Different tools for testing psychology - Problems with Using Psychological Tests - Measuring effectiveness of these tests - Usage of tests for improving the employee psychology, - Challenges for I-O Psychology

Workers Behavior

Individual and Group Behavior - Interaction as Individuals and as Groups - Determining factors for improving their psychology Group Dynamics - Characteristics of Group Dynamics - Necessary steps in Group Dynamics to enhance efficiency & productivity.

Occupational Stress

Approaches and Terminology – Occupational Stress Terminology – Occupational Stress Models – Workplace Stressors – Reducing the Impact of Workplace Stressors – Cross Cultural Occupational Stress Research.

REFERENCES:

1. Anderson, N.; Ones, D.S.; Sinangil, H.K. &Viswesvaran, C. (Eds.). (2002). *Handbook of industrial, work and organizational psychology*, Volume 2: Organizational psychology. Thousand Oaks, CA: Sage Publications Ltd
2. Fred Luthans (2006) *Organisational Behavior* (11th Ed.) McGraw- Hill/Irwin.
3. Harrel Thomas W (1964). *Industrial Psychology* (Revised Edition) Oxford & IBH Publishing Co. India.

4. Koppes, L.L. (Ed.). (2007*). Historical perspectives in industrial and organizational psychology*. Mahwah, NJ: Lawrence Erlbaum Rogelberg, S.G. (Ed.). (2002).
5. Maier R F Norman (1970). *Psychology in Industry* (3rded.). Oxford & IBH Publishing Co. India.
6. Paul Hersey, Kenneth H. Blanchard, Dewey E. Johnson (2008) *Management of organizational behavior: leading human resources*, Pearson Prentice Hall.
7. Rogelberg, S.G. (Ed.). (2002). *Handbook of research methods in industrial and organizational psychology*. Malden, MA: Blackwell.

COURSE OUTCOMES:

1. On completion of this course the students will know the conceptual understanding amongst the upcoming managers of industrial & organizational psychology.

Course objectives	**Mapping with Programme outcomes**										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	✓	✓				✓	✓				