BANNARI AMMAN INSTITUTE OF TECHNOLOGY
(Autonomous Institution Affiliated to Anna University, Chennai
Approved by AICTE - Accredited by NBA and NAAC with "A" Grade)
SATHYAMANGALAM – 638 401

B.E. Civil Engineering Programme

Regulation – 2011 (Revision 2014)

CONTENTS

The Vision of the Department

A. To educate the students to face the challenges pertaining to Civil Engineering by maintaining continuous sprit on creativity, innovation, safety and ethics.

The Mission of the Department

A. To prepare graduates to learn beyond the syllabi and texts

B. To train students through periodical in-plant training and industrial visits

C. To motivate students to pursue higher education through competitive examinations

D. To create Centre of Excellence in the emerging areas of Civil Engineering

E. To give a broad education to the students on recent areas of development in the field of Civil Engineering and through guest lectures and educational camps

CIVIL ENGINEERING PROGRAMME (CEP) EDUCATIONAL OBJECTIVES

I. Become successful Civil Engineer to meet the demand driven needs in the field of Civil Engineering and related profession.

II. Demonstrate core competence to purse higher study or research in institute of repute.

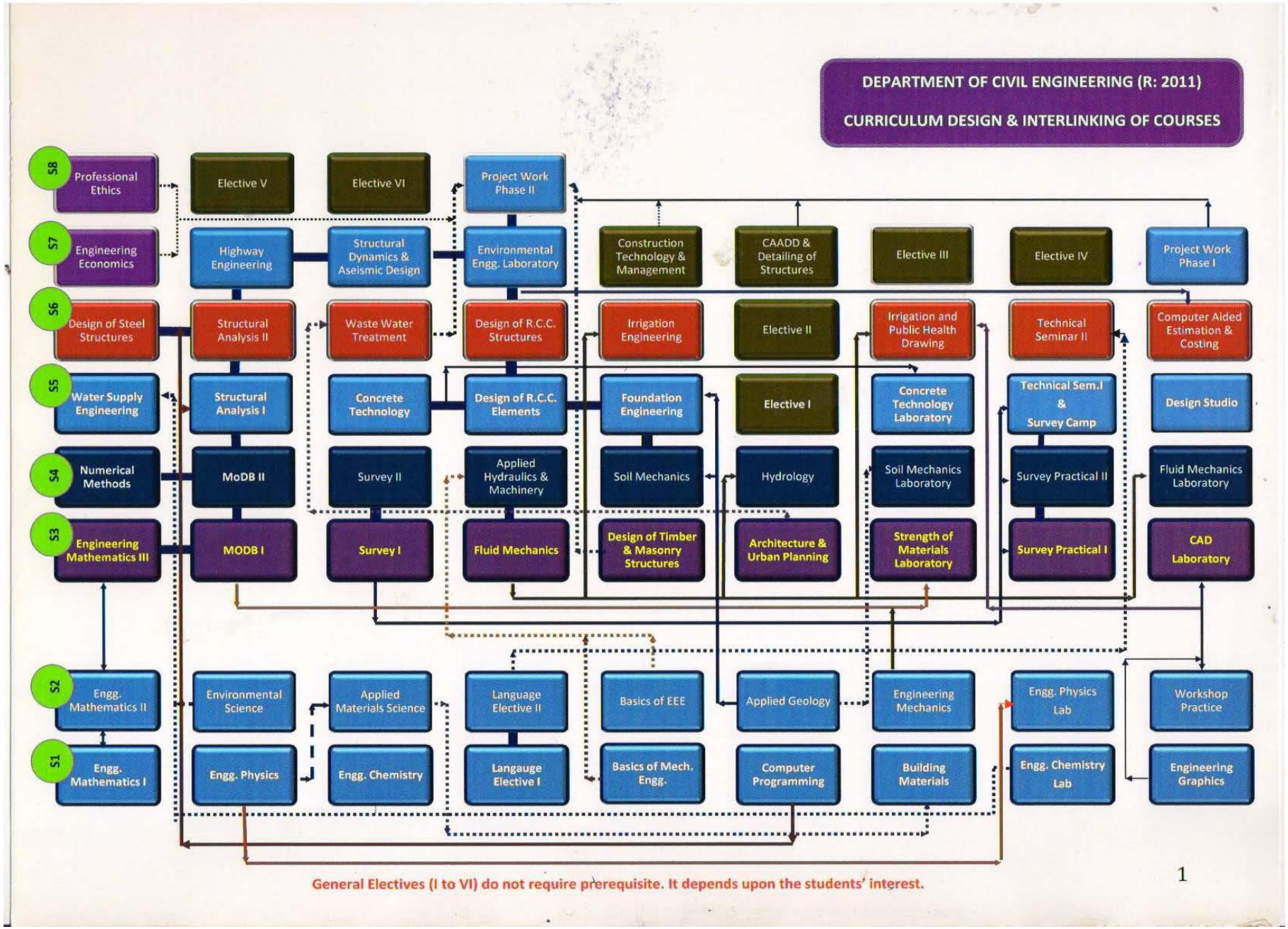
III. Exhibit good breadth of knowledge in core areas of Civil and related engineering by offering/assisting consultancy and testing services.

CIVIL ENGINEERING PROGRAMME OUTCOMES

1. Apply the fundamental knowledge of mathematics, science and engineering.
2. Identify, formulate and solve Civil Engineering problems in accordance with Indian Standard codes of practice.
3. Design and conduct experiments, as well as to analyze and interpret data.
4. Use the techniques, skills and modern Civil Engineering tools necessary for engineering practice.
5. Design a safe system, component, or process as per the needs and specifications, within economic, environmental and social constraints.
6. Observe the impact of engineering solutions on the society and utilize the knowledge for sustained development.
7. Understand the role of Civil Engineers with commitment to ethical values.
8. Function on multidisciplinary teams.
9. Deliver effective verbal, written and graphical communications.
10. Recognize the need for, and an ability to engage in life- long learning.
11. Perform economic analysis, resource management and activities related to design and construction of Civil Engineering structures.

Mapping of PEOs – POs

	Programme Outcomes										
	1	2	3	4	5	6	7	8	9	10	11
PEO I	x	x	x	x	x	x	x	x	x	x	x
PEO II	x	x	x	x	x				x	x	x
PEO III	x	x	x	x	x	x	x				x


DEPARTMENT OF CIVIL ENGINEERING (R: 2011)
CURRICULUM DESIGN & INTERLINKING OF COURSES
S8
Professional Ethics
Elective V
Elective VI
Project Work Phase II
S7
Engineering Economics
Highway Engineering
Structural Dynamics & Aseismic Design
Environmental Engg. Laboratory
Construction Technology & Management
CAADD & Detailing of Structures
Elective III
Elective IV
Project Work Phase I
S6
Design of Steel Structures
Structural Analysis II
Waste Water Treatment
Design of R.C.C. Structures
Irrigation Engineering
Elective II
Irrigation and Public Health Drawing
Technical Seminar II
Computer Aided Estimation & Costing
S5
Water Supply Engineering
Structural Analysis I
Concrete Technology
Design of R.C.C. Elements
Foundation Engineering
Elective I
Concrete Technology Laboratory
Technical Sem.I & Survey Camp
Design Studio
S4
Numerical Methods
MoDB II
Survey II
Applied Hydraulics & Machinery
Soil Mechanics
Hydrology
Soil Mechanics Laboratory
Survey Practical II
Fluid Mechanics Laboratory
S3
Engineering Mathematics III
MODB I
Survey I
Fluid Mechanics
Design of Timber & Masonry Structures
Architecture & Urban Planning
Strength of Materials Laboratory
Survey Practical I
CAD Laboratory
S2
Engg. Mathematics II
Environmental Science
Applied Materials Science
Language Elective II
Basics of EEE
Applied Geology
Engineering Mechanics
Engg. Physics Lab
Workshop Practice
S1
Engg. Mathematics I
Engg. Physics
Engg. Chemistry
Langauge Elective I
Basics of Mech. Engg.
Computer Programming
Building Materials
Engg. Chemistry Lab
Engineering Graphics
General Electives (I to VI) do not require prerequisite. It depends upon the students' interest.

RULES AND REGULATIONS
B. E. /B. Tech. Programmes

(for the batches of candidates admitted in Academic year 2011-2012 and subsequently)

NOTE: *The regulations hereunder are subject to amendments as may be decided by the Academic Council of the Institute from time to time. Any or all such amendments will be effective from such date and to such batches of students (including those already in the middle of the programme) as may be decided by the Academic Council.*

1. Conditions for Admission

Candidates for admission to the B.E. / B.Tech. degree programmes will be required to satisfy the conditions of admission thereto prescribed by the Anna University of Technology, Coimbatore and the Government of Tamil Nadu.

2. Duration of the Programme

(i) For purposes of these regulations, the academic year will be normally spanning from June to May. Each academic year will be divided into Two semesters, the odd semester normally spanning from June to November and the even semester from December to May.

(ii) **Minimum Duration**: The Programme will extend over a period of Four years with Eight semesters (3 years with six semesters for lateral entry) leading to the Degree of Bachelor of Engineering (B.E.) / Bachelor of Technology (B.Tech.) of the Anna University of Technology, Coimbatore.

(iii) **Maximum Duration:** The candidate shall be required to successfully complete all the requirements to qualify for the award of B.E./B.Tech. degree programme within a maximum period of 7 years (6 years for lateral entry), these periods reckoned from the commencement of the semester to which the candidate was first admitted to the programme.

3. Branches of Study

B. E. Programmes

I Aeronautical Engineering
II Civil Engineering
III Computer Science and Engineering
IV Electrical and Electronics Engineering
V Electronics and Communication Engineering
VI Electronics and Instrumentation Engineering
VII Mechanical Engineering
VIII Mechatronics Engineering

B. Tech. Programmes

I Biotechnology
II Information Technology
III Textile Technology
IV Textile Technology (Fashion Technology)

4. Structure of Programmes

i. The curriculum will consist of courses of study (Theory, Practical, Project) and Personality Development Programme and syllabi as prescribed by the respective Boards of Studies from time to time.

ii. A Diagnostic Test will be administered to all the BE/BTech students at the entry level to identify their level of proficiency in English and they will be brought under two streams namely A Stream and B Stream. Students under A Stream will study **Communicative English** and B Stream will study **Basic English 1** under Language Elective I in the I Semester. In the second semester, A Stream will be further divided into two categories based on their English language proficiency in the end semester examination and the upper segment will study **German / Japanese / French / Hindi** and the remaining students will study **Advanced Communicative English**. The students under B Stream will study **Basic English II.**

iii. Every student will be required to opt for **six** electives from the list of electives. Under Choice Based Credit System (CBCS), students can opt for any course as elective in consultation with respective HoDs during VIth & VIIth Semesters from any branches of B.E / B.Tech. Programme including electives pertaining to **Physical Sciences.** (not more than two from Physical Sciences)

iv. Candidates can also opt for **one credit courses** of 15 to 20 hours duration which will be offered at our institution from industry / other institution / our institution on specialised topics. Candidates can complete such **one-credit courses** during the semesters III to VI as and when these courses are offered by different departments. A candidate will also be permitted to register for the **one credit courses** of other departments provided the candidate has fulfilled the necessary pre-requisites of the course being offered subject to approval by both the Heads of Departments. Credits will be indicated for these courses in the grade sheet, but it will not be considered for computing CGPA. However, if a candidate wishes to avail exemption of electives V or elective VI of the VIII Semester, he/she can do so by exercising his/her option in writing to the respective Head of the Department during the beginning of the VIII Semester by following the equivalence norm that **one elective** in the **VIII Semester** is equivalent to **three one-credit courses** completed by the candidate during the previous semesters.

v. Every student will be required to undertake a suitable project work in Industry / Department during VII semester in consultation with the Head of the Department and the faculty guide and submit the project report Phase I and thereon submit the project report Phase II at the end of the VIII Semester on dates announced by the Institute/Department.

vi. A candidate can register for Self-Study Elective(s) over and above the electives from any branch of Engineering / Technology one per semester starting from **V** semester onwards provided he/she maintains a Cumulative Grade Point Average(CGPA) of 7.5 or above till the previous semesters with no standing arrears. Credits will be indicated for these courses in the grade sheet, but it will not be considered for computing CGPA.

5. Special Courses:

Students can opt for any one of the special courses as self-study in **addition to** the courses specified in the curriculum in V, VI and VII semesters to get exposure in the recent research areas, under the guidance of the faculty provided he/she maintenance a minimum CGPA of 7.5 till the previous semester with no standing arrears. The credits obtained will be indicated in the grade sheet, but **will not be considered** for **CGPA.**

6. Certificate Courses:

Students can opt for any one of the certificate courses offered in the various departments in IV, V, VI and VII semesters. A separate certificate will be issued on successful completion of the course.

7. Requirements of Attendance and Progress

(I) **Minimum Attendance**: A candidate will be deemed to have completed the requirements of study of any semester only if:

a) He / she has kept not less than 70% of attendance in each course and at least 80% of attendance on an average in all the courses in that semester put together.

[*However, a candidate who secures less than 70% of attendance in any subject(s) will not be permitted to appear for the examinations in those subject(s).He / she will be allowed to makeup the shortage of the attendance immediately after that particular semester examinations, as prescribed by the subject faculty, HoD and Principal. The candidate will be allowed to appear for the examination in the respective subjects(s) at the next opportunity and such an appearance will be considered as second attempt*
a candidate who has secured attendance between 70% & 79% in the current semester due to medical reasons (hospitalization / accident/ specific illness) or due to participation in Institute/ University/ State/ National/ International level sports events with prior permission from the Principal shall be given exemption from the prescribed attendance requirements and he/she shall be permitted to appear for the current semester examinations.]

b) His / her academic progress and conduct have been satisfactory

(II) **Personality Development :** Every candidate shall be required to undergo a minimum of 40 hours of Personality Development Programme viz, NSS / NCC / YRC / YOGA / Sports and Games activities during the first year failing which he/she will not be permitted to appear for the Semester - End examinations of semester III onwards. Such candidates are permitted to appear for the Semester - End examinations of semester III onwards only after completing the above mentioned requirement.
The record of attendance for Personality Development Programmes shall be maintained and sent to the Academic Section at the end of 1st and 2nd Semesters.

National Cadet Corps (NCC) will have parades.

National Service Scheme (NSS) will have social service activities in the community and camps.

Youth Red Cross (YRC) society activities will include peace time activities like health and hygiene, international friendship, awareness camps, etc.

Yoga will be practiced through Yoga master

Sports and Games will include preparation for Intra Institute and inter-collegiate sports events.

8. Procedure for Completing Programme

(i) A candidate will be permitted to proceed to the courses of study of any semester only, if he / she has satisfied the requirements of attendance and progress in respect of the preceding semester and had registered for the highest semester examination for which he / she was eligible to register. vide Clause 7. In the case of project work, no candidate will be permitted to appear for the project work examination unless he /she had submitted the project report not later than the prescribed date.

(ii) A candidate who is required to repeat the study of any semester for want of attendance / unsatisfactory progress and conduct or who desires to rejoin the course after a period of discontinuance or who upon his / her own request is permitted by the authorities to repeat the study of any semester, may join the semester for which he / she is eligible or permitted to rejoin, only at the time of its normal commencement for a regular batch of candidates and after obtaining the approval from the Director of Technical Education and Anna University of Technology, Coimbatore. No candidate will however be enrolled in more than one semester at any time. In the case of repeaters, the earlier assessment in the repeated courses will be disregarded.

9. Assessment

(i) The assessment will be based on the performance in the Semester - End examinations and / or continuous assessment, carrying marks as specified in Clause 12.

(ii) At the end of each semester, final examinations will normally be conducted during October/November and during April / May of each year. Supplementary examinations may also be conducted at such times as may be decided by the Institute.

(iii) (a) Continuous Assessment Marks will be awarded on the basis of Continuous Evaluation made during the semester as per the scheme given in Clause 12.

(Credit assignment: *Each course is normally assigned with certain number of credits @ 1 credit per one hour of lecture, 0.5 credit per one hour of tutorial/practical per week.*)

(b) The letter grade and the grade point are awarded based on the percentage of marks secured by a candidate in individual course as detailed below:

Range of Percentage of Total Marks	Letter grade	Grade Point (g)
90 to 100	S	10
80 to 89	A	9
70 to 79	B	8
60 to 69	C	7
55 to 59	D	6
50 to 54	E	5
0 to 49	RA	0
Incomplete	I	0
Withdrawal	W	0
Absent	AB	0

RA − Reappearance in the course.

(A candidate who fails in the Semester - End Examination in any course(s) including Project Work after having registered for the same, shall be awarded grade RA.)

I − Incomplete (as per clause 7 (I) & (II)) and hence prevented from writing Semester – End Examination.

W − Withdrawal from the Semester - End Examination vide clause 11

AB − Absent

(A candidate who is eligible but fails to register and also fails to appear after registration for the Semester - End examination will be awarded the grade AB.)

(c) After completion of the programme, the Cumulative Grade Point Average (CGPA) from the I Semester to VIII Semester (*from III to VIII semester for lateral entry*)is calculated using the formula:

$$CGPA = \frac{\sum_{1}^{n} g_i * C_i}{\sum_{1}^{n} C_i}$$

where g_i : Grade Point secured corresponding to the course.

C_i : Credit allotted to the course.

n : Total number of courses for the entire programme.

10. (a). Passing Requirements and Provisions

i. The minimum number of total credits to be earned by a candidate to qualify for the award of degree in the various branches of study as prescribed by the respective Boards of Studies is given below:

Branch of Study	Minimum Credits	
	entry at first semester	lateral entry at third semester
BE Programmes		
Aeronautical Engineering	193	141
Civil Engineering	193	141
Computer Science and Engineering	192	142
Electrical and Electronics Engineering	193	143
Electronics and Communication Engineering	193	141
Electronics and Instrumentation Engineering	192	142
Mechanical Engineering	193	143
Mechatronics Engineering	192	142
B Tech Programmes		
B.Tech. Biotechnology	192	143
B.Tech. Information Technology	193	143
B.Tech. Textile Technology	192	143
B.Tech. Textile Technology (Fashion Technology)	193	141

(Students Migration- Credit Accounting)
Normalisation of the credits will be carried out in consultation with the BoS chairman of the concerned branch & approval by the chairman of Governing Council to the students migrating from other institutions to Bannari Amman Institute of Technology

ii. A candidate who secures a minimum of 50% marks in the Semester - End Examinations of a course and a minimum Grade point 5 with internal assessment and Semester - End Examination put together will be declared to have passed that course.

iii. A candidate, who absents or withdraws or is disqualified to appear (as per clause 7 (I) and (II)) or secures a letter grade RA (Grade Point 0) or less than 50% in the Semester - End Examination in any course carrying Internal Assessment and Semester - End Examination Marks, will retain the already earned Internal Assessment Marks for two subsequent attempts only of that course and thereafter he / she will be solely assessed by Semester - End examination marks..

iv. A candidate shall be declared to have qualified for award of B.E/B.Tech. degree if

(i) He/she successfully completed the courses requirement (vide clause 7) and has passed all the prescribed courses of study of the respective programme listed in clause 13 within the duration specified in clause 2 and
(ii) No disciplinary action is pending against him/her.

(b). Classification of degree

i. **First Class with Distinction** : A candidate who qualifies for the award of the Degree (vide clause 10 a (iv)) having passed all the courses of study of all the eight semesters (six semesters for lateral entry candidates) at the first opportunity, within eight consecutive semesters (six consecutive semesters for lateral entry candidates) after the commencement of his /her study and securing a CGPA of 8.5 and above (vide clause 9c) shall be declared to have passed in **First Class with Distinction**. *For this purpose the withdrawal from examination (vide clause 11) will not be construed as an opportunity for appearance in the examination.*

ii. **First Class** : A candidate who qualifies for the award of the Degree (vide clause 10 a (iv)) having passed all the courses of study of all the eight semesters (six semesters for lateral entry candidates) within maximum period of ten consecutive semesters (eight consecutive semesters for lateral entry candidates) after the commencement of his /her study and securing a CGPA of 6.50 and above shall be declared to have passed in **First Class**.

iii. **Second Class** : All other candidates who qualify for the award of the degree shall be declared to have passed in **Second Class**.

11. Withdrawal from the Examination

(i) A candidate may, for valid reasons, be granted permission by the Principal to withdraw from appearing for the examination in any course or courses of only one semester examination during the entire duration of the degree programme. Also, only ONE application for withdrawal is permitted for that semester examination in which withdrawal is sought.

(ii) Withdrawal application shall be valid only if the candidate is otherwise eligible to write the examination and if it is made prior to the commencement of the examination in that course or courses and also recommended by the Head of the Department.

(iii) Withdrawal shall not be construed as an opportunity for appearance in the examination for the eligibility of a candidate for First Class with Distinction.

12. Scheme of Assessment

(a) (i) THEORY

Semester - End Examination	**: 50 Marks**
Internal Assessment	**: 50 Marks**

Distribution of marks for Internal Assessment:

Assignments	10
Test 1	10
Test 2	10
Model Examination	20

	50

A*n optional test will be conducted in the respective test portion after the second test, to the students who opt, on valid reasons*

(ii) THEORY - ONE CREDIT COURSE

TOTAL 100 Marks

Semester - End Examination	**: 50 Marks**
Internal Assessment	**: 50 Marks**

Distribution of Marks for Internal Assessment:

Assignment *(Two Assignments)*	10
Test I	15
Test II	15
Viva voce	10

	50

(b) (i) PRACTICAL (Without Mini Project)

Semester - End Examination	**: 50 Marks**
Internal Assessment	**: 50 Marks**

Distribution of Marks for Internal Assessment

Preparation	10
Observation & Results	15
Record	10
Model Examination & Viva-Voce	15

	50

(ii) Practical (With Mini Project)

Semester - End Examination	**: 50 Marks**
Internal Assessment	**: 50 Marks**

Distribution of Marks for Internal Assessment

Preparation	05
Observation & Results	10
Record	10
Mini Project Report	10
Model Examination & Viva-Voce	15

	50

(c) THEORY WITH LABORATORY COMPONENT

Semester - End Theory Examination	**: 50 Marks**
Internal Assessment	**: 50 Marks**
Theory	
Test I	10.0
Test II	10.0
Model (Theory)	15.0
Practical	
Observation & Results	5.0
Model Practical	10.0

	50.0

(d) SPECIAL COURSES

Internal Assessment: 100 Marks

State of Art	20
Preparation	15
Presentation	10
Discussion & Conclusion	15
Viva - voce	40

	100

(e) SELF STUDY ELECTIVES

Semester - End Examination	**: 50 Marks**
Internal Assessment	**: 50 Marks**
Assignments (minimum 2 Nos)	15
Test I	10
Test II	10
Model	15

	50

(f) LANGUAGE ELECTIVES

Test 1	: 15 Marks
Test 2	: 15 Marks
Listening Test	: 10 Marks
Speaking Test	: 10 Marks
Final Examination	: 50 Marks

	: **100 Marks**

(g) PROJECT WORK

i) PHASE – I

Semester - End Examination	**: 50 Marks**
Internal Assessment	**: 50 Marks**

Distribution of Marks for Internal assessment

Literature survey (*one seminar*)	10
Problem formulation	10
Approach *(one seminar)*	15
Progress (*one seminar)*	15

Total	50

Distribution of Marks for Semester - End Examination

Report Preparation & Presentation	25
Viva-Voce	25

	50
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ii) PHASE – II

Semester - End Examination	**: 100 Marks**
Internal Assessment	**: 100 Marks**

Distribution of Marks for Internal assessment

Continuation of Approach & Progress *(Two seminars – 2x20)*	40
Findings, Discussion & Conclusion (*Two seminars - 2x30*)	60

Total	100

Distribution of Marks for Semester - End Examination

Report Preparation & Presentation	50
Viva Voce	50

	100

(h) TECHNICAL SEMINAR

Internal Assessment: 100 Marks

Two Seminars (2 X 50)	100

Distribution of Marks Each Seminar

Report Evaluation	10
Presentation	20
Viva – voce	20
	50

(A team of 2 members and HOD constituted by the Principal, will evaluate the seminar report and conduct the viva-voce for assessment.)

13) Curriculum and Syllabi

B. E. CIVIL ENGINEERING

(Minimum credits to be earned: 193)

First Semester

Code No.	Course	Objectives & Outcomes		L	T	P	C
		PEOs	POs				
11O101	Engineering Mathematics I*	II	1	3	1	0	3.5
11O102	Engineering Physics*	II	1	3	0	0	3.0
11O103	Engineering Chemistry*	II	1	3	0	0	3.0
	Language Elective I‡			3	0	0	3.0
11C105	Basics of Mechanical Engineering	II	1,2	3	0	0	3.0
11C106	Computer Programming†	II	1,8	2	0	2	3.0
11C107	Building Materials	III	1	3	0	0	3.0
11O208	Engineering Graphics$	II	1	2	0	2	3.0
11O109	Engineering Chemistry Laboratory#	II	1	0	0	2	1.0
			Total	**22**	**1**	**6**	**25.5**

Second Semester

Code No.	Course	Objectives & Outcomes		L	T	P	C
		PEOs	POs				
11O201	Engineering Mathematics II*	II	1	3	1	0	3.5
11O202	Environmental Science*	II	1	3	0	0	3.0
	Language Elective II‡			3	1	0	3.5
11C204	Applied Material Science	II	1	3	0	0	3.0
11O205	Basics of Electrical and Electronics Engineering+	II	1,8	4	0	0	4.0
11C206	Applied Geology	II, III	1	3	0	2	4.0
11C207	Engineering Mechanics	II, III	1,2	3	1	0	3.5
11C209	Workshop Practice	II	1	0	0	2	1.0
11O108	Engineering Physics Laboratory#	II	1	0	0	2	1.0
			Total	**22**	**3**	**6**	**26.5**

* Common to all branches of B.E./B.Tech.
‡ Common to all branches of B.E./B.Tech. (Continuous Assessment)
† Common to CE, TT & FT
$ Common to CE, CSE, AE, ECE & EIE (II Semester), ME, EE , BT, IT, TT & FT (I Semester)
+ Common to CSE, IT, FT & ME (first semester) and to CE, AE, EIE, TT & BT
# Common to CE, CSE, AE, ECE & EIE (I Semester) and to ME, EEE , BT, IT, TT & FT (II Semester)

Third Semester							
Code No.	**Course**	**Objectives & Outcomes**		**L**	**T**	**P**	**C**
		PEOs	**POs**				
11O301	Engineering Mathematics III*	II	1	3	1	0	3.5
11C302	Mechanics of Deformable Bodies I	III	1	3	1	0	3.5
11C303	Survey I	III	5	3	1	0	3.5
11C304	Fluid Mechanics	III	3	3	1	0	3.5
11C305	Design of Timber and Masonry Structures	I, III	5,11	3	0	0	3.0
11C306	Architecture and Urban Planning	III	5,11	3	0	0	3.0
11C307	Strength of Materials Laboratory	III	3	0	0	3	1.5
11C308	Computer Aided Building Plan and Drawing	III	9	0	0	3	1.5
11C309	Survey Practical I	III	3,5	0	0	4	2.0
			Total	**18**	**4**	**10**	**25.0**
Fourth Semester							
Code No.	**Course**	**Objectives & Outcomes**		**L**	**T**	**P**	**C**
		PEOs	**POs**				
11C401	Numerical Methods	II	1	3	1	0	3.5
11C402	Mechanics of Deformable Bodies – II	III	1	3	1	0	3.5
11C403	Survey II	III	5	3	1	0	3.5
11C404	Soil Mechanics	III	5	3	1	0	3.5
11C405	Applied Hydraulics and Hydraulic Machinery	III	5	3	0	0	3.0
11C406	Hydrology	III	5	3	0	0	3.0
11C407	Soil Mechanics Laboratory	III	3	0	0	3	1.5
11C408	Fluid Mechanics Laboratory	III	3	0	0	3	1.5
11C409	Survey Practical II	III	3,5	0	0	3	1.5
			Total	**18**	**4**	**9**	**24.5**

* Common to all branches of B.E./B.Tech. except BT & CSE

Fifth Semester							
Code No.	**Course**	**Objectives & Outcomes**		**L**	**T**	**P**	**C**
		PEOs	**POs**				
11C501	Water Supply Engineering	III	5	3	0	0	3.0
11C502	Structural Analysis I	II, III	1,2	3	1	0	3.5
11C503	Foundation Engineering	II, III	5	3	1	0	3.5
11C504	Concrete Technology	III	5	3	0	0	3.0
11C505	Design of R.C.C. Elements	II, III	3,11	3	0	0	3.0
	Elective I			-	-	-	3.0
11C507	Concrete Technology Laboratory	III	3	0	0	3	1.5
11C508	Design Studio	III	3,5,8,9	0	0	3	1.5
11C509	Survey Camp	III	3,5,7,8,9	0	0	3	1.5
11C510	Technical Seminar I	I	6,9	-	-	-	1.0
			Total	**15**	**2**	**9**	**24.5♥**

Sixth Semester							
Code No.	**Course**	**Objectives & Outcomes**		**L**	**T**	**P**	**C**
		PEOs	**POs**				
11C601	Design of R.C.C. Structures	II, III	5,11	3	0	0	3.0
11C602	Structural Analysis II	II, III	1,2	3	1	0	3.5
11C603	Waste Water Treatment	III	3	3	0	0	3.0
11C604	Irrigation Engineering	III	5	3	0	0	3.0
11C605	Design of Steel Structures	II, III	5,11	3	1	0	3.5
	Elective II			-	-	-	3.0
11C607	Irrigation and Public Health Engineering Drawing	III	9	0	0	3	1.5
11C608	Computer Aided Estimation, Costing and Valuation	III	9,11	0	0	3	1.5
11C609	Technical Seminar II	I	6,9	-	-	-	1.0
			Total	**15**	**2**	**6**	**23.0♥**

♥ Minimum credits to be earned. The maximum number of credits as well as the total number of L T P hours may vary depending upon the electives offered

Seventh Semester							
Code No.	**Course**	**Objectives & Outcomes**		**L**	**T**	**P**	**C**
		PEOs	**POs**				
11O701	Engineering Economics*	I, III	7,9	3	0	0	3.0
11C702	Highway Engineering	III	5	3	0	0	3.0
11C703	Basics of Structural Dynamics and Aseismic Design of Structures	I, II	1,2	3	0	0	3.0
11C704	Construction Technology and Management	III	11	3	0	0	3.0
	Elective III			-	-	-	3.0
	Elective IV			-	-	-	3.0
11C707	Computer Aided Analysis, Design and Drawing and Detailing of Structures	III	3,5,11	0	0	3	1.5
11C708	Environmental Engineering Laboratory	III	3	0	0	3	1.5
11C709	Project Work Phase I	I, III	2,5,7,11	-	-	-	3.0
			Total	**12**	**0**	**6**	**24.0♥**
Eighth Semester							
Code No.	**Course**	**Objectives & Outcomes**		**L**	**T**	**P**	**C**
		PEOs	**POs**				
11O801	Professional Ethics*	I,III	6,7	2	0	0	2.0
	Elective V			-	-	-	3.0
	Elective VI			-	-	-	3.0
11C804	Project Work Phase II	I, III	2,5,7,11	-	-	-	12.0
			Total	**2**	**0**	**0**	**20.0♥**

* Common to all branches of B.E./B.Tech.

♥ Minimum credits to be earned. The maximum number of credits as well as the total number of L T P hours may vary depending upon the electives chosen

ELECTIVES

LANGUAGE ELECTIVES							
Code No.	**Course**	**Objectives & Outcomes**		**L**	**T**	**P**	**C**
		PEOs	**POs**				
Language Elective I							
11O10B	Basic English I	II	9	3	0	0	3.0
11O10C	Communicative English	II II	9	3	0	0	3.0
Language Elective II							
11O20B	Basic English II	II	9	3	1	0	3.5
11O20C	Advanced Communicative English	II	9	3	1	0	3.5
11O20G	German	II	9	3	1	0	3.5
11O20J	Japanese	II	9	3	1	0	3.5
11020F	French	II	9	3	1	0	3.5
11O20H	Hindi	II	9	3	1	0	3.5

DISCIPLINE ELECTIVES							
Environmental Engineering & Project Management							
11C001	Municipal Solid Waste Management	III	2,7	3	0	0	3.0
11C002	Solid and Liquid Industrial Waste Management	III	2,7	3	0	0	3.0
11C003	Hazardous Waste Management and Site Remediation	III	2,6	3	0	0	3.0
11C004	Environmental Impact Assessment	I, III	2,6,7,11	3	0	0	3.0
Geotechnical Engineering							
11C005	Ground Improvement Techniques	III	3,4,5	3	0	0	3.0
11C006	Earth Retaining Structures	III	1	3	0	0	3.0
11C007	Machine Foundation	III	1,2,5	3	0	0	3.0
Water Resources & Transportation Engineering							
11C008	Open Channel Flow	III	1,5	3	0	0	3.0
11C009	Water Resources Planning and Management	III	5,7	3	0	0	3.0
11C010	Transportation Planning and Mass Transportation System	III	5	3	0	0	3.0
11C011	Railways, Airports and Harbours	III	5	3	0	0	3.0

Structural Engineering							
11C012	Design of Prestressed Concrete Structures	III	5,11	3	0	0	3.0
11C013	Bridge Engineering	III	5,11	3	0	0	3.0
11C014	Design of Industrial Structures	III	5,11	3	0	0	3.0
11C015	Advanced RC Design	III	5,11	3	0	0	3.0
11C016	Tall Structures	III	4	3	0	0	3.0
11C017	Repair and Rehabilitation of Structures	III	2	3	0	0	3.0
11C018	Finite Element Method	II, III	1,2,4,11	3	0	0	3.0
11C019	Advanced Steel Design	III	1,2,4,11	3	0	0	3.0

General							
11C020	Building Services	III	5	3	0	0	3.0
11C021	Disaster Management	I, III	4,6	3	0	0	3.0
11C022	Concepts of Engineering Design	I, III	5	3	0	0	3.0
11C023	Creativity and Innovations	I, IV	4	3	0	0	3.0
11C024	Remote Sensing and GIS	III	1,4,8	3	0	0	3.0
11C025	Green Buildings	III	5,6,8	3	0	0	3.0
11C026	Prefabricated Structures	III	5	3	0	0	3.0

Landscape Architecture - I							
11C027	Contemporary Landscapes	III	6,7,8	3	0	0	3.0
11C028	Sustainable Landscapes and Green Building Designs	I, III	6,7,8	3	0	0	3.0
11C029	Ecological Landscape Planning	I, III	6,7,8	3	0	0	3.0
11C030	Landscape Construction I	I, III	6,7,8	3	0	0	3.0

Landscape Architecture - II							
11C031	Landscape Planting Design	III	6,7,8	3	0	0	3.0
11C032	Advanced Landscape Construction II	I, III	6,7,8	3	0	0	3.0
11C033	Landscape Planting and Horticultural Practices	I, III	6,7,8	3	0	0	3.0
11C034	Urban Landscape Design	I, III	6,7,8	3	0	0	3.0

PHYSICS ELECTIVES							
11O0PA	Nano Science and Technology	II	1	3	0	0	3.0
11O0PB	Laser Technology	II	1	3	0	0	3.0
11O0PC	Electro-Optic Materials	II	1	3	0	0	3.0
11O0PD	Vacuum Science and Deposition Techniques	II	1	3	0	0	3.0
11O0PE	Semiconducting materials and Devices	II	1	3	0	0	3.0
11O0PF	Solar Cells	II	1	-	-	-	1

CHEMISTRY ELECTIVES							
11O0YA	Polymer Chemistry and Processing	II	1	3	0	0	3.0
11O0YB	Energy Storing Devices and Fuel Cells	II	1	3	0	0	3.0
11O0YC	Chemistry of Nanomaterials	II	1	3	0	0	3.0
11O0YD	Corrosion Science and Engineering	II	1	3	0	0	3.0
11O0YE	Polymer Electronics	II	1	-	-	-	1

ENTREPRENEURSHIP ELECTIVES							
11O001	Entrepreneurship Development I	I, III	4,6,8,9	3	0	0	3.0
11O002	Entrepreneurship Development II€	I, III	4,6,8,9	3	0	0	3.0

ONE CREDIT COURSES*							
11C0XA	Air Pollution	III	5,6	-	-	-	1.0
11C0XB	E-waste Management	III	2,7	-	-	-	1.0
11C0XC	Building Information Modelling	III	4,5,9,11	-	-	-	1.0
11C0XD	Advanced Computer Aided Analysis And Design	III	1,2,4,11				1.0
11C0XE	Interior Design	III	1,2,4,11	-	-	-	1.0
11C0XF	Cut and Cover Structures	III	1,2,4,11	-	-	-	1.0

€ Pre-requisite for this course is Entrepreneurship Development Elective I

* Classes to be conducted for 20 Hours duration

SPECIAL COURSES							
11C0RA	Innovative Practices in Earthquake Resistant Design of Structures	III	5	-	-	-	3.0
11C0RB	Advanced Concrete Technology	III	5	-	-	-	3.0
11C0RC	Composite Structures	III	5	-	-	-	3.0
11C0RD	Space Structures	III	5	-	-	-	3.0
11C0RE	Case Studies on Failure of Structures	III	3,5	-	-	-	3.0
11C0RF	Advanced Transportation System	III	5	-	-	-	3.0
11C0RG	Urban Transportation System	III	5	-	-	-	3.0
11C0RH	Application of AI in Civil Engineering	II, III	1,4,5	-	-	-	3.0

11O101 ENGINEERING MATHEMATICS I

(Common to all Branches)

3 1 0 3.5

COURSE OBJECTIVES

- Acquire knowledge in matrix theory, a part of linear algebra, which has wider application in engineering problems.
- To make the student knowledgeable in the area of infinite series, their convergence and to solve first and higher order differential equations using Laplace transform.

PROGRAMME OUTCOME (PO)

1. Able to apply the fundamental knowledge of mathematics, science and engineering.

COURSE OUTCOMES (COs)

1. Acquire more knowledge in basic concepts of engineering mathematics
2. To improve problem evaluation technique
3. Choose an appropriate method to solve a practical problem

PREREQUISITES:

Knowledge of Mathematics of Higher secondary and State board of Government of Tamilnadu or equivalent subject

ASSESSMENT PATTERN

S. No		Test I[1]	Test II[1]	Model Examination[1]	Semester End Examination
1	Remember	20	20	20	20
2	Understand	40	40	40	40
3	Apply	30	30	30	30
4	Analyze/ Evaluate	10	10	10	10
5	Create	-	-	-	-
Total		100	100	100	100

Unit I

Matrices

Characteristic equation - eigen values and eigen vectors of a real matrix - properties of eigen values - Cayley–Hamilton theorem- Reduction of a real matrix to a diagonal form- Orthogonal matrices- Quadratic form -

[1] The marks secured in Test I and II will be converted to a maximum of 20 and model examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly, internal assessment will be calculated for 50 marks.

Reduction of a quadratic form to a canonical form by orthogonal transformation-application to engineering problems.

9 Hours

Unit II

Series and Differential Calculus

Series- Convergences and divergence- Comparison test– Ratio test - Curvature in Cartesian Coordinates- Centre and radius of curvature - Circle of curvature – Evolutes –Envelopes – application to engineering problems.

9 Hours

Unit III

Differential Equation of First Order

Linear differential equation of first order-exact-integrating factor- Euler's equation-Bernoulli's-modeling-application to engineering problems.

9 Hours

Unit IV

Differential Equations of Higher Order

Linear differential equations of second and higher order with constant and variable coefficients - Cauchy's and Legendre's linear differential equations - method of variation of parameters –application of engineering problems.

9 Hours

Unit V

Laplace Transforms

Laplace Transform- conditions for existence(statement only) -Transforms of standard functions – properties (statement only) - Transforms of derivatives and integrals - Initial and Final value theorems (statement only) - Periodic functions - Inverse transforms - Convolution theorems(statement only) - Applications of Laplace transforms for solving the ordinary differential equations up to second order with constant coefficients-application to engineering problems.

9 Hours

Total: 45 + 15 Hours

Textbooks

1. B S Grewal, *Higher Engineering Mathematics*, Khanna Publications , New Delhi 2007 .
2. Kreyszig E, Advanced Engineering Mathematics 8th Edition, John Wiley and Sons, Inc, Singapor, 2008

References

1. B.V.Ramana, *Higher Engineering Mathematics*, Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2007.
2. N.P.Bali and Manish Goyal, *Text book of Engineering Mathematics*,3rd EditioLaxmi Publications(P)Ltd., 2008
3. C. Ray Wylie and C. Louis Barrett, *Advanced Engineering Mathematics*, Tata McGraw-Hill Publishing Company Ltd, 2003.
4. Glyn James. *Advanced Engineering Mathematics*, 3rd Edition, Wiley India, 2007
5. Michael D. Greenberg, *Advanced Engineering Mathematics*, Second Edition, Pearson Education, Inc. 2002

1O102 ENGINEERING PHYSICS

(Common to all branches)

3 0 0 3.0

COURSE OBJECTIVES

- To impart fundamental knowledge in the areas of acoustics, crystallography and new engineering materials.
- To apply fundamental knowledge in the area of LASERS and fiber optics
- To use the principles of quantum physics in the respective fields
- At the end of the course the students are familiar with the basic principles and applications of physics in various fields.

PROGRAMME OUTCOME (PO)

1. Able to apply the fundamental knowledge of mathematics, science and engineering.

COURSE OUTCOMES (COs)

1. Making to learn modern techniques in sound.
2. Study the working and applications of different types of laser.
3. Understanding the Schrödinger wave equation and scattering of X-rays.
4. Utilization of concept of air wedge in determining the thickness of a thin wire.

PREREQUISITES:

Knowledge of Physics of Higher secondary and State board of Government of Tamilnadu or equivalent subject

ASSESSMENT PATTERN

S.No		Test 1†	Test 2†	Model Examination†	Semester End Examination
1	Remember	25	25	20	20
2	Understand	25	25	25	25
3	Apply	20	20	20	20
4	Analyze	20	20	20	20
5	Evaluate	10	10	15	15
6	Create	-	-	-	-
Total		**100**	**100**	**100**	**100**

Unit I

Acoustics and Ultrasonics

Acoustics: Classification of sound – characteristics of musical sound – loudness – Weber – Fechner law – decibel – absorption coefficient – reverberation – reverberation time – Sabine's formula (growth & decay). Factors affecting acoustics of buildings and their remedies. Ultrasonics: Ultrasonic production –

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks.

magnetostriction - piezo electric methods. Applications: Determination of velocity of ultrasonic waves (acoustic grating) - SONAR.
The phenomenon of cavitation.

9 Hours

Unit II
Crystallography
Crystal Physics: Lattice – unit cell – Bravais lattices – lattice planes – Miller indices – 'd' spacing in cubic lattice – calculation of number of atoms per unit cell – atomic radius – coordination number – packing factor for SC, BCC, FCC and HCP structures - X-ray Diffraction: Laue's method – powder crystal method.
Crystal defects.

9 Hours

Unit III
Waveoptics
Interference: Air wedge – theory – uses – testing of flat surfaces – thickness of a thin wire. LASER: Types of lasers – Nd – YAG laser – CO_2 laser – semiconductor laser (homojunction). Applications: Holography – construction – reconstruction – uses. Fiber Optics: Principle of light transmission through fiber - expression for acceptance angle and numerical aperture - types of optical fibers (refractive Index profile, mode) fiber optic communication system (block diagram only)
Laser gas sensors.

9 Hours

Unit IV
Modern Physics
Quantum Physics: Development of quantum theory – de Broglie wavelength – Schrödinger's wave equation – time dependent – time independent wave equations – physical significance – applications – particle in a box (1d). X-rays**:** Scattering of X-rays – Compton Effect – theory and experimental verification.
Degenerate and non degenerate.

9 Hours

Unit V
New Engineering Materials
Metallic glasses: Manufacturing – properties – uses. Shape Memory Alloys**:** Working principle – shape memory effect – applications. Nanomaterials**:** Preparation method – sol gel technique – mechanical – magnetic characteristics – uses. Ceramics**:** Manufacturing methods – slip casting – isostatic pressing – thermal and electrical properties - uses.
Carbon nano tubes and applications.

9 Hours
Total: 45 Hours

Textbooks

1. V. Rajendran, *Engineering Physics*, Tata McGraw-Hill, New Delhi, 2011.
2. P. K. Palanisami, *Physics for Engineers*, Vol. 1, Scitech Pub. (India) Pvt. Ltd., Chennai, 2002.

References

1. M. N. Avadhanulu and P. G. Kshirsagar, *A Textbook of Engineering Physics*, S. Chand & Company Ltd., New Delhi, 2005
2. S. O. Pillai, *Solid State Physics*, New Age International Publication, New Delhi, 2006.
3. V. Rajendran and A. Marikani, *Physics I*, TMH, New Delhi, 2004.
4. Arthur Beiser, *Concepts of Modern Physics*, TMH, 2008.
5. R. K. Gaur and S. L. Gupta, *Engineering Physics*, Dhanpat Rai Publishers, New Delhi, 2006

11O103 ENGINEERING CHEMISTRY

(Common to all branches)

3 0 0 3.0

COURSE OBJECTIVES

- Imparting knowledge on the principles of water characterization, treatment methods and industrial applications.
- Understanding the principles and application of electrochemistry and corrosion science.
- Basic information and application of polymer chemistry, nanotechnology and analytical techniques.

PROGRAMME OUTCOME (PO)

1. Able to apply the fundamental knowledge of mathematics, science and engineering.

COURSE OUTCOMES (COs)

1. Understand the chemistry of water and its industrial & domestic application
2. Utilization of electrochemistry principle in corrosion control and industrial application
3. Understanding the various types of polymers and its industrial application
4. Applications of nanotechnology and analytical techniques in day to day life

PREREQUISITES:

Knowledge of Chemistry of Higher secondary and State board of Government of Tamilnadu or equivalent subject

ASSESSMENT PATTERN

S. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	20	20	10	10
2	Understand	20	20	20	20
3	Apply	30	30	30	30
4	Analyze	20	20	20	20
5	Evaluate	10	10	20	20
6	Create	-	-	-	-
	Total	**100**	**100**	**100**	**100**

Unit I

Chemistry of Water and its Industrial Applications

Hardness of water: Equivalents of calcium carbonate - Units of hardness - Degree of hardness and its estimation (EDTA method) - Numerical problems on degree of hardness - pH value of water. Use of water for industrial

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks.

purposes: Boiler feed water-scale-sludge - caustic embrittlement. Softening of hard water: External conditioning – zeolite - ion exchange methods - internal conditioning – calgon - phosphate methods. Desalination: Reverse osmosis - electrodialysis. Use of water for domestic purposes: Domestic water treatment - Disinfection of water - break point chlorination.
Characterization of your campus water

9 Hours

Unit II

Electrochemistry for Materials Processing

Introduction – emf - Single electrode potential - Hydrogen electrode - Calomel electrode - Glass electrode - pH measurement using glass electrode - Electrochemical series. Cells: Electrochemical cells – Cell reactions- Daniel cell – Reversible cells and irreversible cells - Difference between electrolytic cells and electrochemical cells. Concept of electroplating: Electroplating of gold - electroless plating (Nickel). Batteries: Secondary batteries - lead acid, nickel - cadmium and lithium batteries. Fuel cell: Hydrogen - oxygen fuel cell.
Electricity assisted painting.

9 Hours

Unit III

Chemistry of Corrosion and its Control

Corrosion: Mechanism of corrosion- – Chemical and electrochemical - Pilling-Bedworth rule - Oxygen absorption – Hydrogen evolution - Galvanic series. Types of corrosion: Galvanic corrosion - Differential aeration corrosion - Examples - Factors influencing corrosion. Methods of corrosion control: Sacrificial anodic protection - Impressed current method. Protective coatings: Paints - Constituents and Functions. Special paints: Fire retardant - Water repellant paints.
Applications of vapour phase inhibitors.

9 Hours

Unit IV

Introduction to Polymer and Nanotechnology

Polymers: Monomer - functionality - Degree of polymerization - Classification based on source - applications. Types of polymerization: Addition, condensation and copolymerization. Mechanism of free radical polymerization. Thermoplastic and thermosetting plastics - Preparation, properties and applications: Epoxy resins, TEFLON, nylon and bakelite. Compounding of plastics. Moulding methods: Injection and extrusion. Nanomaterials: Introduction – Nanoelectrodes - Carbon nanotubes - Nanopolymers - Application.
A detailed survey on application of polymer in day to day life.

9 Hours

Unit V

Instrumental Techniques of Chemical Analysis

Beer – Lambert's law - Problems. UV visible and IR spectroscopy: Principle- Instrumentation (block diagram only) - Applications. Colorimetry: Principle – Instrumentation (block diagram only) - Estimation of iron by colorimetry. Flame photometry: Principle - Instrumentation (block diagram only) - Estimation of sodium by flame photometry. Atomic absorption spectroscopy: Principle - Instrumentation (block diagram only) - Estimation of nickel by atomic absorption spectroscopy.
Applications of analytical instruments in medical field.

9 Hours

Total: 45 Hours

Textbooks

1. P. C. Jain and M. Jain, *Engineering Chemistry*, Dhanpat Rai Publications., New Delhi, 2009.
2. R. Sivakumar and N. Sivakumar, *Engineering Chemistry*, TMH, New Delhi, 2009.
3. B. R. Puri, L. R. Sharma and Madan S. Pathania, *Principles of Physical Chemistry*, Shoban Lal Nagin Chand & Co., 2005.

References

1. Sashi Chawla, *Text Book of Engineering Chemistry*, Dhanpat Rai Publications, New Delhi, 2003.

2. B. S. Bahl, G. D. Tuli and Arun Bahl, *Essentials of Physical Chemistry*, S. Chand & Company, 2008.
3. J. C. Kuriacose and J. Rajaram, *Chemistry in Engineering & Technology*, Vol. 1&2, TMH, 2009.
4. C. P. Poole Jr., J. F. Owens, *Introduction to Nanotechnology*, Wiley India Private Limited, 2007.
5. Andre Arsenault and Geoffrey A. Ozin, *Nanochemistry*: *A Chemical Approach to Nanomaterials*, Royal Society of Chemistry, London, 2005.
6. D. A. Skoog, D. M. West, F. James Holler &S. R. Crouch, *Fundamentals of Analytical Chemistry*, Wiley, 2004.

LANGUAGE ELECTIVE I

3 0 0 3.0

11C105 BASICS OF MECHANICAL ENGINEERING

3 0 0 3.0

COURSE OBJECTIVES

- To impart basic knowledge in the field of Mechanical Engineering focusing on generation of power from various natural resources and to know about various types of Boilers and Turbines used for power generation
- To impart basic knowledge in the field of Mechanical Engineering focusing IC Engines and Refrigeration.
- To gain knowledge in various types of Manufacturing Process and Engineering Materials

PROGRAMME OUTCOMES (POs)

1. Able to apply the fundamental knowledge of mathematics, science and engineering.

2. Able to identify, formulate and solve Civil Engineering problems in accordance with Indian Standard codes of practice.

COURSE OUTCOMES (COs)

1. Ability to understand the fundamental philosophy of Mechanical Engineering and enable them to work together in a multidisciplinary technical team.
2. Ability to identify the nature of materials and manufacturing process.
3. Ability to demonstrate the working principle of boilers and turbines for power generation
4. Ability to demonstrate the physical processes like welding, lathe operations and drilling

PREREQUISITES:

Knowledge of Physics of Higher secondary and State board of Government of Tamilnadu

ASSESSMENT PATTERN

S. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	10	10	10	10
2	Understand	20	20	20	20
3	Apply	20	20	20	20
4	Analyze / Evaluate	40	40	40	40
5	Create	10	10	10	10
	Total	100	100	100	100

Unit I

Steam Boilers and Turbines

Types of Boilers - Boiler mountings and accessories - Cochran - Bobcock and Wilcox - Benson and Lamont boilers, differences between fire tube and water tube boiler. Steam Turbines: Main parts of a steam turbine, types of turbines, working of a single stage impulse turbine, (De-Laval turbine), working of Parsons Reaction turbine, difference between impulse and reaction turbine.

† The marks secured in Test I and II will be converted to a maximum of 20and that in Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks

- *Biomass and Biofuels in power generation* **9 Hours**

Unit II

Power Plants

Classification of Power Plants - Steam, Nuclear, Diesel, Hydro, and Gas Turbine Power Plants. Alternate Sources of Energy: Solar Energy, Wind Mills, Tidal Power, Geothermal Power, Ocean Thermal Energy Conversion (OTEC). - *Maintenance of power plants*

9 Hours

Unit III

IC Engines and Refrigeration

Classification of IC engines, Main components of IC engines, working of a 4 stroke & 2 stroke petrol & diesel engine, differences between 4 stroke and 2 stroke engine & petrol and diesel Engines- Fuel system in a petrol engine, Exhaust Gas emission - Green house effect.

Refrigeration: Working Principle of vapour compression & vapour absorption system, domestic refrigerator. - *Hybrid vehicle* **9 Hours**

Unit IV

Manufacturing Processes

Introduction to Manufacturing processes - Casting Process - Pattern, Mould, Moulding Sand - Types & Properties – Melting of cast iron - Cupola Furnace - Fettling - Casting Defects. Metal Joining: Welding - Arc & Gas Welding, Soldering & Brazing. Metal Forming: Extrusion, Forging, Rolling, & Drawing Processes. Lathe and Drilling - Construction and working. -*Milling Operation* **9 Hours**

Unit V

Engineering Materials and Heat Treatment

Mechanical properties of Materials - Engineering Materials: Classification, Composition, and uses of cast iron, mild steel, high carbon steel and high speed steel. Introduction to Composite and smart materials

Heat Treatment – Annealing, Normalizing, Tempering and Hardening (elementary treatment only). – *Hybrid materials*

9 Hours

Total: 45 Hours

Textbook

1. S. R. J. Shantha Kumar, *Basic Mechanical Engineering*, Hi-tech Publications, Mayiladuthurai, 2000

References

1. B. K. Sarkar, *Thermal Engineering*, Tata McGraw Hill Company, New Delhi, 2008
2. N. Rao, *Manufacturing Technology: Foundry, Forming and Welding*, Tata McGraw Hill Company, New Delhi, 2003
3. K. Venugopal and V. Prahu Raja, *Basic Mechanical Engineering*, Anuradha Publishers, 2000
4. G. Shanmugam and S. Ravindran, *Basic Mechanical Engineering*, TMH, New Delhi, 2010
5. Basant Agrawal and C. M. Agrawal, *Basics of Mechanical Engineering*, Wiley, 2008
6. http://www.tutorvista.co.in/content/science/science-ii/sources-energy/sources-energyindex.php
7. http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT-ROORKEE/MANUFACTURING-PROCESSES/ index.htm

11C106 / 11F106 COMPUTER PROGRAMMING

(Common to CE & FT)

2 0 2 3.0

COURSE OBJECTIVES

- To impart basic knowledge on computer programming using 'C' programming
- To provide an overview of some of the fundamental concepts of Object Oriented Programming using C++

PROGRAMME OUTCOMES (POs)

1. Able to apply the fundamental knowledge of mathematics, science and engineering.
8. Able to function on multidisciplinary teams.

COURSE OUTCOMES (COs)

1. Apply the concept of computer programming to solve problems related to Civil Engineering
2. An ability to participate and succeed in competitive examinations

PREREQUISITES:

Basic Knowledge of Computer Science.

ASSESSMENT PATTERN

Sl. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	30	30	30	30
2	Understand	30	30	30	30
3	Apply / Analyze / Evaluate	40	40	40	40
4	Create	-	-	-	-
Total		**100**	**100**	**100**	**100**

Unit I

Introduction to 'C' Programming

Components of computer – Difference between system and application software – Operating system – Role of operating system in a computer – Types of programming: structured and object oriented – various programming languages - Overview of compilers and interpreters - ANSI C standard – structure of 'C' program – Programming rules – Character set – Keywords – Identifiers – Constants – Variables – Rules for naming variables – Data types – variable declaration – Initializing variables – Type conversion – Constant and volatile variables

6 Hours

Unit II

Operators, Expressions and Statements

Operators and Expressions : Arithmetic operators – Relational operators – Logical operators – Bitwise operators – Conditional operators – Comma operator - Priority of operators - Input and output in 'C': Formatted and Unformatted functions - Expression statements - Selection statements – Looping statements – Jump statements

6 Hours

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks.

Unit III

Arrays, Strings and Pointers

Arrays: Definition – Declaration – Initialization - Single Dimension – Two Dimensional – Multi-dimensional – Strings: Overview of strings – Concept of a string literal – String functions: sprintf – strcpy – sscanf – strcat – strlen – strcmp - Pointers: Concept – address operator – indirection operator – malloc – sizeof - Arrays of pointers – pointers and strings **6 Hours**

Unit IV

Functions and File Management

Functions: Definition – Built-in and user defined functions - Declaration – Function Call – Recursion – File Management: Disks and files – File operations – File functions – Overview of Structures and Unions

6 Hours

Unit V

Introduction to Matlab Programming

Data types – Basic program components: Variables, Keywords, Operators, Special values, Expressions and Regular expressions – Program control statements – Graphics – 2D and 3D – Matlab functions – M-file functions – Built-in functions - Programming

6 Hours

Total: 30 + 30 Hours

List of Experiments

1. Simple Programs
   (a) Sum of set of numbers (b) Fibonacci Series (c) Generation of prime numbers
2. Matrix: addition, multiplication and inverse
3. Sorting of names and numbers
4. String manipulation and Array of structures
5. Pointers to functions and pointers
6. File manipulations
   (a) Read the file and display the contents of the file (b) Read the inputs from the user and write them to a file

Textbooks

1. Herbert Schidt, *C- The Complete Reference*, McGraw Hill, 2002
2. Herbert Schidt, *C++- The Complete Reference*, McGraw Hill, 2003

References

1. Yashavant Kanetkar, *Let us C*, BPB Publications, 2007
2. Byron S. Gottfried, *Schaum's Outline of Programming with C*, McGraw Hill, 1996

11C107 BUILDING MATERIALS

3 0 0 3.0

COURSE OBJECTIVES

- To equip the students to have a clear understanding of building materials and their properties
- To introduce students to new topics such as Expansion joints and water proof materials

PROGRAMME OUTCOME (PO)

1. Able to apply the fundamental knowledge of mathematics, science and engineering

COURSE OUTCOMES (COs)

1. Understand the properties of Ferrous & Non-Ferrous Metals
2. Proportioning of materials for making concrete
3. Importance of joints in a structure.

ASSESSMENT PATTERN

Sl. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	30	30	30	30
2	Understand	30	30	30	30
3	Apply / Analyze / Evaluate	40	40	40	40
4	Create	-	-	-	-
Total		**100**	**100**	**100**	**100**

Unit I

Bricks, Stones and Wood

Structural Clay Products: Bricks – Classification of Bricks – Characteristics of Good Bricks – Ingredients of Good Earth Bricks – Clay Tiles – Fire Clay Bricks Or Refractory Bricks – Terracotta. Rocks and Stones: Classification of Rocks – Dressing of Stones – Uses of Stones – Characteristics of Good Building Stones. Wood and Wood Products: Classification Of timbers – Structures of Timber – Characteristics of Good Timber – Seasoning Of timber – Defects in Timber – Suitability of timber for specific uses – Wood Products

Applications of Wood and Wood Products

9 Hours

Unit II

Cement, Fine and Coarse Aggregates, Lime

Materials for making Concrete: Cement: Portland cement – Chemical Composition of raw materials – Composition of Cement clinker – Hydration – Rate of Hydration – Water requirement for Hydration – Manufacture – Testing – Types – Storage – Admixtures. Aggregates: Classification – Characteristics – Alkali Aggregate reaction. Water: Quality of mixing Water – Water for washing Aggregates – Curing Water. Lime: Introduction – Impurities in Lime stones –Classification – Lime Vs Cement. Pozzolans: Introduction – Classification – The activity of Pozzolans –Fly ash – Calcined Clay Puzzolan

Effects of Natural Pozzolans

9 Hours

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks.

Unit III

Expansion joints and water proof materials

Introduction – Type of joints – Expansion joints – Isolation joints – Contraction joints – Construction joints – Materials used for joints – Location of joints - Water proof materials: Introduction – Waterproofing of cement works - Waterproofing materials and system – Waterproofing flat roof slabs – Sloped roof – Roof and parapet wall junction – Wet area – Treatment of sunken floors in wet areas for leakage – Care in sanitary fitting.
Sliding joints

9 Hours

Unit IV

Other Materials

Ferrous Metals: Introduction – Structures of Ferrous Metal – Iron – Pig iron – Cast Iron – Wrought Iron – Alloy Steel. Non Ferrous Metals: Introduction – Aluminum- Copper – Zinc – Lead - Tin – Nickel. Properties of Tar steel, Stainless steel, Structural steel, Testing - Ceramic Materials: Introduction – Classification of Ceramics – Refractories – Glass – Glass Wool – Polymorphism in Ceramic Materials – Mechanical Properties of Ceramic Phases – Thermal Properties of Ceramic Phases – Electrical Properties of Ceramic Phases. Polymeric Materials: Introduction - Rubbers – Plastics – Constituents of Plastics – Fabrication of Commercial Articles – Application of Plastics - Properties of Plastics
Effect of Temperature on Mechanical Properties **9 Hours**

Unit V

Paints and Enamels

Paints, Enamels and Varnishes: Introduction – Composition of Oil paints – Characteristics of an Ideal Paint – Preparation of Paints – Covering power of paints – Pigment Volume Concentration – Painting Plastered Surfaces - Painting Wood Surfaces - Painting Metal Surfaces – Defects – Enamels – Distempers – Water Wash and Colour Wash – Varnish – French Polish – Wax Polish – Miscellaneous Paints. Tar, Bitumen and Asphalt: Introduction – Bitumen – Tar – Asphalt – Application of Bituminous Materials. Thermo Cole – Heat Insulating Materials
Sound Insulating Materials

9 Hours
Total: 45 Hours

Textbook

1. P. C. Varghese, *Building Materials*, PHI Learning Private Limited, New Delhi, 2010

References

1. S. K. Duggal, *Building Materials*, New Age International (P) Ltd., 2003
2. S. P. Arora and S. P. Bindra, *Textbook of Building Construction*, Dhanpat Rai Publications (P) Ltd., 2003

11O208 ENGINEERING GRAPHICS

(Common to ME, CSE, EE, BT, IT, TT & FT – [I Semester], CE, AE, ECE & EIE – [II Semester])

2 0 0 2

COURSE OBJECTIVES

- Understand and appreciate the importance of Engineering Graphics in Engineering
- Understand the basic principles of Technical/Engineering Drawing
- Understand the different steps in producing drawings according to BIS conventions

PROGRAMME OUTCOME (PO)

1. Able to apply the fundamental knowledge of mathematics, science and engineering.

COURSE OUTCOMES (COs)

1. Projection of various components according to BIS specifications.
2. Assembly of datas and information of various components in visualized way
3. Interpretation of technical graphics assemblies
4. 2D modeling by AutoCAD

PREREQUISITES:

Baisc knowledge of geometry taught in High Schools.

ASSESSMENT PATTERN

	Internal Assessment	**Semester End Examination**
Preparation	10	15
Observation and Results	15	25
Record	10	-
Mini-project/ Model examination/ Viva-voce	15	10
Total	**50**	**50**

Unit I

Concepts and Conventions

Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning. General principles of orthographic projection – First angle projection – Layout of views – Projection of points, located in all quadrant and straight lines located in the first quadrant – Determination of true lengths and true inclinations.

6 Hours

Unit II

Projection of Solids

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

6 Hours

Unit III

Section of Solids and Development of Surfaces

Sectioning of solids like prisms, pyramids, cylinder and cone in simple vertical position by cutting planes inclined to one Reference: plane – Obtaining the true shape of section. Development of lateral surfaces of simple solids – prisms, pyramids, cylinders and cones.

6 Hours

Unit IV

Isometric Projection and Perspective Projection

Principles of isometric projection – isometric scale – isometric projections of simple solids, pyramids, cylinders and cones. Orthographic projection - Systems of orthographic projection - First angle orthographic projection - Conversion of pictorial to orthographic views (Free hand).

6 Hours

Unit V

Introduction to AutoCAD and 2D Modeling

Starting AutoCAD – Interfaces – Menus – Tool bars – Coordinates – Limits – Units – 2D commands – Drawing Commands - Creating a Point, Construction of Lines, Polyline, Multiline, Circles, Arcs, Rectangle, Polygon, Ellipse, Hatch, Text, Mtext, Linetypes – Edit and Modify commands - Copy, Move, Erase, Mirror, Zoom, Pan, Arrays, Trim, Break, Fillet, Chamfer, Redraw, Regen, Dimensioning, Colors, Layers – Exercises

6 Hours

Total: 30 Hours

Textbook

1. K. V. Natarajan, *A Textbook: of Engineering Graphics*, Dhanalakshmi Publishers, Chennai, 2006

References

1. S. Julyes Jaisingh, *Engineering Graphics*, Tri Sea Publishers, 2010
2. V. Rameshbabu, *Engineering Graphics*, VRB Publishers Pvt Ltd., 2009
3. K. Venugopal, *Engineering Graphics*, New Age International (P) Limited, 2002
4. N. D. Bhatt, *Engineering Drawing,* Charotar publishing House 2003
5. K. L. Narayana and P. Kannaiah, *Engineering Graphics*, Scitech Publications (Pvt) Limited-2002

List of Experiments

1. Projection of points located in all quadrants.
2. Projection of straight lines located in the first quadrant inclined to both the planes.
3. Determination of true lengths and true inclinations of Straight lines.
4. Projection of Solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.
5. Sectioning of solids in simple vertical position by cutting planes inclined to one reference plane and obtaining true shape of section.
6. Development of lateral surfaces of simple and truncated solids like prisms, pyramids cylinder and cone.
7. Isometric Projections / Views of Solids like prisms, pyramids and Cylinders.
8. Orthographic Projection of various components from pictorial views.
9. Drawing of front, top and side views from given pictorial views using AutoCAD.
10. Drawing sectional views of prism, pyramid and cylinder using AutoCAD.

Practical Schedule

Sl. No	Experiment	Hours
1	Projection of points located in all quadrants	3
2	Projection of straight lines located in the first quadrant inclined to both the planes.	3
3	Determination of true lengths and true inclinations of Straight lines	3
4	Projection of Solids when the axis is inclined to one reference plane by change of position method.	3
5	Sectioning of solids in simple vertical position by cutting planes inclined to one reference plane and obtaining true shape of section	3
6	Development of lateral surfaces of simple and truncated solids.	3
7	Isometric Projections / Views of Solids like prisms, pyramids and Cylinders.	3
8	Orthographic Projection of various components from pictorial views.	3
9	Drawing of front, top and side views from given pictorial views using AutoCAD.	3
10	Drawing sectional views of prism, pyramid and cylinder using AutoCAD.	3

11O109 ENGINEERING CHEMISTRY LABORATORY

(Common to all branches)

0 0 2 1.0

COURSE OBJECTIVES

- Imparting knowledge on basic concepts and its applications of chemical analysis
- Training in chemical and instrumental methods
- Develop skills in estimation of a given sample by chemical and instrumental methods

PROGRAMME OUTCOME (PO)

1. Able to apply the fundamental knowledge of mathematics, science and engineering.

COURSE OUTCOMES (COs)

1. Estimate the strength of solution by chemical and instrumental methods
2. Analyze the water quality parameters of given water samples
3. Measurement of corrosion rate of a given sample
4. Knowledge of various components used in analytical instruments

PREREQUISITES:

Basic Knowledge of Volumetric and Gravimetric analysis.

ASSESSMENT PATTERN

	Internal Assessment
Preparation	10
Observation & Results	15
Record	10
Model Examination & Viva Voce	15
Total	**50**

LIST OF EXPERIMENTS

1. Preparation of molar and normal solutions of the following substances – oxalic acid, sodium carbonate, sodium hydroxide, hydrochloric acid.
2. Determination of alkalinity in a water sample.
3. Determination of molecular weight of a polymer by viscometry method.
4. Determination of total, temporary and permanent hardness of water by EDTA method.
5. Conductometric titration of mixture of acids.
6. Determination of strength of iron by potentiometric method using potassium dichromate.
7. Estimation of iron (thiocyanate method) in the given solution by spectrophotometric method.
8. Determination of strength of hydrochloric acid by sodium hydroxide using pH meter.
9. Determination of sodium and potassium ions in water sample by flame photometric method.
10. Determination of corrosion rate by weight loss measurements.
11. Comparison of alkalinities of the given water samples.
12. Comparison of total dissolved solids (TDS) and hardness of water in Bhavani river and Bannari Amman Institute of Technology campus.

Total: 30 Hours

11O201 ENGINEERING MATHEMATICS II

(Common to all branches)

3 1 0 3.5

COURSE OBJECTIVES

- Acquire knowledge to use multiple integrals to find area and volume of surface and solids respectively.
- Have a good grasp of analytic functions, complex integration and their interesting properties and its applications.

PROGRAMME OUTCOME (PO)

1. Able to apply the fundamental knowledge of mathematics, science and engineering.

COURSE OUTCOMES (COs)

1. Acquire more knowledge in basic concepts of engineering mathematics
2. To improve problem evaluation technique
3. Choose an appropriate method to solve a practical problem

PREREQUISITES:

Knowledge of Mathematics of Higher secondary and Engineering Mathematics I

ASSESSMENT PATTERN

S. No	Bloom's Taxonomy (New Version)	Test I[2]	Test II[1]	Model Examination[1]	Semester End Examination
1	Remember	20	20	20	20
2	Understand	40	40	40	40
3	Apply	30	30	30	30
4	Analyze/ Evaluate	10	10	10	10
5	Create	-	-	-	-
Total		100	100	100	100

Unit I

Functions of Several Variables

Functions of two variables - Partial derivatives - Total differential - Derivative of implicit functions - Maxima and minima - Constrained Maxima and Minima by Lagrangian Multiplier method - Jacobians-application to engineering problems. **9 Hours**

Unit II

Multiple Integrals

Double integration in cartesian and polar co-ordinates - Change of order of integration - change of variables- Area and volume by multiple integrals- application to engineering problems.

9 Hours

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks.

Unit III

Vector Calculus

Gradient - divergence - curl- line - surface and volume integrals - Green's - Gauss divergence and Stokes' theorems (statement only) - application to engineering problems. **9 Hours**

Unit IV

Analytic Functions

Analytic functions- Necessary condition of analytic function-Sufficient condition of analytic function(statement only)- properties - Determination of analytic function using Milne Thomson's method, conformal mappings - Mappings of $w= z + a$, az, $1/z$, e^z- bilinear transformation - application to engineering problems.

9 Hours

Unit V

Complex Integration

Cauchy's fundamental theorem (statement only)- and application of Cauchy's integral formula(statement only) – Taylor's and Laurent's series- classification of singularities - Cauchy's residue theorem (statement only) – Contour integration - circular and semi circular contours (excluding poles on the real axis)- application to engineering problems **9 Hours**

Total: 45 + 15 Hours

Textbooks

1. B. S. Grewal, *Higher Engineering Mathematics*, Khanna Publications, New Delhi, 2008.
2. Kreyszig E, *Advanced Engineering Mathematics*, John Wiley & Sons, Inc, Singapore, 2008

References

1. B.V.Ramana, *Higher Engineering Mathematics,* Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2007.
2. N.P.Bali and Manish Goyal, *Text book of Engineering Mathematics,*3rd EditioLaxmi Publications(P)Ltd., 2008
3. C. Ray Wylie and C. Louis Barrett, *Advanced Engineering Mathematics*, Tata McGraw-Hill Publishing Company Ltd, 2003.
4. Glyn James. *Advanced Engineering Mathematics,* 3rd Edition, Wiley India, 2007
5. George B. Thomas, Jr. and Ross L.Finney *Calculus and Analytic Geometry,*Addison- Wesley Publishing Company,1998.

11O202 ENVIRONMENTAL SCIENCE

(Common to all branches)

3 0 0 3.0

COURSE OBJECTIVES

- Imparting knowledge on principles of environmental science and engineering.
- Understanding the concepts of ecosystem, biodiversity and impact of environmental pollution.
- Awareness on value education, population and social issues.

PROGRAMME OUTCOME (PO)

1. Able to apply the fundamental knowledge of mathematics, science and engineering.

COURSE OUTCOMES (COs)

1. Awareness on natural resources and understanding environmental problems
2. Realize the benefits of ecology and biodiversity
3. Characterize and analyze different levels of pollution and its management techniques
4. List human activities that may be responsible for global warming and cooling of earth's atmosphere and pave way for sustainable development
5. Classify and understand about the relation between human population and environment

PREREQUISITES:

Knowledge of Environmental Science taught in High school

ASSESSMENT PATTERN

S. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	25	25	15	15
2	Understand	25	25	25	25
3	Apply	20	20	20	20
4	Analyze	20	20	20	20
5	Evaluate	10	10	20	20
6	Create	-	-	-	-
Total		**100**	**100**	**100**	**100**

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Unit I

Introduction to Environmental Studies and Natural Resources

Environment: Definition- scope - importance – need for public awareness. Forest resources: Use –over exploitation- deforestation - case studies- mining - effects on forests and tribal people. Water resources: Use – over utilization of surface and ground water- floods – drought - conflicts over water. Mineral resources: Use – exploitation - environmental effects of extracting and using mineral resources - case studies. Food resources: World food problems - changes caused by agriculture and overgrazing - effects of modern agriculture-fertilizer-pesticide problems - water logging - salinity -case studies. Energy resources: Growing energy needs -

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks.

renewable and non renewable energy sources. Land resources: Land as a resource - land degradation - soil erosion. Role of an individual in conservation of natural resources.
Documentation of the effect of degradation of forest resource.

9 Hours

Unit II

Ecosystems and Biodiversity

Concept of an ecosystem: Structure and function of an ecosystem – producers - consumers -decomposers – energy flow in the ecosystem – ecological succession – food chains - food webs and ecological pyramids. Types of ecosystem: Introduction - characteristic features - forest ecosystem - grassland ecosystem - desert ecosystem - aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries). Biodiversity: Introduction– definition (genetic - species –ecosystem) diversity. Value of biodiversity: Consumptive use - productive use – social values – ethical values - aesthetic values. Biodiversity level: Global - national - local levels- India as a mega diversity nation- hotspots of biodiversity. Threats to biodiversity: Habitat loss - poaching of wildlife – man wildlife conflicts – endangered and endemic species of India. Conservation of biodiversity: *In-situ* and e*x-situ* conservation of biodiversity - field study**.**
Documentation of the endangered flora and fauna in your native place.

9 Hours

Unit III

Environmental Pollution

Pollution: Definition –air pollution - water pollution - soil pollution - marine pollution - noise pollution - thermal pollution - nuclear hazards. Solid waste management: Causes - effects - control measures of urban and industrial wastes. Role of an individual in prevention of pollution - pollution case studies. Disaster management: Floods – earthquake - cyclone - landslides. Electronic wastes**.**
Investigation on the pollution status of Bhavani river.

9 Hours

Unit IV

Social Issues and Environment

Sustainable development : Unsustainable to sustainable development – urban problems related to energy. Water conservation - rain water harvesting - watershed management. Resettlement and rehabilitation of people. Environmental ethics: Issues - possible solutions – climate change - global warming and its effects on flora and fauna - acid rain - ozone layer depletion - nuclear accidents - nuclear holocaust - wasteland reclamation - consumerism and waste products. Environment protection act: Air (Prevention and Control of Pollution) act – water (Prevention and control of Pollution) act – wildlife protection act – forest conservation act – issues involved in enforcement of environmental legislation**.**
Analyze the recent steps taken by government of India to prevent pollution.

9 Hours

Unit V

Human Population and Environment

Human population: Population growth - variation among nations – population explosion – family welfare programme and family planning – environment and human health – Human rights – value education – HIV / AIDS, Swine flu – women and child welfare . Role of information technology in environment and human health.
Population explosion in India, China – the present and future scenario.

9 Hours

Total: 45 Hours

Textbooks

1. T. G. Jr. Miller, *Environmental Science*, Wadsworth Publishing Co., 2004.
2. Anubha Kaushik and Kaushik C P, "Environmental Science and Engineering",,New Age International(P) Ltd, New Delhi, Third Edition:2008, (Reprint 2010)

References

1. Bharucha Erach, *The Biodiversity of India*, Mapin Publishing Pvt. Ltd., Ahmedabad India, 2010 .
2. S. Divan, *Environmental Law and Policy in India*, Oxford University Press, New Delhi, 2001.

3. K. D. Wager, *Environmental Management*, W. B. Saunders Co., Philadelphia, USA, 1998.
4. W. P. Cunningham, *Environmental Encyclopedia*, Jaico Publising House, Mumbai, 2004.
5. S. K. Garg, R. Garg, R. Garg, *Ecological & Environmental Studies*, Khanna Publishers, Delhi, 2006.
6. http://www.ipcc.ch/index.html
7. http://unfccc.int/2860.php

LANGUAGE ELECTIVE II

3 1 0 3.5

11C204 / 11A204 / 11M204 APPLIED MATERIALS SCIENCE

(Common to AE, CE, and ME)

3 0 0 3.0

COURSE OBJECTIVES

- To make students familiar in the properties of conducting, semiconducting, magnetic and dielectric materials.
- To acquire knowledge in thermal properties of materials used in construction and non-destructive techniques.

PROGRAMME OUTCOME (PO)

1. Able to apply the fundamental knowledge of mathematics, science and engineering.

COURSE OUTCOMES (COs)

1. Understanding the electrical properties of metals
2. Able to differentiate intrinsic and extrinsic semiconductors
3. Realize the frequency and temperature dependence of various polarization mechanisms
4. The importance of good and bad conductors and their practical applications in their respective fields
5. Acquiring knowledge about the non-destructive technology

PREREQUISITES:

Knowledge of Engineering Physics taught in I Semester

ASSESSMENT PATTERN

S.No		Test 1*	Test 2*	Model Examination*	Semester End Examination
1	Remember	25	25	20	20
2	Understand	25	25	25	25
3	Apply	20	20	20	20
4	Analyze	20	20	20	20
5	Evaluate	10	10	15	15
6	Create	-	-	-	-
Total		**100**	**100**	**100**	**100**

Unit I

Electrical Properties of Metals

Introduction- Derivation of microscopic form of Ohm's law- postulates of classical free electron theory- derivation of electrical conductivity of metals (Drude- Lorentz theory)- merits and demerits. Derivation of

* The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks.

thermal conductivity – Wiedemann-Franz law- verification. Electron energies in metal and Fermi energy- Fermi-Dirac distribution function and its variation with temperature- density of energy states- calculation of density of electron and fermi energy at 0K- average energy of free electron at 0K- Importance of fermi energy- problems.

Quantum free electron theory and Band theory of solids. **9 Hours**

Unit II

Semiconducting Materials & Devices

Introduction - elemental and compound semiconductors - Intrinsic semiconductors: density of electrons - density of holes- determination of carrier concentration and position of Fermi energy- band gap energy determination (quantitative treatment). Extrinsic semiconductors: carrier concentration in p-type and n-type semiconductors. Hall effect- theory of Hall effect- experimental determination of Hall voltage- applications. Semi conducting devices: solar cells (Photovoltaic effect) – uses. Photo detectors: pin photo diodes – applications.

Variation of Fermi level with temperature and doping concentration in extrinsic semiconductors.

9 Hours

Unit III

Dielectrics

Introduction- fundamental definitions in dielectrics- expressions for electronic, ionic and orientation polarization mechanisms- space charge polarization- Langevin- Debye equation- frequency and temperature effects on polarization- dielectric loss- internal field- expression for internal field (cubic structure)- derivation of Clausius-Mosotti equation – importance. Dielectric breakdown- various breakdown mechanisms with characteristics- applications of dielectric materials and insulating materials - problems.

Charging and discharging of capacitors. **9 Hours**

Unit IV

Thermal Physics

Mode of heat transfer-thermal conductivity-thermal diffusivity-thermal conduction through compound media (bodies in series and parallel) - thermal conductivity of good conductor - Forbe's method-thermal conductivity of bad conductor- Lee's disc-radial flow of heat-expression for thermal conductivity of rubber-experimental determination-practical applications of conduction-problems.

Thermal and ventilation design of buildings . **9 Hours**

Unit V

Non-Destructive Testing

Introduction - various steps involved in NDT process-X-ray radiographic technique -displacement method – merits, demerits and applications of X-ray radiography - X-ray fluoroscopy – liquid penetrant method-advantages, disadvantages and applications –ultrasonic flaw detector - block diagram - construction and working - merits and demerits. Thermography: types-block diagram - recording of thermal images - merits, demerits and applications.

Fluoroscopy or Real-time Radiography.

9 Hours

Total: 45 Hours

Text Books

1. V. Rajendran, *Engineering Physics*, Tata McGraw-Hill, New Delhi, 2011.
2. M. Arumugam, *Physics II*, Anuradha Publications, Kumbakonam, 2005.

References

1. S. O. Pillai, Solid State Physics, New Age International Publications, New Delhi, 2006.
2. M.N. Avadhanulu and P.G. Kshirsagar, A Text Book of Engineering Physics, S. Chand & Company Ltd., New Delhi, 2005.
3. V. Raghavan, Materials Science and Engineering, Prentice Hall of India, New Delhi, 2009.
4. D.S Mathur, Elements of properties of matter, S.Chand Publications, New Delhi, Reprints 2010.
5. P.K. Palanisami, Physics For Engineers, Scitech Publications (India)Pvt. Ltd, Chennai, 2002.

11O205 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

(Common to all branches except EEE, ECE, EIE)

4 0 0 4.0

COURSE OBJECTIVES

- To understand the basics concepts of electric circuits & magnetic circuits
- To learn the operations of electrical machines
- To impart knowledge in the concepts of Communication systems

PROGRAMME OUTCOMES (POs)

1. Able to apply the fundamental knowledge of mathematics, science and engineering.
8. Able to function on multidisciplinary teams.

COURSE OUTCOMES (COs)

1. Analyze the power in single phase AC systems
2. Derive an equation for self and mutual inductance
3. Determine the characteristics of Bipolar junction transistors
4. Diagnose the operation of half wave and full wave rectifier
5. Design of an operational amplifier

PREREQUISITES:

Knowledge of Electrical & Electronics taught in High school and Engineering Physics taught in I Semester

ASSESSMENT PATTERN

S. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	10	10	10	10
2	Understand	20	20	20	20
3	Apply	30	30	30	30
4	Analyze / Evaluate	35	35	35	35
5	Create	5	5	5	5
Total		100	100	100	100

Unit I

Electric Circuits

Definition of Voltage, Current, Power & Energy, Ohm's law, Kirchoff's Law & its applications – simple problems, division of current in series & parallel circuits, generation of alternating EMF, definition of RMS value, average value, peak factor, form factor. Power in single phase AC – three phase system.

Star to delta and delta to star transformations, R-L and R-C series circuit

12 Hours

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks

Unit II

Magnetic Circuits

Definition of MMF, Flux, Reluctance, Properties of Flux lines, Self & Mutual Inductance, Ampere Turns, Series & parallel magnetic circuits, Comparison between Electric & magnetic circuits, Law of Electromagnetic induction, Fleming's Right & Left hand rule.

Magnetic impedance, Effective resistance, Magnetic capacitivity

12 Hours

Unit III

Electrical Machines

Construction, Type, Principle of Operation & Working Principle of DC Generator, DC Motor, Transformer, Induction Motor, Induction type single phase energy meter, Domestic wiring practice, Tube light circuit, Earthing & earthing methods.

Characteristics of DC generators and DC motors

12 Hours

Unit IV

Electronics Engineering

PN Junction diode & Zener diode – Characteristics – Half wave and full wave rectifier – Bipolar junction transistors – CB,CE, CC Configurations and characteristics – basic concepts of amplifiers and oscillators – Logic gates – Inverting, Non inverting amplifiers and Operational amplifiers- Basic Computer organization – Block diagram of Microprocessors (8085).

Semiconductor theory, Diode clippers, op-amp parameters and applications

12 Hours

Unit V

Communication Engineering

Introduction to communication systems – Need for modulation – Types- Block Diagram representation only – Block diagram of TV system – Introduction to cellular & mobile telephony- Block diagram of Optical and Satellite communication systems.

Analog and digital signals, Transmission medium, Digital communication

12 Hours

Total: 60 Hours

Textbook (s)

1. T. K. Nagsarkar and M. S. Sukhija, *Basic of Electrical Engineering*, Oxford Press, 2005
2. R. Muthusubramaninan, S. Salivahanan and K. A. Muraleedharan, *Basic Electrical, Electronics and Computer Engineering*, Tata McGraw Hill, 2004

References

1. J. A. Edminister, *Electric Circuits*, Schaum's Series, McGraw Hill, 2005
2. Van Valkenbergm, *Electric Circuits and Network Analysis*, Prentice Hall (India) Pvt. Ltd., 2005
3. Smarjith Ghosh, *Fundamentals of Electrical and Electronics Engineering*, Prentice Hall (India) Pvt. Ltd., 2005

11C206 APPLIED GEOLOGY

2 0 2 3.0

COURSE OBJECTIVES

- To impart basic knowledge on earth sciences and their applications in civil engineering
- To impart knowledge on rock mechanics and engineering

PROGRAMME OUTCOME (PO)

1. Able to apply the fundamental knowledge of mathematics, science and engineering.

COURSE OUTCOMES (COs)

1. Identification of rocks and its structures
2. Analysis of rocks during the construction of tunnels, dams and road cuttings

PREREQUISITES:

Knowledge of Geography taught in High school and knowledge of Applied Material Science

ASSESSMENT PATTERN

S. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	20	20	20	20
2	Understand	40	40	40	40
3	Apply	20	20	20	20
4	Analyze / Evaluate	20	20	20	20
5	Create	-	-	-	-
	Total	100	100	100	100

Unit I

General Geology

Geology in civil engineering – Branches of geology – Earth structures and composition - Earth processes – Weathering – Work of rivers - Wind and their engineering importance – Earthquake belts in India – Groundwater: Mode of occurrence – Prospecting - Importance in civil engineering.

Elementary knowledge on continental drift and plate tectonics

6 Hours

Unit II

Mineralogy

Elementary knowledge on symmetry elements of important crystallographic systems – Physical properties of minerals – Study of the rock forming minerals – Quartz family - Feldspar family – Mica - Pyroxene family minerals –- Fundamentals of process of formation of ore minerals

Coal and petroleum – Their origin and occurrence in India

6 Hours

† The marks secured in Test I and II will be converted to a maximum of 20 and model examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly, internal assessment will be calculated for 50 marks.

Unit III

Petrology and Rock Mechanics

Rocks - Introduction - Rock cycle – Physical description of rock types - Igneous rocks – Granite – Syenite and Basalt - Sedimentary rocks - Conglomerate – Sandstone – Shale and Limestone - Metamorphic rocks - Schist – Gneiss - Quartzite and marble – Rock mechanics - Introduction - Study of rock properties – Porosity – Permeability - Moisture content – Swelling – Durability.

Properties, behaviour and engineering significance of clay minerals

6 Hours

Unit IV

Structural Geology and Geophysical Investigations

Attitude of beds – Outcrops - Contours – Introduction to geological maps –Folds - Faults and joints – Their bearing on engineering construction - Seismic and electrical methods for civil engineering investigations.

Study of structures **6 Hours**

Unit V

Geological Investigations in Civil Engineering

Study of air photos and satellite images – Interpretation for civil engineering projects – Geological conditions necessary for construction of dams – Tunnels – Road cuttings - Land slides – Causes and preventions - Sea erosion and coastal protection.

Remote sensing techniques **6 Hours**

Total: 30 + 30 Hours

List of Experiments

1. Physical properties of minerals
2. Physical properties of rocks
3. Identification of minerals in hand specimen
4. Identification of rocks in hand specimen

Textbooks

1. Parbin Singh, *Engineering and General Geology*, Katson Publication House, 2001
2. B. P. Verma, *Rock Mechanics for Engineers*, Khanna Publishers, 1997

Reference

1. Legeet, *Geology and Engineering*, McGraw-Hill Book Company 1998

11C207 ENGINEERING MECHANICS

3 1 0 3.5

COURSE OBJECTIVES

- At the end of the course, students will have knowledge of coplanar and space forces and the conditions for the equilibrium of particles and rigid bodies
- The students will be able to apply Newton's second law of motion to the dynamics of particles

PROGRAMME OUTCOME (POs)

1. Able to apply the fundamental knowledge of mathematics, science and engineering.

2. Able to identify, formulate and solve Civil Engineering problems in accordance with Indian Standard codes of practice.

COURSE OUTCOMES (COs)

1. Determination of unknown reactions using free body diagram of particles and rigid bodies
2. Application of equations of statics/Dynamics to determine the unknown quantities.
3. Determine the properties of section that are needed for the design of structural elements.

PREREQUISITES:

Knowledge of Statics and Dynamics taught in High Schools

ASSESSMENT PATTERN

S. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	10	10	10	10
2	Understand	20	20	20	20
3	Apply	40	40	40	40
4	Analyze / Evaluate	30	30	30	30
5	Create				
	Total	100	100	100	100

Unit I

Basics and Statics of Particles

Introduction - Units and dimensions - Laws of mechanics – Parallelogram law of forces – Vectors – Vectorial representation of forces -Coplanar forces – Resolution and composition of forces – Equilibrium of a particle under coplanar forces – Forces in space - Equilibrium of a particle in space.

Principles of relativistic Mechanics

9 Hours

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks

Unit II

Equilibrium of Rigid Bodies

Free body diagram – Types of supports and their reactions – Moments and couples – Vectorial representation of moments and couples – Scalar components of a moment – Varignon's theorem – Resolution of a given force into a force acting at a given point and a couple – Reduction of a system of coplanar forces acting on a rigid body into a single force and a single couple - Equilibrium of rigid bodies in two dimensions – Equilibrium of rigid bodies in three dimensions.

Equilibrium of Multiply Connected Rigid Bodies

9 Hours

Unit III

Friction

Frictional force – Laws of Coulomb friction – Angle of friction – Cone of friction - Simple contact friction – Ladder friction - Belt friction –Transmission of power through belts – Wedge friction – Screw jack – Self locking - Rolling resistance – Problems involving the equilibrium of rigid bodies with frictional forces.

Friction Offered by Thrust Bearing

9 Hours

Unit IV

Properties of Surfaces and Solids

Determination of areas and volumes – First moment of area and the determination of centroid of any cross section – Moment of inertia of plane areas - Parallel axis theorem-Polar moment of inertia-Product of inertia-Principal moments of inertia of plane areas - Mass centre of a body - Moment of inertia of mass of a body.

Principal Mass Moment of Inertia

9 Hours

Unit V

Dynamics of Particles

Kinematics of particles in rectilinear motion - Relationships between displacement - velocity and acceleration - Uniform rectilinear motion and uniformly accelerated rectilinear motion - Curvilinear motion-projectile motion. Newton's second law of motion - Work done by a force-kinetic energy and potential energy - Principle of work and energy - Principle of impulse and momentum - Impact of elastic bodies

Equations of Motion in terms of Radial and Transverse Components

9 Hours

Total: 45 + 15 Hours

Textbook

1. M. S. Palanisamy and S. Nagan, *Engineering Mechanics – Statics & Dynamics,* TMH Publishing Company, 2005

References

1. F. P. Beer and E. R. Johnston, *Vector Mechanics for Engineers – Statics and Dynamics,* Tata McGraw Hill Publishing Company, New Delhi, 2005
2. R.C. Hibbeller, *Engineering Mechanics – Statics (vol. I), Dynamics (vol. II*), Pearson Education Asia Pvt. Ltd., 2000.
3. Andrew Pytel and Jaan Kiusalaas, *Engineering Mechanics – Statics (vol. I), Dynamics (vol. II),* Brooks / Cole Publishing Company, 1999
4. Irving H. Shames, *Engineering Mechanics - Statics and Dynamics,* Pearson Education Asia Pvt. Ltd., 2004

11C209 WORKSHOP PRACTICE

0 0 2 1.0

COURSE OBJECTIVES

- To learn the use of basic hand tools and to know the need for safety in work place
- To gain hands on experience on Carpentry, Fitting, Sheet metal, Plumbing, Arc welding, Foundry and Basic electrical circuits
- To have the basic knowledge on working of domestic appliances.

PROGRAMME OUTCOME (PO)

1. Able to apply the fundamental knowledge of mathematics, science and engineering.

COURSE OUTCOMES (COs)

1. Perform basic Carpentry work
2. Perform basic Fitting work
3. Fabrication of Sheet metal objects
4. Plumbing work
5. Arc welding skill

PREREQUISITES:

Knowledge of basics of Mechanical Engineering

ASSESSMENT PATTERN

	Internal Assessment	**Semester End Examination**
Preparation	10	20
Observation and Results	10	10
Record	10	-
Mini-Project/ Model Examination / Viva-Voce	20	20
Total	**50**	**50**

LIST OF EXPERIMENTS

MECHANICAL

1. Forming of simple objects using sheet metal
2. Preparing a V joint from the given MS flat
3. Preparing a half round joint from the given MS flat
4. Preparing a green sand mould using solid pattern
5. Demonstration of Assembly and Disassembly of centrifugal pump
6. Making simple gadget like chair, sofa, table, cell phone stand by using welding joints

CIVIL

1. Making simple gadget like pen stand, box, cell phone stand etc., by using power tools
2. Making English letters from A to Z by using carpentry tools with screw, bolt and nut

3. Making a connection of basic pipe lines, using PVC pipes, that includes valves and taps

ELECTRICAL

1. Staircase and Godown wiring
2. Soldering practice.
3. Assembly and Disassembly of computer system/Television
4. Demonstration of working of domestic appliances: Mixie, Electric Iron/ Heater, Washing Machine/ Refrigerator and Window Air-Conditioner

Total: 30 Hours

PRACTICAL SCHEDULE

SI. No.	Experiments	Hours
1	Forming of simple objects using sheet metal	2
2	Preparing a V joint from the given MS flat	2
3	Preparing a half round joint from the given MS flat	2
4	Preparing a green sand mould using solid pattern	2
5	Demonstration of Assembly and Disassembly of centrifugal pump	2
6	Making simple gadget like chair, sofa, table, cell phone stand by using welding joints	2
7	Making simple gadget like pen stand, box, cell phone stand etc., by using power tools	2
8	Making English letters from A to Z by using carpentry tools with screw, bolt and nut	3
9	Making a connection of basic pipe lines, using PVC pipes, that includes valves and taps.	3
10	Staircase and Godown wiring	2
11	Soldering practice	2
11	Assembly / Disassembly of computer system, TV	3
12	Demonstration of working of domestic appliances: Mixie, Electric Iron, Heater, Washing Machine, Refrigerator and Window Air-Conditioner	3

11O108 ENGINEERING PHYSICS LABORATORY

(Common to all branches)

0 0 2 1.0

COURSE OBJECTIVES

- To know how to execute experiments properly, presentation of observations and arrival of conclusions
- It is an integral part of any science and technology program
- To view and realize the theoretical knowledge acquired by the students through experiments

PROGRAMME OUTCOME (PO)

1. Able to apply the fundamental knowledge of mathematics, science and engineering.

COURSE OUTCOMES (COs)

1. Observation and analytical skills are developed
2. Various properties of matter can be known
3. Different optical properties can be analyzed

PREREQUISITES:

Knowledge of Engineering Physics

ASSESSMENT PATTERN

	Internal Assessment
Preparation	10
Observation & Results	15
Record	10
Model Examination & Viva Voce	15
Total	**50**

LIST OF EXPERIMENTS

1. Determination of moment of inertia and rigidity modulus of wire using torsion pendulum (symmetrical masses method).
2. Determination of Young's modulus by non-uniform bending.
3. Determination of thermal conductivity of a bad conductor using Lee's disc.
4. Determination of frequency of vibrating rod using Melde's apparatus.
5. Determination of viscosity of a liquid - Poiseulle's method.
6. Determination of thickness of a thin wire - air wedge method.
7. Determination of wavelength of mercury spectrum – grating.
8. Determination of refractive index of a liquid and solid using traveling microscope.
9. Determination of energy band gap of a semiconductor diode.
10. Determination of wavelength of LASER and particle size of a given powder.
11. Measurement of numerical aperture and acceptance angle of a optical fiber.
12. Young's modulus – uniform bending (pin and microscope).

Total: 30 Hours

11O301 ENGINEERING MATHEMATICS III

(Common to all branches Except CSE and Bio-Tech)

3 1 0 3.5

COURSE OBJECTIVES

- To obtain the knowledge of expressing periodic functions as Fourier series, Fourier transform and Z transform which is used to analyze signals in signal processing
- Ability to solve boundary value problems in heat and wave equation using partial differential equations

PROGRAMME OUTCOME (PO)

1. Able to apply the fundamental knowledge of mathematics, science and engineering.

COURSE OUTCOMES (COs)

1. Acquire more knowledge in basic concepts of engineering mathematics
2. To improve problem evaluation technique
3. Choose an appropriate method to solve a practical problem

PREREQUISITES:

Knowledge of Engineering Mathematics I & II

ASSESSMENT PATTERN

S. No		Test I[†]	Test II[†]	Model Examination[†]	Semester End Examination
1	Remember	20	20	20	20
2	Understand	40	40	40	40
3	Apply	30	30	30	30
4	Analyze/ Evaluate	10	10	10	10
5	Create	-	-	--	-
Total		**100**	**100**	**100**	**100**

Unit I

Fourier Series

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range cosine and sine series – Parseval's Identity - Harmonic Analysis- Application to engineering problems

9 Hours

Unit II

Fourier Transform

Fourier transform pair – Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem - Parseval's Identity-Finite Fourier Transform- Application to engineering problems

9 Hours

[†] The marks secured in Test I and II will be converted to a maximum of 20 and model examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly, internal assessment will be calculated for 50 marks.

Unit III

Z -Transform and Difference Equations

Z-transform - Elementary properties – Inverse Z-transform – Convolution theorem -Formation of difference equations – Solution of difference equations using Z- transform - Application to engineering problems.

9 Hours

Unit IV

Partial Differential Equations

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solution of standard types of first order partial differential equations (excluding reducible to standard forms) – Lagrange's linear equation – Linear partial differential equations of second and higher order with constant coefficients

9 Hours

Unit V

Boundary value problems

Classification of second order quasi linear partial differential equations – Fourier series solutions of one dimensional wave equation – One dimensional heat equation (Insulated ends excluded) – Steady state solution of two-dimensional heat equation (Insulated edges excluded) – Fourier series solutions in Cartesian coordinates

9 Hours

Total: 45 + 15 Hours

Text Books

1. B. S .Grewal , *Higher Engineering Mathematics* , Khanna Publications , New Delhi ,2007.
2. E. Kreyszig. *Advanced Engineering Mathematics* , 8th Edition , John Wiley & Sons, Inc,Singapore , 2008.

Reference Books

1. B.V.Ramana, *Higher Engineering Mathematics*, Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2007.
2. N.P.Bali and Manish Goyal, *Text book of Engineering Mathematics*,3rd EditioLaxmi Publications(P)Ltd., 2008
3. C. Ray Wylie and C. Louis Barrett, *Advanced Engineering Mathematics*, Tata McGraw-Hill Publishing Company Ltd, 2003.
4. Glyn James. *Advanced Engineering Mathematics*, 3rd Edition, Wiley India, 2007

11C302 MECHANICS OF DEFORMABLE BODIES I

3 1 0 3.5

COURSE OBJECTIVES

- To impart knowledge on simple stresses, strains and elastic constants
- To determine the stresses, strains and displacement in structural components due to flexure and torsion

PROGRAMME OUTCOME (PO)

1. Able to apply the fundamental knowledge of mathematics, science and engineering.

COURSE OUTCOMES (COs)

1. Analyze stress, strain and elastic constants
2. Evaluate shear & bending in beams
3. Design shafts under torsion
4. Evaluate shear stress distribution

PREREQUISITES:

Knowledge of Engineering Mechanics

ASSESSMENT PATTERN

S. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	20	20	20	20
2	Understand	20	20	20	20
3	Apply	60	60	60	60
4	Analyze / Evaluate	-	-	-	-
5	Create	-	-	-	-
	Total	**100**	**100**	**100**	**100**

Unit I

Simple Stresses and Strains

Stress and strain due to axial load – Elastic limit – Hooke's law – Stress – Strain diagram – Stresses in Composite sections - Thermal stresses – Poisson's ratio – Shear stress and Shear strain – Rigidity modulus – Volumetric strain – Bulk modulus – Relation between elastic constants – Strain energy due to axial force

Stresses and strain energy due to suddenly applied load and impact load **9 Hours**

Unit II

Beams and Bending

Types of beams – Types of supports – Shear force and bending moment in beams – Sketching of shear force and bending moment diagrams for cantilever, simply supported and over hanging beams for any type of loading – *Relationship between rate of loading, shear force and bending moment*

9 Hours

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks

Unit III

Stresses in Beams

Theory of simple bending – Assumptions – Analysis for bending stresses – Load carrying capacity of beams – proportioning sections – Flitched beams – Leaf springs – Strain energy due to bending moment – Shear stress distribution

Strain energy due to pure shear

9 Hours

Unit IV

Torsion of Circular Shafts and Springs

Derivation of torsion equation – Assumptions – Theory of torsion – Stresses in solid circular and hollow shafts – Power transmitted by the shaft – Stepped shafts – Strain energy due to torsion – Deformations and stresses in closed and open coiled helical springs

Composite shaft – Stress due to combined bending and torsion

9 Hours

Unit V

Two Dimensional State of Stress

Two dimensional state of stress at a point – Normal and shear stresses on any plane – Principal planes and principal stresses – Maximum shear stress – Analytical methods and Mohr's circle method – Two dimensional state of strains at a point - Principal strains and their directions- Stresses and deformations in thin walled cylinders and spherical shells due to internal pressure

Strain rosettes

9 Hours

Total: 45 + 15 Hours

Textbooks

1. E. P. Popov, *Mechanics of Solids*, Prentice Hall of India, New Delhi, 1996
2. S. Rajput, *Strength of Materials*, S. Chand & Co., 2006

References

1. S. M. A. Kazimi, *Solid Mechanics*, Tata McGraw –Hill Book Co Ltd., 1998
2. B. C. Punmia, *Strength of Materials*, Laxmi Publications, 1992
3. B. S. Basavarajaiah and P. Mahadevappa, *Strength of Materials*, Universities Press Pvt. Ltd., 2010

11C303 SURVEY I

3 1 0 3.5

COURSE OBJECTIVES

- To impart knowledge on the basic principles of field surveying procedures
- To impart a clear understanding on the working principles and use of theodolite

PROGRAMME OUTCOME (PO)

5. Able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.

COURSE OUTCOMES (COs)

1. Demonstrate the various functional aspects of surveying instruments
2. Prepare topographic map including contours of any site
3. Become a registered building and land surveyor
4. Calculate the area and volume of earthwork

PREREQUISITES:

Knowledge of Analytical Geometry taught in Higher secondary

ASSESSMENT PATTERN

S. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	30	20	10	10
2	Understand	30	30	30	30
3	Apply	40	50	60	60
4	Analyze / Evaluate	-	-	-	-
5	Create	-	-	-	-
Total		**100**	**100**	**100**	**100**

Unit I

Introduction and Chain Surveying

Definition - Principles - Classification - Scales - Survey instruments, their care and adjustment - Ranging and chaining - Reciprocal ranging - Setting perpendiculars - well conditioned triangles - Traversing - Plotting - Enlarging and reducing figures.

Field and office work - Conventional signs

9 Hours

Unit II

Compass Surveying and Plane Table Surveying

Prismatic compass - Bearing - Systems and conversions - Local attraction – True and magnetic meridians - Magnetic declination - Dip - Traversing - Plotting - Adjustment of errors by graphical and analytical methods - Plane table instruments and accessories – Methods: Radiation, Intersection, Resection and Traversing - Three and

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks

two point problems.
Surveyor's compass - Merits and demerits of plane table surveying

9 Hours

Unit III

Levelling

Level line - Horizontal line - Spirit level - Temporary and permanent adjustments - Fly and check levelling - Booking - Reduction – Effect of curvature and refraction - Reciprocal levelling - Longitudinal and cross sections - Plotting - Calculation of areas and volumes - Contouring – Methods - Characteristics of contours - Plotting - Earth work volume - Capacity of reservoirs – Block contouring.
Levels and Staves - Sensitiveness - Bench marks - Uses of contours - Microptic

9 Hours

Unit IV

Theodolite Surveying

Theodolite - Vernier and microptic - Temporary and permanent adjustments of vernier transit - Horizontal angles and their measurement - Vertical angles and their measurement - Heights and distances - Traversing - Closing error and distribution - Gale's tables.
Description and uses of theodolite - Omitted measurements – Radial contouring

9 Hours

Unit V

Tacheometric Surveying

Tacheometric systems - Tangential, stadia and subtense methods - Stadia systems – Fixed hair method - Horizontal and inclined sights – Determination of Stadia constants of the tacheometer - Anallactic lens – Tangential system – Subtense measurements - Subtense bar – Direct reading tacheometry.
Principles, instruments required - Vertical and normal staffing - Fixed and movable hairs

9 Hours
Total: 45 + 15 Hours

Textbook

1. B. C. Punmia, *Surveying, Vol. I & II*, Laxmi Publications, New Delhi, 2005

References

1. K. R. Arora, *Surveying, Vol. I*, Standard Book House, 2008
2. N. Basak, *Surveying*, Tata McGraw Hill, 2007
3. T. P. Kanetkar, *Surveying and Levelling*, *Vol. I & II*, United Book Corporation, 2002

11C304 FLUID MECHANICS

3 1 0 3.5

COURSE OBJECTIVES

- To enhance the students' knowledge on fluid statics, kinematics and dynamics
- To impart knowledge on the fluid properties and application to real situations of fluid flow

PROGRAMME OUTCOME (PO)

3. Able to design and conduct experiments, as well as to analyze and interpret data.

COURSE OUTCOMES (COs)

1. Identify the fluid's classifications, properties and their units of measurement
2. Handle various pressure measuring instruments in the field
3. Assess the stability criteria's for a floating body
4. Expertise in Dimensional Analysis, Similitude and Model Analysis
5. Demonstrate the fluid flow
6. Design of pipe layout

PREREQUISITES:

Knowledge of Engineering Mechanics

ASSESSMENT PATTERN

S. No.		Test 1†	Test II†	Model Examination†	Semester End Examination
1	Remember	30	20	20	20
2	Understand	30	30	20	20
3	Apply	40	50	60	60
4	Analyze	-	-	-	-
5	Evaluate	-	-	-	-
6	Create	-	-	-	-
Total		**100**	**100**	**100**	**100**

Unit I

Fluid Properties and Fluid Statics

Dimensions and units - Fluid properties - Hydrostatic law- Pascal's law - Atmospheric, absolute, gauge and vacuum pressures - Measurement of pressure by various types of manometers - Total pressure on plane surfaces - Buoyancy and meta-centre.

Types of fluids

9 Hours

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks

Unit II

Fluid Kinematics

Classification of fluid flow - Stream line, streak line and path line - Convective and local acceleration - Continuity equation for one, two and three dimensional flows - Stream function and velocity potential function - Flow net *Properties of flow net and its uses*

9 Hours

Unit III

Fluid Dynamics

Pressure, kinetic and datum energy - Euler's equations of motion for a three dimensional flow - Bernoulli's theorem and proof - Application of Bernoulli's equation - Discharge measurement – Pitot tube - Orifice meter, Venturimeter, Mouth piece and Orifice - Laminar flow through pipes and between plates - Hagen Poiseuille equation - Turbulent flow
Moody diagram

9 Hours

Unit IV

Boundary Layer and Flow through Pipes

Boundary layer concept - Displacement and momentum thickness - Development of laminar and turbulent flows in circular pipes - Darcy-Weisbach equation for flow through circular pipe - Moody diagram - Major and minor losses of flow in pipes problems - Pipes in series - Equivalent pipe.
Pipes in parallel

9 Hours

Unit V

Dimensional Analysis, Similitude and Model Analysis

Methods of dimensional analysis - Rayleigh's method - Buckingham's ∏ theorem - Hydraulic similitude - Model analysis - Types of models.
Dimensionless numbers

9 Hours
Total: 45 Hours

Textbooks

1. R. K. Bansal, *Fluid Mechanics and Hydraulic Machines*, Laxmi Publications, New Delhi, 2005
2. R. K. Rajput, *A Text Book of Fluid Mechanics*, S. Chand & Co., New Delhi, 2006

References

1. P. N. Modi and S. M. Seth, *Hydraulics and Fluid Mechanics*, Standard Book House, Delhi, 2010
2. V. L. Streeter and B. E. Wylie, *Fluid Mechanics*, McGraw Hill International Book Co., 2006
3. Yunus A. Cengal and John M. Cimbala, *Fluid Mechanics – Fundamentals and Applications (In SI Units)*, McGraw Hill International Book Co., 2004

11C305 DESIGN OF TIMBER AND MASONRY STRUCTURES

3 0 0 3.0

COURSE OBJECTIVES

To impart fundamental knowledge on the design of timber and masonry structures

- To make the students understand the design principles of timber and masonry structures

PROGRAMME OUTCOME (PO)

5. Able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.

11. Able to perform economic analysis, labour/time/material management, construction schedules and activities related to design, construction, operations and maintenance of systems in the technical specializations of Civil Engineering.

COURSE OUTCOMES (COs)

1. Design of wooden members subjected to axial forces and bending moment etc
2. Design of masonry piers and walls

PREREQUISITES:

Knowledge of Engineering Mechanics and Mechanics of Deformable Bodies I

ASSESSMENT PATTERN

S. No.		Test 1†	Test II†	Model Examination†	Semester End Examination
1	Remember	10	10	10	10
2	Understand	10	10	10	10
3	Apply/ Evaluate	40	40	40	40
4	Analyze	20	20	20	20
5	Create	20	20	20	20
	Total	**100**	**100**	**100**	**100**

Unit I

Concepts of Structure

Definition and classification of structures - Structural systems - Basic structural requirements - Strength, stability and stiffness - Design methods - Working stress method - Limit state method -Code of practice - Choice between different structural materials - Masonry, timber, concrete and steel - Types of loads - Dead load - Live load - Wind load – earthquake load.

Case studies of buildings

9 Hours

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks

Unit II

Timber Structures

General - Factors affecting strength of timber - Permissible stresses - Bearing stress - Live load for design - Types of timber joints - Design of rectangular beams - Design of tension members - Design of compression members of solid and box sections - Design of bolted and nailed connections – Design of timber joists - Allowable stresses in tension, compression and flexure

Design of timber trusses

9 Hours

Unit III

Design of Masonry Column

Design of permissible compressive stresses in masonry - Design of masonry column subjected to axial and eccentric loading - Design of reinforced brick masonry - Design of composite brick masonry - Design of masonry arches in building

Stability of masonry arches

9 Hours

Unit IV

Design of Hollow Block Masonry

Materials for Hollow Blocks as per IS 2185 – Size of the Hollow blocks – Tests on Hollow Blocks – Design and Construction of Hollow Block Masonry Walls

Methods of Manufacturing Hollow Blocks

9 Hours

Unit V

Design of Masonry Wall

Types of walls - Design of solid load bearing wall for axial loads - Design of solid load bearing wall for eccentric loads - - Design of wall with opening - Design of cavity wall - Design of stiffened and unstiffened wall

Design of masonry retaining wall.

9 Hours

Total: 45 Hours

Textbooks

1. A.S. Arya, *Design of Masonry and Timber Structures*, Nemchand and Bros. Publishing, 2007
2. P. Dayaratnam, *Brick and Reinforced Brick Structures*, Oxford & IBH Publishing Co. Pvt. Ltd, 1987

References

1. B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, *Design of steel structures*, Laxmi Publications (P) Ltd, 2007
2. W. M. C McKenzie, *Design of Structural Elements*, Macmillan Publishers, 2010
3. IS: 1905 – 1980, *Indian Standard Code of Practice for Structural Safety of Buildings*, Masonry Walls, Indian Standards Institution, 1981
4. IS: 883 – 1994, *Code of Practice for Design of Structural Timber in Buildings*, BIS New Delhi
5. IS: 2185 (Part I) – 1979, *Indian Standard Specification for Concrete Masonry Units Part I Hollow and Solid Concrete Blocks* BIS New Delhi
6. IS: 2185 (Part II) – 1983, *Indian Standard Specification for Concrete Masonry Units Part II, Hollow and Solid Light Weight Concrete Blocks*, BIS New Delhi
7. IS: 2185 (Part III) – 1984, *Indian Standard Specification for Concrete Masonry Units, Part III Autoclaved Cellular (Aerated) Concrete Blocks*, BIS New Delhi

11C306 ARCHITECTURE AND URBAN PLANNING

3 0 0 3.0

COURSE OBJECTIVES

- To provide a basic knowledge on architecture and urban planning.
- To provide basic knowledge on different types of plans, implementation and management for sustainable development

PROGRAMME OUTCOMES (POs)

5. Able to design a system, component, or process to meet desired needs within realistic constraints such as
   economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.
11. Able to perform economic analysis, labour/time/material management, construction schedules and activities related to design, construction, operations and maintenance of systems in the technical specializations of Civil Engineering.

COURSE OUTCOMES (COs)

1. Design of buildings with respect to architectural point of view
2. Assess and select the best urban layout plan
3. Prepare Environmental Impact Assessment for any civil project.
4. Better assessment of the proposals because of the cost-benefit analysis knowledge.

PREREQUISITES:

Knowledge of Engineering Physics and Survey I

ASSESSMENT PATTERN

S. No.		Test 1†	Test II†	Model Examination†	Semester End Examination
1	Remember	20	20	20	20
2	Understand	40	40	40	40
3	Apply	20	20	20	20
4	Analyze	20	20	20	20
5	Evaluate	-	-	-	-
6	Create	-	-	-	-
Total		**100**	**100**	**100**	**100**

Unit I

Architectural and Climate Responsive Design

Architectural design - An analysis - Integration of function and aesthetics - Introduction to basic elements and principles of design - Factors that determine climate - Characteristics of climate types - Design for various climate types.

Passive and active energy controls

9 Hours

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks

Unit II

Building Types

Building types – Classification of residential, industries and public building - Planning concepts - Residential, institutional, commercial and Industrial - Application of anthropometry and space standards - Building rules and regulations - Building services. Layout regulations

Safety standards

9 Hours

Unit III

Urban Planning Process

Urban planning – Development plan – Needs, goals, COURSE OBJECTIVES (COs) and contents – Factors to be considered in development plan – collection of data – surveys – procedure for preparation – guidelines of development plan – important measures and stages of development plan. Town planning – objects – principles – necessity – forms – stages.

Plan implementation – Chandigarh case study

9 Hours

Unit IV

Urban Project Evaluation

Project evaluation - Economic evaluation [Benefit cost ratio method, Net present value and Internal rate of return – problems] - Environmental impact assessment and Cash flow analysis

Basic introduction about Housing,, transportation and traffic improvement projects

9 Hours

Unit V

Development Management Systems

Planning standards – The basic frame work – distribution of land use – Infrastructure – Physical infrastructure – Social infrastructure – Commercial activity – variations in norms and standards by size of settlement - Development control rules – Zoning regulations - Building bye-laws.

Co-ordination between urban local bodies and other functional agencies such as water supply & sewerage boards, housing boards including slum boards and planning authorities

9 Hours

Total: 45 Hours

Textbooks

1. VRA. Saathappan and K. Yogeshwari, *Principles of Architecture*, Raamalingaa Publication, 2005
2. M. Pratap Rao, *Urban Planning*, CBS Publishers and Distributors, New Delhi, 2005

References

1. Gallian B Arthur and Simon Eisner, *The Urban Pattern, City Planning and Design*, Affiliated Press Pvt., Ltd., New Delhi, 1995
2. Margaret Roberts, *An Introduction to Town Planning and Planning Techniques*, Hutchinson, London, 1990.
3. Francis D.K. Ching, *Architecture: Form, Space and Order*, VNR, N.Y., 1999
4. B. Givoni , *Man Climate and Architecture* , Applied Science, Barking ESSEX, 1982
5. Edward D. Mills, *Planning the Architects Handbook* , Butterworth London, 1995
6. Rangwala S C, *Town Planning*, Charotar Publishing House, 1987

11C307 STRENGTH OF MATERIALS LABORATORY

0 0 3 1.5

COURSE OBJECTIVES

- To make the students understand the behavior of materials under various loading conditions, viz., tension, compression, torsion and bending
- To know the impact strength and the hardness number of the given material

PROGRAMME OUTCOME (PO)

3. Able to design and conduct experiments, as well as to analyze and interpret data.

COURSE OUTCOMES (COs)

1. Design of any structural (or) machine components
2. Design of weigh bridges
3. Design of metallic pipes
4. Design of shaft

PREREQUISITES:

Knowledge of Mechanics of Deformable Bodies I

ASSESSMENT PATTERN

	Internal Assessment	Semester End Examination
Preparation	10	15
Observation and Results	15	20
Record	10	-
Mini-Project / Model Examination/ Viva-Voce	15	15
Total	**50**	**50**

LIST OF EXPERIMENTS

1. Tension and Torsion tests on mild steel rod
2. Shear test on mild steel rod
3. Compression test on brick and wood
4. Tests on open and closed coil helical springs
5. Izod and Charpy impact tests
6. Static bending test on metal beam
7. Determination of Brinell's Hardness Number
8. Determination of Rockwell's Hardness Number
9. Tests on thin cylinder
10. Demonstration on the variation of shear force and bending moment in a beam

Mini Project **Total: 45 Hours**

PRACTICAL SCHEDULE

Sl. No.	Experiments	Hours
1	Tension and Torsion tests on mild steel rod	12
2	Shear test on mild steel rod	6
3	Compression test on brick and wood	3
4	Tests on open and closed coil helical springs	6
5	Izod and Charpy impact tests	6
6	Static bending test on metal beam	3
7	Determination of Brinell's Hardness Number	3
8	Tests on thin cylinders	3
9	Demonstration on the variation of shear force and bending moment in a beam	3

11C308 COMPUTER AIDED BUILDING PLAN AND DRAWING

0 0 3 1.5

COURSE OBJECTIVES

- To make the students understand and learn various elements of Residential / Institutional / Workshop buildings.
- To impart fundamental knowledge on AutoCAD to make the students draw truss structures, the plan, elevation and sectional view of a building.

PROGRAMME OUTCOME (PO)

9. Able to deliver effective verbal, written and graphical communications.

COURSE OUTCOMES (COs)

1. To know the various components of the different types of building.
2. To acquire knowledge of minimum size of the various elements of a building.
3. To draw a building plan for a given area.
4. To prepare an elevation and a sectional view of the given plan.

PREREQUISITES:

Knowledge of Engineering Graphics and Introduction to Computer Science

ASSESSMENT PATTERN

	Internal Assessment	Semester End Examination
Preparation	10	15
Observation and Results	15	20
Record	10	-
Mini-Project / Model Examination/ Viva-Voce	15	15
Total	**50**	**50**

LIST OF EXERCISES

1. Develop a model of a Brick wall using basic commands
    - Flemish Bond
    - English Bond
    - Header Bond
    - Stretcher Bond
    - Raking Bond
    - Zigzag Bond
2. Create a model of a hexagonal, triangular shaped paver blocks for a given floor area
3. Joinery details for doors and windows
4. Plan, Elevation and Cross section of a

• Single- and Multi-storeyed residential buildings for a given plan

5. Steel Truss
6. Develop a 3 Dimensional model of a single storey single bay residential building for a given plan

Mini Project

Total: 45 Hours

PRACTICAL SCHEDULE

Sl. No.	Exercises	Hours
1	Develop a model of a Brick wall using basic commands	3
2	Create a model of a hexagonal, triangular shaped paver blocks for a given floor area	6
3	Joinery details for doors and windows	10
4	Elevation and cross section for a single/multi storeyed residential building	10
5	Plan, elevation and cross section of multi – storeyed residential building	6
6	Plan, elevation and cross section of industrial building	6
7	Steel truss and its connection details	4

11C309 SURVEY PRACTICAL I

0 0 4 2.0

COURSE OBJECTIVES

- To impart a basic knowledge on chain and compass traversing
- To impart knowledge on leveling and tachometry survey

PROGRAMME OUTCOMES (POs)

3. Able to design and conduct experiments, as well as to analyze and interpret data.
5. Able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.

COURSE OUTCOMES (COs)

1. Select a particular site for surveying.
2. Demonstrate the various functional aspects of surveying instruments.
3. Set perpendiculars and well conditioned triangles by chaining.
4. Solve the two point and three point problems.
5. Calculate the area and volume of earthwork.
6. Recommend the proper method for contouring.
7. Survey using theodolite and tachometry.

PREREQUISITES:

Knowledge of Survey I

ASSESSMENT PATTERN

	Internal Assessment	Semester End Examination
Preparation	10	15
Observation and Results	15	20
Record	10	-
Mini-Project / Model Examination/ Viva-Voce	15	15
Total	**50**	**50**

LIST OF EXPERIMENTS

1. Aligning, Ranging and Chaining
2. Plane table surveying: Radiation, Intersection, Traversing
3. Plane table surveying: Resection – Two and Three point problems
4. Fly levelling using Dumpy and Tilting level
5. Check levelling
6. LS and CS
7. Repetation and Reiteration
8. Heights and distances - Single plane method.
9. Tacheometric Constants
10. Subtense system

Mini Project

Total: 60 Hours

PRACTICAL SCHEDULE

Sl. No	Experiment	Hours
1	Aligning, Ranging and Chaining	6
2	Plane table surveying: Radiation, Intersection, Traversing	6
3	Plane table surveying: Resection – Two and Three point problems	12
4	Fly levelling using Dumpy and Tilting level	6
5	Check levelling LS and CS	10
6	Heights and distances – single/double plane method.	10
7	Tachometry - tangential system - stadia system	5
8	Subtense system	5

11C401 / 11M401 / 11A401 NUMERICAL METHODS

(Common to CE, ME and AE)

3 1 0 3.5

COURSE OBJECTIVES

- Acquire the knowledge of finding approximate solutions of algebraic, transcendental, differential and integral equations by numerical methods and interpolating the values of a function using Lagrange's and Newton's polynomial approximations
- Ability to find solution of initial and boundary value problems using multi step approximations and ability to solve boundary value problems using finite difference methods

PROGRAMME OUTCOME (PO)

1. Able to apply the fundamental knowledge of mathematics, science and engineering.

COURSE OUTCOMES (COs)

1. Acquire more knowledge in basic concepts of engineering mathematics
2. To improve problem evaluation technique
3. Choose an appropriate method to solve a practical problem

PREREQUISITES:

Knowledge of Physics of Higher secondary and State board of Government of Tamilnadu

ASSESSMENT PATTERN

S. No		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	10	10	10	10
2	Understand	30	30	30	30
3	Apply	60	60	60	60
4	Analyze/ Evaluate	-	-	-	-
5	Create	-	-	-	-
Total		100	100	100	100

Unit I

Solution of Equations and Eigen Value Problems

Solution of Algebraic and Transcendental equations by the method of False position – Newton- Raphson method- Solution of system of linear equations : Gauss- elimination method and Gauss-Jordan method - Iterative method: Gauss – Seidel method- Inverse of a matrix by Gauss-Jordan method. Eigen value of a matrix by power method.

9 Hours

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks

Unit II

Interpolation and Curve Fitting

Newton 's Forward and Backward interpolation. Newton's Divided difference interpolation formula – Lagrange's interpolation formula – Fitting of curves by the method of Least squares: Straight line,Parabolic curves and the conversion of equations of the curves in the form of straight lines.

9 Hours

Unit III

Numerical Differentiation and Integration

Derivatives from difference table – Numerical differentiation using Newton 's forward and backward interpolation formulae - Numerical integration by Trapezoidal and Simpson's 1/3 and 3/8 rules - Romberg's method - Two and three point Gaussian quadrature formulae - Double integrals using Trapezoidal and Simpson's rules.

9 Hours

Unit IV

Initial Value Problems for Ordinary Differential Equations

Single step Methods : Taylor Series method for solving first and second order equations - Euler's and Modified Euler's methods - Fourth order Runge-Kutta method for solving first order equations - Multistep methods – Milne's and Adam's predictor and corrector methods.

9 Hours

Unit V

Boundary Value Problems

Finite difference solution for the second order ordinary differential equations- Finite difference solution for one dimensional heat equation by implicit and explicit methods - one dimensional wave equation and two dimensional Laplace's and Poisson's equations**.**

9 Hours

Total: 45+15 Hours

MAT LAB: Invited Lectures on Mat lab and its applications on Numerical methods.

Text books

1. B. S. Grewal, *Numerical Methods in Engineering and Science with Programms in C & C++*, Ninth Edition, Khanna Publications, 2010.
2. S.S.Sastry, *Introductory Methods of Numerical Analysis,* Fifth Edition, PHI Learning Pvt. Ltd, 2012.

References

1. R. L Burden, and T. D Faries, *Numerical Analysis*, Seventh Edition, Thomson Asia Pvt. Ltd., Singapore, 2002.
2. K. Sankara Rao , *Numerical Methods for Scientists and Engineers*, Third Ed.Prentice Hall of India, 2007.
3. C.F Gerald., and P.OWheatley, *Applied Numerical Analysis*, Sixth Edition, Pearson Education Asia, New Delhi.2006.
4. S. C. Chapra and R. P. Canale, *Numerical Methods for Engineers,* Fifth Edition, Tata McGraw Hill, New Delhi, 2007.

11C402 MECHANICS OF DEFORMABLE BODIES – II

3 1 0 3.5

COURSE OBJECTIVES

- To impart knowledge on deflection of statically determinate beams, ideal Columns and real columns.
- To determine the stresses due to unsymmetrical bending and understand various theories of failures.

PROGRAMME OUTCOME (PO)

1. Able to apply the fundamental knowledge of mathematics, science and engineering.

COURSE OUTCOMES (COs)

1. Determine the deflection of beams
2. Design of beams and columns
3. Analysis of stress distribution in thin and thick cylinders
4. Discuss the various types of failures

PREREQUISITES:

Knowledge of Physics Engineering Mechanics and Mechanics of Deformable Bodies I

ASSESSMENT PATTERN

S. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	20	20	20	20
2	Understand	20	20	20	20
3	Apply	60	60	60	60
4	Analyze	-	-	-	-
5	Evaluate	-	-	-	-
6	Create	-	-	-	-
	Total	**100**	**100**	**100**	**100**

Unit I

Deflection of Statically Determinate Beams

Governing differential equation – Macaulay's method – Moment area method – Conjugate beam method – Strain nergy method.

Newmark's method

9 Hours

Unit II

Columns and Struts

Columns – Slenderness ratio - Calculation of stresses in short columns due to axial load and uni-axial and biaxial bending moments - Core of the section - Buckling load of long columns - Euler's theory – Different end conditions - Rankine's formula – Straight line formula

Secant formula for columns subjected to eccentric loading

9 Hours

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks

Unit III

Thick Walled Cylinders and Curved Beams

Thick walled cylinders – Lame's equations – Hoop stress and radial stress distribution – Compound cylinders – shrink fit. Curved beams – Stresses due to bending by Winkler Bach theory – Rectangular, trapezoidal, circular solid sections – Crane Hook Problems

Stresses in Chain Links and Proving Ring

9 Hours

Unit IV

Shear Centre and Unsymmetrical Bending

Shear flow in thin walled beam cross section – Shear centre of mono/symmetric open sections – Hollow thin walled torsion members – Single and multi connected sections - Symmetrical and unsymmetrical bending – Bending stresses in beams subjected to unsymmetrical bending

Change in direction of neutral axis and simple problems

9 Hours

Unit V

Theories of Elastic Failure

Types of Failure: Brittle and ductile – Maximum principal stress theory – Maximum Principal strain theory – Maximum strain energy theory – Maximum shear stress theory – Mohr's theory – simple problems

Octahedral Shear Stress Theory

9 Hours

Total: 45 + 15 Hours

Textbooks

1. S. Rajput, *Strength of Materials*, S. Chand & Co., 2006
2. R. K. Bansal, *A Textbook of Strength of Materials*, Laxmi Publications, 2010

References

1. P. Boresi, F. B. Seeli and J. P. Smith, *Advanced Mechanics of Materials*, John Wiley & Sons, 1993
2. D. S. Bedi, *Strength of Materials*, S. Chand & Co. Ltd., 1984
3. *C. Punmia, Strength of Materials*, Laxmi Publications, *1992*

11C403 SURVEY II

3 1 0 3.5

COURSE OBJECTIVES

- To make the students understand the basic knowledge in designing curves.
- To impart knowledge on the application of various electronic instruments in surveying.
- To make them understand the probable error and its correction factor in surveying.

PROGRAMME OUTCOME (PO)

5. Able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.

COURSE OUTCOME (CO)

1. Design of horizontal and vertical curves for a highways and roadways

PREREQUISITES:

Knowledge of Survey I

ASSESSMENT PATTERN

S. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	30	30	30	30
2	Understand	30	30	30	30
3	Apply	40	40	40	40
4	Analyze	-	-	-	-
5	Evaluate	-	-	-	-
6	Create	-	-	-	-
	Total	**100**	**100**	**100**	**100**

Unit I

Surveying Techniques and Curves

Horizontal curves – Elements of simple curve – Setting out with chain and tape with theodolites by deflection angles – Obstruction in curve ranging, compound and reverse curve (Parallel tangent only) – Transition curve – Setting out of combined curve by Theodolites - Vertical curves – summits and sags – setting out vertical curve by tangent corrections.

Different kinds, functions and requirements of transition curves - uses and advantages of electronic theodolites

9 Hours

Unit II

Control Surveying

Working from whole to part - Horizontal and vertical control methods - Triangulation - Signals - Base line - Satellite station - Reduction to centre - Trignometric levelling – Corrections – Curvature and refraction - Single and reciprocal observations - Modern trends – Bench marking – Trilateration.

Triangulation instruments and accessories

9 Hours

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks

Unit III

Survey Adjustments

Errors - corrections - Classification of errors - True and most probable values - weighted observations - Method of equal shifts - Principle of least squares - Normal equation - Correlates - Level nets - Adjustment of simple triangulation networks-Principle of electronic theodolites - electromagnetic distance measurement.

Sources and precautions of errors

9 Hours

Unit IV

Astronomical Surveying

Celestial sphere - Motion of sun and stars - Apparent altitude and corrections - Celestial co-ordinate systems - Different time systems - Nautical almanac - Practical astronomy - Field observations and calculations for azimuth of a line - Astronomical terms and definitions

Star constellations

9 Hours

Unit V

Advances in surveying

Basic concept of hydrographic surveying – Tides – MSL – *Location of soundings* - Sounding methods – Three point problem – Strength of fix – Sextants and station pointer – River surveys – Measurement of current and discharge – Photogrammetry – Introduction only – Basic concept of terrestial and aerial photographs Stereoscopy – Definition of parallax – Basic concept of Cartography and Cadastral surveying - Electronic Total Station- Basic Concepts of Remote Sensing - GIS and GPS

Example using Total station

9 Hours

Total: 45 Hours

Textbook

1. B.C. Punmia, *Surveying, Vols. II & III,* Laxmi Publications, 2005

References

1. R. Subramanian, *Surveying and Levelling*, Oxford university Press, 2007
2. T. P. Kanetkar, and Kulkarni, *Surveying and Levelling, Vol. I and II*, United Book Corporation, 1994

11C404 SOIL MECHANICS

3 1 0 3.5

COURSE OBJECTIVES

- To make the students gain adequate knowledge on the engineering properties of soils
- To make them know the significance of the soil properties

PROGRAMME OUTCOME (PO)

5. Able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.

COURSE OUTCOMES (COs)

1. Determine the properties of the given soil sample
2. Determine the suitability of soil for building construction
3. Analyze the stability of slopes

PREREQUISITES:

Knowledge of Applied Geology and Mechanics of Deformable Bodies I

ASSESSMENT PATTERN

S. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	20	20	20	20
2	Understand	20	20	20	20
3	Apply	60	60	60	60
4	Analyze	-	-	--	-
5	Evaluate	-	-	-	-
6	Create	-	-	-	-
	Total	**100**	**100**	**100**	**100**

Unit I

Introduction

Nature of soils - Phase diagrams – Basic definitions and inter--relationships - Index properties of soils and their determinations: Specific gravity - Water content - Density –Field test - Relative density - Stoke's law - applications - Sieve analysis - Particle size distribution - Sedimentation analysis - Consistency of soils – Atterberg limits and indices - Classification of soils: Necessity – Classification based on BIS classification- Field Identification of Soils

Problems encountered in different types of soils

9 Hours

Unit II

Soil Water and Water Flow

Soil water – Various forms – Capillary flow – Suction – Effective stress concept – Total - Neutral and effective stress distribution in soils - Flow of water through soils - Darcy's law; Assumptions and validity - Permeability -

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks

Coefficient of permeability – Laboratory test and Field test - Factors affecting permeability: Permeability of stratified deposits of soils - Seepage - Laplace equation – Introductin to Flow nets.
Quick sand phenomena

9 Hours

Unit III

Compressibility of Soils

Compaction – Factors affecting compaction - Effect of compaction on soil properties - Proctor and modified Proctor tests - Zero air void lines - Field compaction and its control - Proctor's needle Consolidation - Fundamental definitions - Spring analogy - Terzaghi's one dimensional consolidation theory – Assumptions, limitations and applications - Pre-consolidation pressure and its determination - Normally, under and over consolidated soils - Laboratory consolidation test and determination of consolidation characteristics of soils
Case studies on failure of structures due to settlements

9 Hours

Unit IV

Shear Strength

Stresses in soils: Boussinesq's and Wester Guard's theories of stresses due to concentrated loads - Circular loads - Rectangular load - Strip load - New Mark's chart - Pressure bulbs - Contact pressure - Shear strength of Soils - Concept of shear strength - Mohr - Coulomb theory - Measurement of shear parameters - Direct shear - Unconfined compression – Triaxial - Drained and un-drained conditions - Vane shear tests
Factors affecting shear strength of soils and shear parameters.

9 Hours

Unit V

Stability of Slopes

Failure mechanism of slopes – slopes – types – Total and effective stress analysis – Finite slopes - Stability analysis for purely cohesive and c – ø soils – Method of slices– Friction circle method – Modified Bishop's method – Taylor's Stability number – Slope protection methods – Stabilization methods
Case studies – Methods for improving the stability of slopes

9 Hours
Total: 45 Hours

Textbook

1. B. C. Punmia, *Soil Mechanics and Foundations*, Laxmi Publications Pvt. Ltd., New Delhi, 2007

References

1. Alam Singh, *Soil Engineering in Theory and Practice*, Asia Publishing House, Bombay, 2003
2. Braja M. Das, *Principles of Geotechnical Engineering*, Thomson Brooks/Cole, Australia, 2005
3. Dr. K.R. Arora, *Soil Mechanics and Foundation Engineering*, Standard Publishers Distributors, Delhi, 2005

11C405 APPLIED HYDRAULICS AND HYDRAULIC MACHINERY

3 0 0 3.0

COURSE OBJECTIVES

- To disseminate the knowledge among the students in the area of open channel flow measurements
- To impart the knowledge on the analysis and design of water turbines and pumps
- At the end of the course the students will be able to design pumps for the given pressure requirement
- Determine the capacity of pump required for water supply and sewage schemes

PROGRAMME OUTCOME (PO)

5. Able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.

COURSE OUTCOMES (COs)

1. Understand the various types of open channel flow
2. Determine cross sections of different types of channels
3. Creation of hydraulic jumps and its advantages
4. Analyze the performance of turbines and pumps under different operating conditions
5. Design the turbines and pumps

PREREQUISITES:

Knowledge of Fluid Mechanics and Engineering Mechanics

ASSESSMENT PATTERN

S. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	20	20	20	20
2	Understand	20	20	20	20
3	Apply	60	60	60	60
4	Analyze / Evaluate	-	-	-	-
5	Create	-	-	-	-
Total		**100**	**100**	**100**	**100**

Unit I

Open Channel Flow

Open channel flow - Regime of flow - Velocity distribution in open channel - Wide open channel -Specific energy - Critical flow and its computation.

Types of flow

9 Hours

Unit II

Uniform Flow

Uniform flow - Velocity measurement - Manning's and Chezy's formula problems - Determination of roughness coefficients - Determination of normal depth and velocity - Most economical sections - Non-erodible channels.

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks

9 Hours

Unit III

Varied Flow

Dynamic equation of gradually varied flow - Characteristics of flow profiles - Drawdown and backwater curves - Profile determination - Graphical integration, direct step, standard step method - Hydraulic jump - types - energy dissipation - Surges - Surge through channel transitions.

9 Hours

Unit IV

Turbines

Application of momentum principle - Impact of jets on plane and curved plates - Turbines - Radial flow turbines - Axial flow turbines - Impulse and reaction turbines – Specific speed and characteristic curves.

Field visits to Power plants

9 Hours

Unit V

Pumps and Hydraulic Devices

Centrifugal pumps - Multistage pumps - Minimum speed to start the pump – Jet pumps - Specific speed and characteristic curves - Reciprocating pumps - Negative slip - Indicator diagram - Functions of air vessels - Hydraulic press - Hydraulic accumulator

Functions of air vessels

9 Hours

Total: 45 Hours

Textbooks

1. R. K. Rajput, *A Text Book of Fluid Mechanics and Hydraulic Machines*, S. Chand and Co, Ltd., New Delhi, 2006
2. R. K. Bansal, *Fluid Mechanics and Hydraulic Machines*, Laxmi Publications, New Delhi, 2005

References

1. P. N. Modi and S. M. Seth, *Hydraulics and Fluid Mechanics*, Standard Book House, Delhi, 2010
2. K. Subramanya, *Flow in Open Channels*, Tata McGraw Hill Publishing Co., New Delhi, 2009
3. Ven Te Chow, *Open Channel Hydraulics*, Tata McGraw Hill Publishing Co., New Delhi, 2009

11C406 HYDROLOGY

3 0 0 3.0

COURSE OBJECTIVES

- To enhance the knowledge on the various components of hydrologic cycle
- To impart knowledge on spatial and temporal distribution of water availability in any region
- At the end of the course the students will be able to estimate the rainfall and ground water flow

PROGRAMME OUTCOME (PO)

5. Able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.

COURSE OUTCOMES (COs)

1. Estimate the various methods of recording the rainfall
2. Perform measurement of water in a river basin e.g. river flow, weather stations
3. Analyse data from multiple sources to construct a water balance model

PREREQUISITES:

Knowledge of Fluid Mechanics and Fundamental knowledge of Environmental Science

ASSESSMENT PATTERN

Sl. No.	Bloom's Taxonomy (New Version)	Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	20	20	20	20
2	Understand	30	30	20	20
3	Apply	50	50	60	60
4	Analyze / Evaluate	-	-	-	-
5	Create	-	-	-	-
	Total	100	100	100	100

Unit I

Precipitation

Hydrologic cycle – Types of precipitation –Measurement of Rainfall – Spatial measurement methods – Temporal measurement methods – Frequency analysis of point rainfall – Intensity, duration, frequency relationship – Probable maximum precipitation.

Rain gauge network

9 Hours

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks

Unit II

Abstraction from Precipitation

Evaporation process – Reservoir evaporation – Infiltration process – Infiltration capacity – Measurement of infiltration – Infiltration indices – Effective rainfall.

Losses from precipitation

9 Hours

Unit III

Hydrographs

Baseflow separation – Unit hydrograph – Derivation of unit hydrograph – S curve hydrograph – Unit hydrograph of different deviations - Synthetic Unit Hydrograph

Factors affecting Hydrograph

9 Hours

Unit IV

Floods and Flood Routing

Recurrence interval – Gumbel's method – Flood routing – Reservoir flood routing – Muskingum's Channel Routing – Flood control – Run-off and Estimation of Run-off

Flood frequency studies - Factores affecting Run-off

9Hours

Unit V

Ground Water Hydrology

Darcy's law – Dupuit's assumptions – Confined Aquifer – Unconfined Aquifer – Recuperation test – Transmissibility – Specific capacity – Pumping test – Steady flow analysis only.

Artesian Wells

9Hours

Total: 45Hours

Text book

1. K Subramanya, *Engineering Hydrology*, Tata McGraw Hill, New Delhi ,2008

References

1. Ven Te.Chow, D.R. Maidment and L.W. Mays, *Applied Hydrology,* McGraw Hill, New York, 2008
2. P. Jayarami Reddy, *Hydrology*, Tata McGraw Hill, New Delhi , 2008
3. H. Ragunath, *Hydrology*, Wiley Eastern Limited, New Delhi,2003

11C407 SOIL MECHANICS LABORATORY

0 0 3 1.5

COURSE OBJECTIVES

- To make the students determine experimentally the fundamental properties of soils that are needed for the classification of soils, determining the strength and seepage characteristics
- To determine the safe bearing capacity of soil at a given site using the knowledge of the fundamental properties of soils

PROGRAMME OUTCOME (PO)

3. Able to design and conduct experiments, as well as to analyze and interpret data.

COURSE OUTCOMES (COs)

1. Determine the properties of the given soil sample.
2. Identification of soil sample.
3. Determine the strength of given soil

PREREQUISITES:

Knowledge of Soil Mechanics

ASSESSMENT PATTERN

	Internal Assessment	Semester End Examination
Preparation	10	15
Observation and Results	15	20
Record	10	-
Mini-Project / Model Examination/ Viva-Voce	15	15
Total	50	50

LIST OF EXPERIMENTS

1. Grain size distribution Sieve analysis and Hydrometer analysis
2. Specific gravity of soil grains and relative density of sand
3. Atterberg limits test
4. Determination of moisture - Density relationship using Standard Proctor test
5. Permeability determination (Constant head and falling head methods)
6. Determination of shear strength parameters
    a) Direct shear test on cohesion less soil
    b) Unconfined compression test on cohesive soil
    c) Triaxial compression test
7. One dimensional consolidation test (Determination of co-efficient of consolidation only)
8. Field density test (Core cutter and sand replacement methods)
9. Determination of the safe bearing capacity of soil for three different sites
10. Estimation of CBR value for pavement design at a given site

Mini Project

Total: 45 Hours

PRACTICAL SCHEDULE

Sl. No	Experiment	Hours
1	Grain size distribution Sieve analysis and Hydrometer analysis	6
2	Specific gravity of soil grains and relative density of sand	3
3	Atterberg limits test	3
4	Determination of moisture - Density relationship using Standard Proctor test	3
5	Permeability determination (Constant head and falling head methods)	6
6	Determination of shear strength parameters a) Direct shear test on cohesionless soil b) Unconfined compression test on cohesive soil c) Triaxial compression test	9
7	One dimensional consolidation test (Determination of co-efficient of consolidation only)	3
8	Field density test (Core cutter and sand replacement methods)	6
9	Determination of the safe bearing capacity of soil for three different sites	3
10	Estimation of CBR value for pavement design at a given site	3

11C408 FLUID MECHANICS LABORATORY

0 0 3 1.5

COURSE OBJECTIVES

- To impart knowledge on flow measurements in pipes and open channels
- To carry out performance studies on hydraulic machineries
- At the end of the course the students will be able to design pipe layouts and design pumps for residential buildings

PROGRAMME OUTCOME (PO)

3. Able to design and conduct experiments, as well as to analyze and interpret data.

COURSE OUTCOMES (COs)

1. Design of turbines
2. Design of pumps
3. To know the various losses of pipes.
4. To acquire knowledge of flow measurements.

PREREQUISITES:

Knowledge of Fluid Mechanics and Applied Hydraulics

ASSESSMENT PATTERN

	Internal Assessment	Semester End Examination
Preparation	10	15
Observation and Results	15	20
Record	10	-
Mini-Project / Model Examination/ Viva-Voce	15	15
Total	**50**	**50**

LIST OF EXPERIMENTS

1. Compare the actually measured flow rates to those calculated using the theoretical formula derived by applying the continuity and Bernoulli's equations of the following pipe flow measuring meters. And also determine its Coefficient of discharge for arriving actual flow rate from the theoretically computed flow rate.
    - Orifice meter
    - Venturi meter
2. Compare the actually measured flow rates to those calculated using the theoretical formula derived by applying the continuity and Bernoulli's equations of the given open channel flow measuring meters. And also determine its Coefficient of discharge for arriving actual flow rate from the theoretically computed flow rate.
3. Find the friction factor of the given pipe using Darcy's equation. The necessary data may obtained by conducting suitable experiment in the lab. And also plot the curve between head loss, energy gradient verses discharge.
4. Conduct the load test for the following turbines by keeping head/discharge as constant and draw the characteristic curves (plot of head, power and efficiency verses discharge). And also determine its specific speed.
    - Pelton wheel
    - Francis turbine
5. Conducting experiments by keeping head/discharge as constant and drawing the characteristic curves (plot of head, power and efficiency verses discharge)of the following pumps. And also determine its specific speed.

- Centrifugal pump
- Submergible pump
- Gear pump

6. Design of Pipe Networks
7. Design a pump and piping system for a multi storey building

Mini Project

Total: 45 Hours

PRACTICAL SCHEDULE

Sl. No.	Experiment	Hours
1	Determination of • Friction factor for pipes • Co-efficient of discharge of venturimeter • Coefficient of discharge of V- notch • Co-efficient of discharge of orifice meter	15
2	Study on Performance Characteristics of • Centrifugal pump • Submersible pump • Reciprocating pump • Jet pump • Gear pump	15
3	Study on performance characteristics of Francis Turbine	6
4	Study on performance characteristics of Pelton Wheel Turbine	3
5	Design a pump and piping system for a multi storey building	6

11C409 SURVEY PRACTICAL II

0 0 3 1.5

COURSE OBJECTIVES

- To impart basic knowledge on designing simple curve
- T o acquire knowledge on finding horizontal angle, vertical angle and distance using total station.

PROGRAMME OUT COMES (POs)

3. Able to design and conduct experiments, as well as to analyze and interpret data.
5. Able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability

COURSE OUTCOMES (COs)

1. Handle Electronic Surveying Instruments
2. Determine the R.L, Distance and horizontal angle using total station.
3. Determine the co-ordinate of a given station points.

PREREQUISITES:

Knowledge of Survey II

ASSESSMENT PATTERN

	Internal Assessment	**Semester End Examination**
Preparation	10	15
Observation and Results	15	20
Record	10	-
Mini-Project / Model Examination/ Viva-Voce	15	15
Total	**50**	**50**

LIST OF EXPERIMENTS

1. Tacheometry - Stadia system
2. Setting out a simple circular curve using chains
3. Setting out a simple circular curve using Rankine's method
4. Setting out a transition curve
5. Setting out of Combined curve
6. Determination of azimuth of a line by observation on the sun
7. Foundation marking
8. Measurements using Total Station
    a) Distance between two points
    b) R. L. of a station
    c) Horizontal angles

Mini Project

Total: 45 Hours

PRACTICAL SCHEDULE

Sl. No.	Experiment	Hours
1	Setting out a simple circular curve using chains	8
2	Setting out a simple circular curve using Rankine's method	8
3	Setting out a transition curve	8
4	Determination of azimuth of a line by observation on the sun	8
5	Foundation marking	4
6	Theodolite traverse	4
7	Measurements using Total Station	5

11C501 WATER SUPPLY ENGINEERING

3 0 0 3.0

COURSE OBJECTIVES

- To impart knowledge on the various issues pertaining to quality and quantity of water
- To emphasize the need for water conservation
- To impart knowledge to select suitable method of water treatment and to find the capacity of water treatment plant.

PROGRAMME OUTCOME (PO)

5. Able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability

COURSE OUTCOMES (COs)

1. Examine the given water sample.
2. Design of various types water treatment units.
3. Arrive the quantity of water for given city. Estimate the quantity of water for a given city.

PREREQUISITES:

Knowledge of Fluid Mechanics

ASSESSMENT PATTERN

Sl. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	20	20	20	20
2	Understand	30	30	30	30
3	Apply	50	40	40	40
4	Analyze / Evaluate	-	10	10	10
5	Create	-	-	-	-
	Total	**100**	**100**	**100**	**100**

Unit I

Quantity of Water

Introduction: Scope for Environmental Engineering - Human activities and environmental pollution - Need for protected water supply - Responsibility of the Government. Quantity of Water Types of water demands - Domestic demand in detail - Institutional and Commercial demands - Public uses - Fire demand - Per capita consumption - Water born diseases - Examination of water COURSE OBJECTIVES (COs) – Physical - chemical and microbiological examinations - Drinking water standards - BIS & WHO standards - Sampling of water for examination – Importance - Precautions – Types.

Public awareness about drinking water

9 Hours

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks

Unit II

Collection and Conveyance of Water

Intake structures - Different types of intakes - Factor of selection and location of intakes - Pumps – Necessity - types - Power of pumps; Factors for the selection of a pump - pipes - Design of the economical diameter of the rising main - Nomograms – Use - Pipe appurtenances – Laying - jointing and testing of pipes - Surface and subsurface sources, Suitability with regard to quality and quantity.

Treatment plant field visit

9 Hours

Unit III

Water Treatment

COURSE OBJECTIVES (COs) of water treatment – Typical flow chart of a water treatment plant - Aeration – COURSE OBJECTIVES (COs) - Principles of aeration - Types of aerators - Sedimentation – Theory - Settling tanks – Types - Design - Aided sedimentation - with coagulants – Dosages - Chemical feeding - Flash mixing - Flocculators - Desalination - Membrane related technologies - Ion exchange technology.

Water softening technology

9 Hours

Unit IV

Advanced Water Treatment

Filtration - Mechanism - Theory of filtration - Design of sand filters - Rapid sand and slow sand filters including construction and operation - Under drainage system - Back washing of filters - Disinfection - Theory of disinfection - Methods of disinfection – Chlorination - Chlorine demand - Residual chlorine.

Use of bleaching powder.

9 Hours

Unit V

Domestic Wastewater Treatment

Types of Treatment - Flow diagram of a typical municipal sewage treatment plant - Primary Treatment – Screening - Grit chambers - Skimming tanks - Primary sedimentation tanks – Sludge deposit - Secondary treatment - Trickling filter - Theory and operation - Types and designs - Activated sludge process - Principle and flow diagram - Methods of aeration – Modifications - F/M ratio - Designs of ASP – Secondary sedimentation tanks - Tertiary treatment - Sludge digestion and filter beds - Sludge drying beds.

Methods of sludge disposal

9 Hours

Total: 45 Hours

Textbooks

1. S. K. Garg, *Water Supply Engineering*, Khanna Publishers, New Delhi, 2008
2. S. K. Garg, *Sewage Disposal and Air Pollution Engineering* , Khanna Publishers, New Delhi, 2008

References

1. Sawyer and Mc Carty, *Chemistry for Environmental Engineers*, McGraw Hill, 2002
2. B. C. Punmia and Ashok Jain, *Environmental Engineering - I*, Laxmi Publications Ltd., 1995
3. Hammer and Hammer, *Water and Wastewater Technology*, Prentice Hall, 2009
4. IS 1172:1993 *Code of basic requirements for water supply, drainage and sanitation*

11C502 STRUCTURAL ANALYSIS – I

3 1 0 3.5

COURSE OBJECTIVES

- To impart knowledge on the different methods of analysis of statically indeterminate structures
- To impart knowledge on moving loads and influence line diagrams
- To provide a thorough understanding on arches and suspension bridges

PROGRAMME OUTCOMES (POs)

1. Able to apply the fundamental knowledge of mathematics, science and engineering.
2. Able to identify, formulate and solve Civil Engineering problems in accordance with Indian Standard codes of practice.

COURSE OUTCOMES (COs)

1. Draw influence line diagram for reaction, shear force and bending moment of determinate structures
2. Calculate shear force and bending moment in stiffening girders
3. Analyze determinate arches subjected to different loading

PREREQUISITES:

Knowledge of Engineering Mechanics and Mechanics of Deformable Bodies I & II

ASSESSMENT PATTERN

Sl. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	10	10	10	10
2	Understand	20	20	20	20
3	Apply / Analyze / Evaluate	70	70	70	70
4	Create	-	-	-	-
Total		**100**	**100**	**100**	**100**

Unit I

Analysis of Statically Determinate and Indeterminate Structures

Introduction – Degrees of freedom- General criteria for determining statical indeterminacy – Calculation of indeterminacy by formulae - Analysis of fixed beams and propped cantilevers - Analysis of continuous beams by Clapeyron's theorem of three moments.

Analysis of statically indeterminate pin jointed frames

9 Hours

Unit II

Slope Deflection Method and Column Analogy Method

Analysis of continuous beams and single storey portal frames by Slope deflection method.

Concept of side sway and sinking of supports - Column analogy method

9 Hours

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks.

Unit III

Moment Distribution and Kani's Method

Introduction – Analysis of continuous beams and single storey portal frames by Moment distribution method. *Concept of side sway and sinking of supports – Analysis by Kani's method*

9 Hours

Unit IV

Moving Loads and Influence Lines

Introduction – Construction of SFD and BMD for rolling loads for simply supported and Overhanging beams with single point load, Two point loads and uniformly distributed loads - Construction of ILD for shear force and bending moment, Computation of load positions for maximum shear force and bending moments for simply supported and overhanging beams with several point loads and UDL - Muller-Breslau's principle.
Construction of ILD for continuous beam

9 Hours

Unit V

Arches and Suspension Bridges

Introduction – Analysis of three hinged and two hinged parabolic and circular arches with and without temperature effects – Influence lines.
Analysis of cables and suspension bridges with stiffening girders

9 Hours
Total : 45 + 15 Hours

Textbooks

1. B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, *Theory of Structures*, Laxmi Publications (P) Ltd., New Delhi, 2006.

References

1. Sujit Kumar Roy and Subrata Chakrabarty, *Fundamentals of Structural Analysis with Computer Analysis & Applications*, S Chand & Co. Ltd., New Delhi, 2003.
2. R. Vaidyanathan and P. Perumal, *Structural Analysis, Vol. I & II*, Laxmi Publications (P) Ltd., New Delhi, 2006.

11C503 FOUNDATION ENGINEERING

3 1 0 3.5

COURSE OBJECTIVES

- To impart fundamental knowledge on investigation of the site and selection of suitable foundation
- To impart knowledge on the design concept of different types of foundations

PROGRAMME OUTCOME (PO)

5. Able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.

COURSE OUTCOMES (COs)

1. Select and design a suitable type of foundation for a given soil condition.
2. Determine the bearing capacity of soil.

PREREQUISITES:

Knowledge of Soil Mechanics and Applied Geology

ASSESSMENT PATTERN

Sl. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	25	20	20	20
2	Understanding	25	20	20	20
3	Apply	50	60	60	60
4	Analyze / Evaluate	-	-	-	-
5	Create	-	-	-	-
Total		**100**	**100**	**100**	**100**

Unit I

Site Investigation and Selection of Foundation

Introduction – COURSE OBJECTIVES (COs) of Soil Exploration - Methods of exploration - Disturbed and undisturbed sampling - Depth of soil exploration - Number and disposition of bore holes - Preservation of samples - Geophysical methods – Penetration tests –SPT, SCPT and DCPT –Pressuremeter tests- Requirements of good foundation - Factors governing location and depth of foundation- Different types of foundation - Choice of types of foundation-Construction aspects of Shallow and Deep Foundation.

Preparation of soil investigation report

9 Hours

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks.

Unit II

Shallow foundations

Bearing capacity definitions – Types of Failure - Terzaghi's bearing capacity theory and Meyerhoff equations – IS Formula - Effect of water table, shape of foundation, inclination of load and eccentricity of load on bearing capacity - Allowable bearing pressure - bearing pressure based on 'N'value - Factors affecting bearing capacity - Methods of improving bearing capacity - Components of settlement - Immediate and consolidation settlements - Differential settlement - Computation of settlement, allowable settlement. Measures to reduce settlement.

Foundation in expansive soil

9 Hours

Unit III

Footings and Rafts

Contact pressure distribution below footings and raft - Isolated and combined footings: types & proportioning - Mat foundation: types, uses - Floating foundation - Allowable bearing pressure for raft foundation on sand - Codal provisions.

Determination of modulus of subgrade reaction for open foundation

9 Hours

Unit IV

Pile Foundations

Types of piles and their function – Factors influencing the selection of pile – Load carrying capacity of single pile in granular and cohesive soil - Static formula - dynamic formulae (Engineering news and Hiley's) – Capacity from insitu tests (SPT and SCPT) – Negative skin friction – uplift capacity – Group of piles - Number and spacing - Pile group efficiency in sands and clays – Settlement of pile groups – Interpretation of pile load test – Forces on pile caps – under reamed piles – Capacity under compression and uplift.

Introduction to Rock socketed piles, pile termination criteria

9 Hours

Unit V

Machine Foundation

Introduction - Types of machine foundation – Basic principles of design of machine foundation- Dynamic properties of soil - Vibration analysis of machine foundation - Natural frequency - Design of foundation for Reciprocating machines and Impact machines - Reinforcement and construction details.

Vibration isolation

9 Hours

Total: 45 + 15 Hours

Textbooks

1. V. N. S. Murthy, *Text Book of Soil Mechanics and Foundation Engineering*, CBS Publishers Distribution Ltd., New Delhi, 2007
2. S. R. Gopal Ranjan and Rao, *Basic and Applied Soil Mechanics*, New Age International (P) Ltd., New Delhi, 2007

References

1. P. C. Varghese, *Foundation Engineering*, Prentice-hall of India Private Limited, New Delhi, 2007
2. B. C. Punmia, *Soil Mechanics and Foundations*, Laxmi publications Pvt. Ltd., New Delhi, 2005
3. IS 6403: 1981 *Code of practice for determination of breaking capacity of shallow foundations*.

11C504 CONCRETE TECHNOLOGY

3 0 0 3.0

COURSE OBJECTIVES

- To impart a sound knowledge on the ingredients of special and conventional concrete and admixtures.
- To impart a basic knowledge on the properties of fresh and hardened concrete and to provide a basic understanding on the usage of admixtures used in concrete

PROGRAMME OUTCOME (PO)

5. Able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability

COURSE OUTCOMES (COs)

1. Imparts the knowledge about the properties of concrete making materials and their testing methods
2. Can design the concrete mix for the field requirements
3. Demonstrate the properties of concrete in plastic and hardened state
4. Application of special concretes

PREREQUISITES:

Knowledge of Engineering Mechanics and Engineering Chemistry

ASSESSMENT PATTERN

Sl. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	30	30	20	20
2	Understand	50	50	50	50
3	Apply / Evaluate	20	20	30	30
4	Analyze	-	-	-	-
5	Create	-	-	-	-
Total		**100**	**100**	**100**	**100**

Unit I

Ingredients of concrete

Cement : Composition and properties of cement - different types of cements – Hydration of cement-Structure of hydrated cement - Tests on physical properties of cement - Consistency - Setting time - Soundness - Strength as per IS code. Aggregates: Classification - Fine aggregate -Coarse Aggregate - Tests on aggregates - IS specifications - Bulking of sand - Sieve analysis - Fineness modulus - interpretation of grading charts - Quality of water for mixing and curing.

Soundness of aggregate, Grading of fine & coarse Aggregates, recycled material as aggregates- tyre rubber, crushed glasses

9 Hours

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks.

Unit II

Admixtures and Mix Design

Chemical admixtures: Accelerators - Retarders - Workability agents - Water reducing agents - Air entraining agents. Mineral admixtures: Fly ash - Silica fume - Ground granulated blast furnace slag – Metakaoline- Dosage, Usage, structural properties and their effects on concrete properties. Mix Design: Objective - Factors influencing mix proportion - Mix design by ACI method and IS code method - Mix design examples.

Mineral additives: reactive and inert

9 Hours

Unit III

Fresh Concrete

Properties of fresh concrete: Workability - Factors affecting workability - Tests for workability of concrete - Slump test and compacting factor test - Segregation and bleeding - Batching and mixing ingredients of concrete - Methods of compaction – Types of curing concrete.

Setting time of concrete- significance and measurements

9 Hours

Unit IV

Hardened Concrete

Properties of hardened concrete - Determination of compressive, tensile and flexural strength of concrete - Shrinkage and creep - Factors affecting shrinkage and creep - Stress-strain curve for concrete - Determination of modulus of elasticity - In situ strength determination - Rebound hammer test.

Durability of concrete: importance of permeability study

9 Hours

Unit V

Special Concrete

Light weight concrete - Fibre reinforced concrete - High performance concrete - High strength concrete - Self compacting concrete - Polymer concrete - Mass concrete - Ready mix concrete – properties and applications

Cellular concrete, shotcrete (sprayed concrete), ferro cement, bendable concrete, light transmitting concrete.

9 Hours

Total: 45 Hours

Textbooks

1. A. R. Santhakumar, *Concrete Technology*, Oxford University Press, New Delhi, 2007
2. M. L. Gambhir, *Concrete Technology*, Tata McGraw Hill Publishing Co., Ltd., New Delhi, 2007
3. M. S. Shetty, *Concrete Technology*, S. Chand and Co., Ltd., New Delhi, 2003

References

1. A. M. Neville, *Properties of Concrete*, Tata McGraw Hill publishers, 2003
2. P. Kumar Mehta and Paulo J. M. Monteiro, *Concrete - Microstructure, Properties and Materials*, Indian Concrete Institute, Chennai, 1997
3. P.D.Kulkarni, *Text book of Concrete Technology*, New Age International (P) Ltd., 2007
4. IS 10262-2009 Concrete mix proportioning –Guidelines.

11C505 DESIGN OF R.C.C. ELEMENTS

3 0 0 3.0

COURSE OBJECTIVES

- To give an exposure on the basic philosophy of design of R.C.C elements
- To impart knowledge on the design the basic elements of reinforced concrete structures in accordance with I.S. codal provisions

PROGRAMME OUTCOME (PO)

3. Able to design and conduct experiments, as well as to analyze and interpret data.

11. Able to perform economic analysis, labour/time/material management, construction schedules and activities related to design, construction, operations and maintenance of systems in the technical specializations of Civil Engineering.

COURSE OUTCOMES (COs)

1. Understand the structural behaviour of various structural elements.
2. Know the different method of design.
3. Can able to use IS codes for design of various structural elements.
4. Can analysis, design and detailing of slab, beam and column.

PREREQUISITES:

Knowledge of Mechanics of Deformable Bodies I and Concrete Technology

ASSESSMENT PATTERN

Sl. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	10	10	10	10
2	Understanding	20	20	20	20
3	Apply	30	30	30	30
4	Analyze / Evaluate	-	-	-	-
5	Create	40	40	40	40
Total		**100**	**100**	**100**	**100**

Unit I

Working Stress Method &Ultimate Strength Method

Assumptions – Analysis for stresses of flexural members during pre cracking and post cracking stages – Design of singly and doubly reinforced sections – Ultimate moment of resistance of Sections as per Whitney's theory – Design of tension members.

Estimation of ultimate load carrying capacity of a beam in flexure

9 Hours

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks.

Unit II

Design for Flexure by Limit State Method

Principles – Characteristic load and strength – Partial safety factor - Stress block parameters – Analysis and design of singly and doubly reinforced rectangular and flanged beams – Analysis, design and detailing of rectangular slabs subjected to uniformly distributed load.

Analysis, design and detailing of square slabs subjected to uniformly distributed load

9 Hours

Unit III

Deformation in Beams and Design of Slabs Subjected to Concentrated Loads

Calculation of deflections in beams under working loads – Check for deflection – Calculation of crack width in beams – Check for crack width – Design of slabs subjected to concentrated loads.

Check for deflection and crack width in slabs.

9 Hours

Unit IV

Design for Bond, Anchorage, Shear and Torsion

Design for development length – End anchorage – Behaviour of rectangular and flanged beams in shear and design for shear – Interaction diagram for combined bending and torsion – Design of sections subjected to the combined action of bending moment, transverse shear and torsion .

Design of sections subjected to the combined action of transverse shear and torsion

9 Hours

Unit V

Design of Columns

Types of columns – Design of rectangular and circular columns for axial load – Provisions of IS-456 code for the analysis of columns subjected to axial load and uniaxial bending – Design of short and long columns subjected to axial load and biaxial bending moment using interaction charts.

Design of short and long columns subjected to axial load and uniaxial bending moment using interaction charts.

9 Hours

Total: 45 Hours

Textbooks

1. N. Krishna Raju and R. N. Pranesh, *Reinforced Concrete Design – IS 456 – 2000 Principles and Practice*, New Age International Publishers, New Delhi, 2003.
2. S. Unnikrishna Pillai and Devedas Menon, *Reinforced Concrete Design,* Tata McGraw Hill, 1998

References

1. P. C. Varghese, *Limit State Design of Reinforced Concrete,* Prentice Hall of India Ltd., New Delhi, 2002
2. A. K. Jain, *Limit State Design of R.C. Structures,* Nemchand Publications, Roorkee, 1989
3. S. N. Sinha, *Reinforced Concrete Design*, Tata McGraw –Hill Publishing Company Ltd., New Delhi, 1996
4. Is 456:2000 Plain and reinforced concrete- Code of Practice

ELECTIVE I

3 0 0 3.0

11C507 CONCRETE TECHNOLOGY LABORATORY

0 0 3 1.5

COURSE OBJECTIVES

- To impart knowledge on the various tests procedure of fresh and hardened concrete
- To impart knowledge on mix design as per Indian Standards

PROGRAMME OUTCOME (PO)

3. Able to design and conduct experiments, as well as to analyze and interpret data.

COURSE OUTCOMES (COs)

1. Determine the properties of ingredients of concrete
2. Determine the properties of fresh and hardened concrete
3. Design a mix ratio for required grade of concrete

PREREQUISITES:

Knowledge of Concrete Technology

ASSESSMENT PATTERN

	Internal Assessment	Semester End Examination
Preparation	10	15
Observation and Results	15	20
Record	10	-
Mini-Project / Model Examination/ Viva-Voce	15	15
Total	**50**	**50**

LIST OF EXPERIMENTS

1. Physical Tests on Cement
   (Fineness, Standard consistency, Initial & final setting times Soundness, Compressive strength)
2. Tests on Fine Aggregate
   (Sieve analysis, Specific gravity, Bulk density, Bulking)
3. Tests on Coarse Aggregate
   (Sieve analysis, Bulk density, Aggregate crushing strength, Aggregate impact, Abrasion, Flakiness index, Elongation index)
4. Tests on Fresh Concrete
   (Slump test, Compaction factor, Veebee consistmeter)
5. Tests on Hardened Concrete
   (Compressive strength: Cube – Cylinder, Split tensile strength Modulus of rupture)
6. Mix design using I.S. Method
7. NDT - Rebound hammer test
8. NDT - Ultrasonic pulse velocity test,
9. Mix design using A.C.I. Method

Mini Project

Total: 45 Hours

PRACTICAL SCHEDULE

S. No.	Experiments	Hours
1	Physical tests on cement	8
2	Tests on fine aggregate	8
3	Tests on coarse aggregate	8
4	Tests on fresh concrete	6
5	Tests on hardened concrete	6
6	Non destructive test	4
7	Mix design	5

11C508 DESIGN STUDIO

0 0 3 1.5

COURSE OBJECTIVES

- To impart knowledge on the concept of rendering.
- To give practical exposure on the application of various architectural softwarees in the field.

PROGRAMME OUTCOMES (POs)

3. Able to design and conduct experiments, as well as to analyze and interpret data.

5. Able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.

8. Able to function on multidisciplinary teams.
9. Able to deliver effective verbal, written and graphical communications.

11. Able to perform economic analysis, labour/time/material management, construction schedules and activities related to design, construction, operations and maintenance of systems in the technical specializations of Civil Engineering.

COURSE OUTCOMES (COs)

1. Demonstrate the various characteristics of rendering a building
2. Analyze any type of building.

PREREQUISITES:

Knowledge of Computer Aided Drawing I

ASSESSMENT PATTERN

	Internal Assessment	**Semester End Examination**
Preparation	10	15
Observation and Results	15	20
Record	10	-
Mini-Project / Model Examination/ Viva-Voce	15	15
Total	**50**	**50**

LIST OF EXERCISES

1. Develop a model of a Residential building showing the plan elevation of
- Single -storey building
- Multi-storey building for a given plan

2. Planning drawing of a
- Residential building
- Commercial building of a given plan with and without rendering effect for daytimes and nighttime effects.

3. Create a model of a residential building plan and accordingly prepare the schedule of quantities for th e same.
4. Develop a walkthrough model of a

- Classroom with all its necessities
- Park with rendering effects for a given floor area.

Mini Project

Total: 45 Hours

PRACTICAL SCHEDULE

S. NO.	EXERCISES	HOURS
1	Plan and Elevation of a single floor residential building	3
2	Plan and Elevation of a multi-storey residential building	3
3	Plan and Elevation of a residential building with all its necessitie	6
4	Plan and Elevation of a commercial building with all its necessities	6
5	Plan and Elevation of a residential building with rendering effects	6
6	Plan of a single room with night rendering effects	3
7	Prepare a schedule of a normal building	3
8	Create a movie of a class room with all its neccessities	3
9	Create a model of a park with rendering effects	6

11C509 SURVEY CAMP

0 0 3 1.5

COURSE OBJECTIVES)

- To make give practical exposure on the application of various basic principles of survey in the field.
- To provide hands on experience to handle modern surveying equipments using total station.

PROGRAMME OUTCOMES (POs)

3. Able to design and conduct experiments, as well as to analyze and interpret data.

5. Able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.
8. Able to function on multidisciplinary teams.

7. Able to understand the role of Civil Engineers and ethical responsibility.

9. Able to deliver effective verbal, written and graphical communications

PREREQUISITES:

Knowledge of Survey I & II

LIST OF EXERCISES

1. Theodolite traverse
2. Block contouring
3. Radial contouring
4. Highway project
5. Triangulation
6. Trilateration
7. Azimuth of a line by observation on sun.
8. Fixing gradient for a pipe line
9. Fly leveling
10. Surveying using total station

Mini Project **Total: 45 Hours**

PRACTICAL SCHEDULE

Sl. No.	Experiment	Hours
1	Theodolite traverse	3
2	Block contouring	3
3	Radial contouring	3
4	Highway project	3
5	Triangulation	6
6	Trilateration	3
7	Azimuth of a line by observation on sun.	3
8	Fixing gradient for a pipe line	6
9	Fly leveling	3
10	Surveying using total station	6

11C510 TECHNICAL SEMINAR I

- - - 1.0

PROGRAMME OUTCOMES (POs)

6.Able to work on the basis of broad education necessary to understand the impact of engineeringsolutions in a global, economc, envrinmental and societal context.
9. Able to deliver effective verbal, witten and graphical communications.

11C601 DESIGN OF R.C.C. STRUCTURES

3 0 0 3.0

COURSE OBJECTIVES

- To impart knowledge on the basic design philosophy of R.C.C structures
- To make students be familiar about the codal provisions for the design of R.C.C structures

PROGRAMME OUTCOME (PO)

5. Able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.

11. Able to perform economic analysis, labour/time/material management, construction schedules and activities related to design, construction, operations and maintenance of systems in the technical specializations of Civil Engineering.

COURSE OUTCOMES (COs)

1. Understand the component behaviour and structural behaviour of various structures
2. Analyse and Design shallow footings
3. Analyse and Design a multi-bay multi storied frames with joint detailing
4. Know the importance of lateral soil pressure distribution on retaining walls and able to design it for various loading condition
5. Analyse and Design various types of water tanks.
6. Analyze and determine the critical loading condition on bridge deck for the economical design

PREREQUISITES:

Knowledge of Design of R.C.C Elements, Mechanics of Deformable Bodies II and Concrete Technology

ASSESSMENT PATTERN

Sl. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	10	10	10	10
2	Understanding	10	10	10	10
3	Apply	40	40	40	40
4	Analyze / Evaluate	-	-	-	-
5	Create	40	40	40	40
Total		**100**	**100**	**100**	**100**

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks.

Unit I

Foundations

Isolated footings –Combined footings of rectangular and trapezoidal shape – Strap beam footings – Principles of design of mat foundation

Design of isolated footing subjected to uniaxial and biaxial moments

9 Hours

Unit II

Building Frames

Steps involved in the design of multibay, multistoreyed frames – Elastic analysis using suitable substitute frames for gravity loadings – Portal and Cantilever methods of analysis for wind forces – Design of frame components – Design of Deep Beams-Design of Corbels-Design of stairs spanning horizontally – Design of doglegged stair

Detailing of joints

9 Hours

Unit III

Earth Retaining Structures

Design of cantilever and counterfort retaining walls for any type of back fill – Stability requirements of retaining walls

Effect of surcharge loading in the design of retaining wall

9 Hours

Unit IV

Liquid Storage Structures

Design of underground and onground rectangular water tanks– Use of Parts I, II and IV of I.S.3370 Codes – Overhead tanks of rectangular shape and circular shape with domical roof – Design of all components including staging and foundation.

Design of underground and onground circular water tanks

9 Hours

Unit V

Bridges

Types of bridges – IRC loadings – Design of single span slab bridge deck for class A loading – Design of the deck of T – beam and slab bridge for class AA loading

Design of single span slab bridge deck for class AA loading

9 Hours

Total: 45 Hours

Textbooks

1. N.Krishnaraju, *Design of Reinforced Concrete Structures*, CBS Publishers & Distributors, New Delhi, 2003.
2. B.C.Punmia, Ashok Kumar Jain and Arun kumar Jain, *Limit State Design of Reinforced Concrete*, Laxmi Publications (P) Ltd., New Delhi, 2007.

References

1. Unnikrishna Pillai and Devedas Menon, *Reinforced Concrete Design*, Tata Mc Graw Hill Publishing Co.Ltd., New Delhi, 1998.
2. M.L.Gambhir, *Design of reinforced concrete structures*, PHI learning Pvt. Ltd., New Delhi, 2008.
3. S.N.Sinha, *Reinforced Concrete Design*, Tata M_c Graw Hill Publishing Co.Ltd., New Delhi, 2002.
4. B.C.Punnmia, Ashok Kumar Jain and Arun Kumar Jain, *Comprehensive R.C.C. Design*, Laxmi Publications (P) Ltd., New Delhi, 1998.
5. P.Dayaratnam, *Design of Reinforced Concrete Structures*, Oxford & IBH Publishers, New Delhi, 2000.
6. P.C.Varghese, *Limit State Design of Reinforced Concrete*, Prentice Hall of India Pvt. Ltd., New Delhi, 2002.

7. IS 456:2000 Plain and reinforced concrete Code of Practice
8. IS 3370 (Part 1):1965 Code Practice for concrete structures for the storage of liquids.
9. IRC 6:2000 Standard Specification and Code of Practice for road bridges, Section II -loads and stresses
10. IRC 21:2000 Standard Specification and Code of Practice for road bridges, Section III –Cement concrete (plain and reinforced)

11C602 STRUCTURAL ANALYSIS II

3 1 0 3.5

COURSE OBJECTIVES

- To impart a thorough knowledge about the matrix methods of structural analysis
- To introduce plastic analysis of structures
- To impart knowledge on finite element analysis and tension co-efficient method

PROGRAMME OUTCOME (POs)

1. Able to apply the fundamental knowledge of mathematics, science and engineering.

2. Able to identify, formulate and solve Civil Engineering problems in accordance with Indian Standard codes of practice.

COURSE OUTCOMES (COs)

1. Analyze a structure by using matrix stiffness and flexibility methods.
2. Importance of Load factor in a Design.
3. Analyze the structure for statistical determinacy.

PREREQUISITES:

Knowledge of Structural Analysis I

ASSESSMENT PATTERN

Sl. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	10	10	10	10
2	Understand	10	10	10	10
3	Apply / Analyze / Evaluate	80	80	80	80
4	Create	-	-	-	-
Total		**100**	**100**	**100**	**100**

Unit I

Analysis of Pin Jointed Frames

Analysis of perfect frames – Method of joints and method of sections - Analysis of statically redundant trusses by Force method – Using reactions as redundant and using axial forces as redundant

Yielding of supports

9 Hours

Unit II

Influence Lines

Introduction to influence lines– Influence lines for member forces in simply supported pin jointed frames – Muller-Breslau principle – Influence lines for beams with degree of indeterminacy one

Stresses in frames with lack of fit

9 Hours

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks.

Unit III

Flexibility Method for Indeterminate Beams and Frames

Introduction - computation of flexibility matrices - Analysis of overhanging, continuous beams and rigid jointed plane frames by flexibility method

Equilibrium and compatibility

9 Hours

Unit IV

Stiffness Method for Indeterminate Beams and Frames

Introduction –equilibrium and compatibility- Analysis of overhanging, continuous beams and rigid jointed plane frames by stiffness method.

Element and global stiffness matrices

9 Hours

Unit V

Miscellaneous Topics

Introduction to finite element analysis – Steps involved in FEA-tension co-efficient method.

Various types of finite element-Convergence and Compatibility requirements.

9 Hours

Total: 45 + 15 Hours

Textbooks

1. R. Vaidyanathan and P. Perumal, *Structural Analysis Vol. I & II*, Laxmi Publications (P) Ltd, New Delhi, 2006.
2. S. S. Bhavikatti, *Structural Analysis Volume 2*, Vikas Publishing House Pvt. Ltd., New Delhi, 2006.

References

1. C. S. Reddy, *Basic Structural Analysis*, Tata Mc Graw Hill Publishing Co. Ltd., New Delhi, 1996
2. A. Ghali and A. M. Neveille, *Structural Analysis a Unified Classical Matrix Approach*, E & FN SPON Taylor & Francis Group – Distributed by Standard Publishers Distributors, Delhi, 1999
3. C.K Wang, *Indetermediate Structural Analysis*, McGraw- Hill, 1983
4. Klaus- Jurgen Bathe, *Finite Element Procedures*, Prentice Hall of India, New Delhi, 1996

11C603 WASTE WATER TREATMENT

3 0 0 3.0

COURSE OBJECTIVES

- To impart knowledge on various methods of domestic and municipal wastewater treatment
- To enhance the knowledge of students on effluent disposal phenomenon
- To emphasize the need for sewage treatment

PROGRAMME OUTCOME (PO)

3. Able to design and conduct experiments, as well as to analyze and interpret data.

COURSE OUTCOMES (COs)

1. Design the hydraulic elements for sewer.
2. Compute the design flow by suitable methods.

PREREQUISITES:

Knowledge of Fluid Mechanics and Water Supply Engineering

ASSESSMENT PATTERN

Sl. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	20	20	20	20
2	Understand	40	20	20	20
3	Apply	40	30	30	30
4	Analyze / Evaluate	-	-	-	-
5	Create	-	30	30	30
Total		**100**	**100**	**100**	**100**

Unit I

Introduction: Quantity of Sewage

Types of sewerage systems suitability - Dry weather flow - Factors effecting dry weather flow - Flow variations and their effects on design of sewerage system - Computation of design flow - Estimation of storm flow: Rational method and empirical formulae - Design of storm water drain - Time of concentration.

Sullage

9 Hours

Unit II

Analysis of Sewage

Physical, chemical and biological characteristics - Concepts of Aerobic and Anaerobic activity - More emphasis on BOD and COD - Sampling – Significance - Techniques and frequency - Design of Sewers**:** Principle – Factors - Hydraulic formulae for velocity - Effects of flow variations on velocity - Self cleansing and non souring velocities - Design of hydraulic elements for circular sewers flowing full.

Design of hydraulic elements for circular sewers flowing partially full.

9 Hours

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks

Unit III

Sewer Appurtenances

Definition - Catch basins - Manholes - Flushing tanks - Oil and grease traps - Drainage traps - Basic principles of house drainage - Typical layout plan showing house drainage connections - Maintenance of house drainage - Materials of sewers**:** Sewer materials - Shapes of sewers - Laying of sewers - Jointing of sewers - Ventilation and cleaning of sewers.

Jointing of sewers

9 Hours

Unit IV

Disposal of Effluents

Dilution - Self-purification phenomenon - Oxygen sag curve - Zones of purification - Sewage farming, sewage sickness - Disposal standards on land and water - Chlorination of sewage - Oxidation pond and oxidation ditch - Septic tanks with soak pits - Oxidation pond –Design

Stabilization pond

9 Hours

Unit V

Treatment of Sewage

Types of Treatment - Flow diagram of a typical municipal sewage treatment plant - Primary Treatment – Screening - Grit chambers - Skimming tanks - Primary sedimentation tanks – Sludge deposit - Secondary treatment - Trickling filter - Theory and operation - Types and designs - Activated sludge process - Principle and flow diagram - Methods of aeration – Modifications - F/M ratio - Designs of ASP – Secondary sedimentation tanks - Tertiary treatment - Sludge digestion and filter beds - Methods of sludge disposal

Sludge drying beds

9 Hours

Total: 45 Hours

Textbook

1. S. K. Garg, *Sewage Disposal and Air Pollution Engineering*, Khanna Publishers, New Delhi, 2008

References

1. B. C. Punmia and Ashok Jain , *Environmental Engineering* Vol II, Lakshmi Publications, New Delhi,1995
2. Howard S. Peavy, Donald R. Rowe and George Tchobanoglous, *Environmental Engineering,* Tata McGraw Hill, 1985

11C604 IRRIGATION ENGINEERING

3 0 0 3.0

COURSE OBJECTIVES

- To impart basic knowledge on the basic needs and modes of irrigation
- To emphasis the significance of ground water irrigation

PROGRAMME OUTCOME (PO)

5. Able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.

COURSE OUTCOMES (COs)

Estimate the various methods of irrigation

1. Perform the water losses and irrigation scheduling
2. Select the suitable site for wells and yield of the wells.
3. Analyze data from multiple sources to do the water management in irrigation.

PREREQUISITES:

Knowledge of Fluid Mechanics and Soil Mechanics

ASSESSMENT PATTERN

S. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	30	30	20	20
2	Understand	50	50	50	50
3	Apply	20	20	30	30
4	Analyze / Evaluate	-	-	-	-
5	Create	-	-	-	-
	Total	**100**	**100**	**100**	**100**

Unit I

Introduction

Irrigation – Need – Benefits - Ill effects - Historical background - National Water Policy – Classification - Crop and Crop Seasons - Consumptive use of Water – Delta - Duty - Relationship between Delta and Duty - Factors affecting Duty- Irrigation efficiencies

Planning and Development of irrigation projects.

9 Hours

Unit II

Irrigation Methods

Surface Irrigation - Subsurface Irrigation - Lift Irrigation - Tank Irrigation - Flooding Irrigation - Sprinkler Irrigation - Drip irrigation – Design of sprinkler and drip irrigation

Canal irrigation

9 Hours

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks

Unit III

Water Requirement of Crops

Crop water requirement – Evapotranspiration – Effective rainfall – Standards of irrigation water – Classes and availability of soil water

Irrigation scheduling

9 Hours

Unit IV

Ground water Irrigation

Well irrigation – open well – Yield of an open well – pumping test – Tube well – Types of tube well – Design criteria – Well shrouding and well development

Selection of suitable site for a tube well

9 Hours

Unit V

Miscellaneous Topics

Minimizing Irrigation water losses - Participating Irrigation Management - Water users association - Optimization of Water use - Necessity - Important Dams in India - Water Logging - Causes –Ill effects – Remedy - Salinity in soil - Improvement of Irrigation Efficiency and management

Changing paradigms in water management

9 Hours

Total: 45 Hours

Textbook

1. Dr. B. C. Punmia, *Irrigation and Water Power Engineering*, Lakshmi Publications, 2010

References

1. S. K. Garg, *Irrigation Engineering*, Khanna Publishers, 2007
2. R. K. Sharma and T. K. Sharma, *Irrigation Engineering*, S. Chand & Co, 2006

11C605 DESIGN OF STEEL STRUCTURES

3 1 0 3.5

COURSE OBJECTIVES

- To impart knowledge on steel constructions
- To impart the knowledge on the codal provisions for the design of steel structures
- At the end of this course students will be able to design bolted and welded connections, tension members, compression members and beams

PROGRAMME OUTCOME (PO)

5. Able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.
11. Able to perform economic analysis, labour/time/material management, construction schedules and activities related to design, construction, operations and maintenance of systems in the technical specializations of Civil Engineering

COURSE OUTCOMES (COs)

1. Design of Connection Details
2. Design of Structural Components

PREREQUISITES:

Knowledge of Mechanics of Deformable Bodies I & II, Structural Analysis I & II

ASSESSMENT PATTERN

S. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	10	10	10	10
2	Understand	50	10	10	10
3	Analyze	-	-	-	-
4	Apply / Evaluate	50	40	30	30
5	Create	20	40	50	50
Total		**100**	**100**	**100**	**100**

Unit I

Introduction

Introduction to steel structures - Use of relevant Indian standard codes – Comparison of Working stress and Limit state method of design - Properties of steel - Structural steel sections - Types of connections - Design of bolted and welded connections - Efficiency of joint - Concept of eccentric connections.

Pin Connections

9 Hours

Unit II

Tension Members

Introduction to types of sections - Calculation of net area - Net effective sections for angles and Tee in tension -

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks

Design of connections in tension members - Design of tension splice.
Gusset Plate

9 Hours

Unit III
Compression Members
Introduction to types of compression members - Theory of column - Codal provisions for compression members - Design of lacings and battens - Design of column base - Gussetted base.
Encased Column

9 Hours

Unit IV
Beams
Introduction to design of flexural members - Design of laterally supported and unsupported beams - Built up beams - Design of plate girders - Intermediate and bearing stiffeners.
Castellated Beam

9 Hours

Unit V
Miscellaneous Topics
Introduction to Beam Columns - Loading specifications and components of an industrial building - Design of roof trusses and purlins – Introduction to gantry girder.
Bracing of Trusses – Industrial Visits

9 Hours
Total: 45 + 15 Hours

Textbooks

1. N. Subramanian, *Design of Steel Structures*, Oxford University Press 2008
2. S. K. Duggal, *Limit State Design of Steel Structures*, Tata , Mc Graw Hill Education Pvt Ltd, New Delhi

References

1. M. R. Shiyekar, *Limit State Design in Structural Steel*, PHI Learning Private Limited, New Delhi, 2010
2. K. S. Sai Ram, *Design of Steel Structures*, Dorling Kindersley (India) Pvt. Ltd, Pearson Education in South Asia.
3. IS 800 – 2007, *General Construction in Steel – Code of Practice*, BIS, New Delhi
4. IS 800 – 1984, *General Construction in Steel – Code of Practice*, BIS, New Delhi

R. Murugesan and A. P. Arulmanickam, *Steel Tables in SI Units*, Pratheeba Publishers, Coimbatore, 2009.

ELECTIVE II

3 0 0 3.0

11C607 IRRIGATION AND PUBLIC HEALTH ENGINEERING DRAWING

0 0 3 1.5

COURSE OBJECTIVES

- To impart basic knowledge on the components and special features of various irrigation structures
- To provide hands on experience pertaining to the design of hydraulic and irrigation structures.

PROGRAMME OUTCOME (PO)

9. Able to deliver effective verbal, written and graphical communications

COURSE OUTCOMES (COs)

1. Demonstrate the functional aspects of irrigation structures.
2. Demonstrate the functional aspects of units in water treatment.

PREREQUISITES:

Knowledge of Irrigation Engineering and Waste water Treatment

ASSESSMENT PATTERN

	Internal Assessment	Semester End Examination
Preparation	10	15
Observation and Results	15	20
Record	10	-
Mini-Project / Model Examination/ Viva-Voce	15	15
Total	**50**	**50**

LIST OF EXERCISES

1. Design and Drawing of
2. Surplus weir
3. Tank sluice with tower head
4. Canal drop
5. Canal regulator
6. Syphon aqueduct
7. Septic tank
8. Imhoff tank
9. Design an Effluent treatment plant for a particular capacity

Mini Project

Total: 45 Hours

PRACTICAL SCHEDULE

S. No.	Exercise	Hours
1	Surplus weir	6
2	Tank sluice with tower head	6
3	Canal drop	6
4	Canal regulator	6
5	Siphon aqueduct	5
6	Spectic Tank	3
7	Imhoff Tank	3
8	Design an Effluent treatment plant for a particular capacity	10

11C608 COMPUTER AIDED ESTIMATION, COSTING AND VALUATION

0 0 3 1.5

COURSE OBJECTIVES

- To enhance the computing capability of the students to draw the plan, elevation and sectional view of various structural elements.
- To impart knowledge on computer aided estimation and costing of various structural elements.
- To impart knowledge on valuation of buildings.

PROGRAMME OUTCOMES (POs)

9. Able to deliver effective verbal, written and graphical communications (l) an ability to perform economic analysis, quality checks, time/labour management and cost estimates related to design, construction, operations and maintenance of systems in the civil technical specialties
11. Able to perform economic analysis, labour/time/material management, construction schedules and activities related to design, construction, operations and maintenance of systems in the technical specializations of Civil Engineering.

COURSE OUTCOMES (COs)

1. Estimation of Load bearing and framed structures
2. Estimation of Septic tanks and soak pit
3. Estimation of Sanitary and Water Supply systems
4. Estimation of Roads
5. Estimation of Retaining walls
6. Estimation of Irrigation works
7. Valuation of residential and industrial buildings

PREREQUISITES:

Knowledge of Concrte Technology and Design of R.C.C Elements

ASSESSMENT PATTERN

	Internal Assessment	Semester End Examination
Preparation	10	15
Observation and Results	15	20
Record	10	-
Mini-Project / Model Examination/ Viva-Voce	15	15
Total	**50**	**50**

LIST OF EXERCISES

1 1.Quantity Estimation of
- Residential building
- Framed structures
- Septic tanks and soak pit
- Water Supply systems

- Sanitary Supply systems
- Roads
- Retaining walls
- Irrigation works

2. Valuation of
   - Residential buildings for a given plan
   - Industrial buildings for a given plan

Mini Project **Total: 45 Hours**

PRACTICAL SCHEDULE

Sl. No	Exercises	Hours
1	Estimation of residential building	3
2	Estimation of framed structures	3
3	Estimation of Septic tanks and soak pit	3
4	Estimation of Water Supply systems	6
5	Estimation of Sanitary Supply systems	6
6	Estimation of Roads	6
7	Estimation of Retaining walls	6
8	Estimation of Irrigation works	6
9	Valuation of residential buildings	3
10	Valuation of industrial buildings	3

11C609 TECHNICAL SEMINAR II

- - - 1.0

PROGRAMME OUTCOME (POs)

6.Able to work on the basis of broad education necessary to understand the impact of engineeringsolutions in a global, economc, envrinmental and societal context.
9. Able to deliver effective verbal, witten and graphical communications.

110701 ENGINEERING ECONOMICS

3 0 0 3.0

COURSE OBJECTIVES

- To understand the basics of Micro and Macro Economics
- To understand the methods by which Demand Forecasting, Cost Analysis, Pricing and Financial Accounting are done in the Industry

PROGRAMME OUTCOMES (POs)

7. Able to understand the role of Civil Engineers and ethical responsibility.
9. Able to deliver effective verbal, written and graphical communications.

COURSE OUTCOMES (COs)

1. Costing of products and services
2. Market Analysis

PREREQUISITES:

Knowledge of General Economics

ASSESSMENT PATTERN

S. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	20	20	20	20
2	Understand	30	30	30	30
3	Apply	20	20	20	20
4	Analyze/ Evaluate	20	20	20	20
5	Create	10	10	10	10
	Total	**100**	**100**	**100**	**100**

Unit I

Introduction

Introduction to Economics, Kinds of Economic Systems, Production Possibility Frontier, Opportunity Cost, Objective of Organizations, Kinds of Organizations, Business Decision Making,
Legal rights and responsibilities of types of Organizations.

9 Hours

Unit II

Demand and Supply

Functions of Demand & Supply, Law of Demand and Supply, Elasticity of Demand, Demand Forecasting Methods, Price Equilibrium
Role of logistics in managing supply and demand.

9 Hours

† The marks secured in Test I and II will be converted to 20 and Model Examination will be converted to 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks

Unit III

Production and Cost

Production Function, Returns to Scale, Economies & Diseconomies of scale, Fixed Cost, Variable Cost, Average Costs, Cost Curves, Break Even point, Law of diminishing Marginal Utility

Costing of a product during the stages of its life cycle

9 Hours

Unit IV

Pricing & Market Structure

Components of Pricing, Methods of Pricing, Return on Investment, Payback Period, Market Structure and Pricing, Perfect Competition, Monopoly, Oligopoly, Monopolistic, Non price competition, E-commerce.

The secure payment process in e-commerce.

9 Hours

Unit V

Introduction to Macro Economics & Financial Accounting,

National Income – GDP, Per Capita Income, Inflation, Stagflation, Deflation, Business Cycle, Stabilization Policies, Direct Taxes, Indirect Taxes, Balance of Payment. Accounting - Terminology, Book Keeping, P&L, Balance Sheet.

Role of Central Excise and Customs

9 Hours

Total: 45 Hours

Textbook(s)

1. A. Ramachandra Aryasri and V V Ramana Murthy, *Engineering Economics and Financial Accounting*, Tata McGraw Hill Publishing Company Limited , New Delhi, 2006

References

1. V L Samuel Paul and G S Gupta, *Managerial Economics – Concepts and Cases*, Tata McGraw Hill Publishing Company Limited, New Delhi, 1981
2. S N Maheswari, *Financial and Management Accounting*, Sultan Chand
3. R Kesavan, C Elanchezhian and T Sunder Selwyn, *Engineering Economics and Financial Accounting*, Laxmi Publication (P) Ltd , New Delhi, 2005

11C702 HIGHWAY ENGINEERING

3 0 0 3.0

COURSE OBJECTIVES

- To provide a basic knowledge on highway planning, geometric design, design of pavements and highway materials.
- To provide a basic knowledge on economic evaluation of highway projects.

PROGRAMME OUTCOME (PO)

5. Able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.

COURSE OUTCOMES (COs)

1. Acquisition of skills in selecting the best highway alignment and the highway proposal
2. Planning of various highway cross sectional elements
3. Ability to design flexible and rigid pavements as per IRC codes.
4. Ability to prepare Environmental Impact Assessment for any highway project.
5. Better assessment of the proposals because of the cost-benefit analysis knowledge.

PREREQUISITES:

Knowledge of Survey I & II and Concrete Technology

ASSESSMENT PATTERN

Sl. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	20	20	20	20
2	Understand	25	25	25	25
3	Apply	25	25	25	25
4	Analyze / Evaluate	30	30	30	30
5	Create	-	-	-	-
	Total	**100**	**100**	**100**	**100**

Unit I

Highway Planning and Alignment

Jayakar committee recommendations - Institutions for highway planning and implementation at different levels - Requirements of ideal alignment - Factors controlling highway alignment -Engineering surveys for alignment - Conventional methods and modern methods (Remote Sensing, GIS and GPS techniques) - Highway cross sectional elements – Right of Way, carriage way, camber, kerbs, shoulders and footpaths [IRC Standards]
Highway Development in India - Classification and cross section of urban and rural roads (IRC)

9 Hours

Unit II

Geometric Design of Highways

Design of horizontal alignments: Super elevation, Widening of pavements on horizontal curves and transition curves [Derivation of Formulae and Problems]. Design of vertical alignments – gradients, summit and valley curves - Sight distances: Factors affecting sight distances, PIEV Theory, Stopping Sight Distance (SSD),

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks

Overtaking Sight Distance (OSD), [Derivations and Problems in SSD and OSD] - Geometric design of hill roads [IRC Standards Only]
Sight distance at intersections, intermediate sight distance and illumination sight distance

9 Hours

Unit III

Highway Design and Construction

Desirable Properties and Testing of Highway Materials – Soil: California Bearing Ratio Test – Aggregate: Crushing, Abrasion and Impact Tests - Bitumen: Penetration, Ductility, Viscosity, Binder Content and Softening Point Tests - Design principles of flexible and rigid pavements – Design of flexible and rigid pavement (IRC Recommendations – Problems) – Construction of WBM, Premix carpet, Surface dressing, bituminous concrete roads and cement concrete roads
Soil tests – Field density test

9 Hours

Unit IV

Highway Maintenance

Types of defects in flexible pavements: Surface defects, cracks, deformation and disintegration – Symptoms, causes and treatments - Types of pavement failures in rigid pavements: Scaling, shrinkage, warping, structural cracks, spalling of joints and mud pumping – Overlays – Overlay design – Benkelman beam method
Special repairs – Highway drainage

9 Hours

Unit V

Economic Evaluation of Highway Projects

Evaluation of Highway Projects – COURSE OBJECTIVES (COs), methods and basic principles of economic evaluation – Types of evaluation techniques – Cost Benefit Analysis (Benefit Cost Ratio, Net Present Value, International Rate of Returns (Problems) – Environmental Impact Assessment – Cash flow analysis (Basic principles)
Build, Operate and Transfer for Highway Projects (Basic Concepts only)

9 Hours
Total: 45 Hours

Textbooks

1. S. K. Khanna and C. E. G. Justo, *Highway Engineering*, Nem Chand and Bros., Roorkee, 2009
2. K. P. Subramaniam, *Highway, Railway, Airport and Harbour Engineering*, Scitech Publications, Chennai, 2011

References

1. IRC 37 – 2001, Guidelines for the Design of Flexible Pavements
2. IRC 58 – 2002, Guidelines for the Design of Plain Jointed Rigid Pavements
3. S. K. Khanna and C. E. G. Justo, *Highway Material Testing Manual*, Nem Chand and Bros., Roorkee, 2002
4. L. R. Kadiyali, *Principles and Practice of Highway Engineering*, Khanna Publishers Ltd., New Delhi, 2000

11C703 BASICS OF STRUCTURAL DYNAMICS AND ASEISMIC DESIGN OF STRUCTURES

3 0 0 3.0

OBJECTIVES

- To impart knowledge on the theory of vibration and basics of structural dynamics
- To impart the design philosophy of earthquake resistant design of structures
- To create awareness on the use of codal provisions for aseismic design of structures

PROGRAMME OUTCOMES

1. Able to apply the fundamental knowledge of mathematics, science and engineering.
2. Able to identify, formulate and solve Civil Engineering problems in accordance with Indian Standard codes of practice

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COURSE OUTCOMES

1. Analyse the amount vibration a structure can withstand
2. Analyze a structure by seismic coefficient method.
3. Importance of providing ductility for a structure.

PREREQUISITES:

Knowledge of Mechanics, Design of R.C.C Elements and Structural Analysis 3

ASSESSMENT PATTERN

Sl. No	Bloom's Category	TEST 1	TEST 2	Model examination	Semester end examination
1	Remember	20	20	20	20
2	Understand	30	30	30	30
3	Apply	20	20	20	20
4	Analyze	10	10	10	10
5	Evaluation	-	-	-	-
6	Create	10	10	10	10
	Total	**100**	**100**	**100**	**100**

Unit I

Introduction and Principles of Dynamics

Vibration studies and their importance to structural engineering problems - Elements of vibratory systems and simple harmonic motion - Vibration with and without damping - Generalized mass - D' Alembert's principle - Degree of freedom: Equation of motion for S.D.O.F. - Damped and undamped free vibrations - Undamped forced vibration

Damped free Vibration,Undamped forced vibration

9 Hours

Unit II

Introduction to Earthquake Engineering

Elements of engineering seismology – Causes of earthquakes - Seismic waves - Magnitude - Intensity and Energy release – Indian seismology – Earthquake history – Catastrophies – Failures - Lessons learnt from past earthquakes – Seismic zone map of India – Strong motion characteristics

Causes of Earthquakes, lessons learnt from past earthquakes

9 Hours

Unit III

Aseismic Design of Buildings

Idealization of building frames - Introduction to methods of seismic analysis – Equivalent static analysis - IS 1893 provisions – Design horizontal seismic coefficient - Design base shear distribution - Seismic resistant design of buildings

Seismic resistant design of buildings

Unit IV **9 Hours**

Earthquake Resistant Construction

Earthquake resistant properties of materials – Lateral force resisting systems – Strong column weak beam – Guidelines for seismic resistant construction - Building configuration requirements – Ductile detailing of reinforcements in RC buildings - Behavior and design of masonry structures.

Guidelines for seismic resistant construction

Unit V **9 Hours**

Repairs and Retrofitting

Code of practices for repairs and retrofitting - Retrofitting of RC buildings and structural elements – Techniques of retrofitting - Improving structural integrity of masonry buildings – Retrofitting by seismic isolation – Case studies.

Retrofitting by seismic isolation

9 Hours

Total: 45 Hours

Textbooks

1. Mario Paz, *Structural Dynamics – Theory and Computation*, CBS Publications, 2004
2. Pankaj Agarwal and Manish Shrikhande, *Earthquake Resistant Design of Structures,* Prentice Hall of India, 2006
3. A. K. Chopra, *Dynamics of Structures - Theory and Applications to Earthquake Engineering*, Prentice Hall of India, New Delhi, 2002

References

1. IS 1893 – 2002, *Criteria for Earthquake Resistant Design of Structures*
2. IS 4326 – 1993, *Earthquake Resistant Design and Construction of Buildings – Code of Practice*
3. IS 13920 – 1993, *Ductile Detailing of Reinforced Concrete Structures to Seismic Forces – Code of Practice*
4. IS 13935 – 1993, *Repair and Seismic Strengthening of Buildings – Guidelines*
5. http://www.bis.org.in/other/quake.html

11C704 CONSTRUCTION TECHNOLOGY AND MANAGEMENT

3 0 0 3.0

COURSE OBJECTIVES

- To impart knowledge on concrete mix design and the importance of chemical/mineral admixtures
- To enhance the knowledge on construction planning, management and execution

PROGRAMME OUTCOMES (POs)

11. Able to perform economic analysis, labour/time/material management, construction schedules and activities related to design, construction, operations and maintenance of systems in the technical specializations of Civil Engineering.

COURSE OUTCOMES (COs)

1. Concrete mix design using various admixtures.
2. Design of masonry wall structures.
3. Identify the different types of construction equipments.

PREREQUISITES:

Knowledge of Concrete Technology, Economics and Building Materials

ASSESSMENT PATTERN

S. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	30	30	30	30
2	Understand	30	30	30	30
3	Apply / Evaluate	10	10	10	10
4	Analyze	20	20	20	20
5	Create	10	10	10	10
	Total	**100**	**100**	**100**	**100**

Unit I

Concrete Mix Design and Admixtures

Grade of cements: 43 grade - 53 grade - High strength concrete - Testing of fresh and hardened concrete - Non destructive testing - Chemical admixtures - Mineral admixtures - Plasticizers - Accelerators - Air entraining admixtures - Construction chemicals

Colouring agents - Workability agents.

9 Hours

Unit II

Construction Techniques

Building components and their functions: Brick masonry – Bonds – Jointing - Stone masonry - Design of brick masonry walls as per I.S. Codes – Specifications - Details and sequence of activity and construction co-ordination - Site clearance - Marking - Earthwork - Building foundations - Basements - Temporary shed –

The marks secured in Test I and II will be converted to a maximum 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks

Shuttering sheet piles - Slip and moving forms - Design of forming work - Scaffoldings - Deshuttering forms - Types of floors & roofs – Ventilators - Functional planning of building: Building orientation – Circulation - Grouping of areas - Privacy concept - Provisions of National Building Code - Building estimates and specifications - Cost of works - Valuation.
Shoring – Shoring methodology

9 Hours

Unit III

Construction Equipments

Standard and special types of equipment - Preventive maintenance and repair - Factors affecting the selection of equipment - Economical life - Capital and maintenance cost - Concreting equipments: Weigh batcher - Concrete pump - Earthwork equipment: Power shovel – Bulldozer – Dumper – Trailers – Tractors - Rollers and sheep foot roller.
Mixer – Vibration - Batching plant

9 Hours

Unit IV

Construction Planning and Management

Construction activity – Schedules - Job layout - Bar charts - Organization of contracting firms - Project control and supervision - Network analysis: CPM and PERT analysis – Difference between CPM and PERT – Advantage of CPM over PERT - Float times - Cashing of activities - Contraction of network for cost optimization - Up dating - Cost analysis and resource allocation – Concept of BOT – BOOT- DPR – Preparation of DPR - Safety in construction - Conflict resolution.
Cost reduction measures

9 Hours

Unit V

Repair and Rehabilitation Works

Definitions: Maintenance - Repair - Rehabilitation - Distresses in concrete structures - Deterioration of structures: Causes and Prevention - Crack repair techniques - Repair techniques/materials for structures - - Repair of structural components - Research and Development.
Damage assessment procedure

9 Hours
Total: 45 Hours

Textbooks

1. P. C. Varghese, *Building Construction,* PHI Learning Private Limited, New Delhi, 2010
2. B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, *Building Construction,* Laxmi Publication (P) Ltd., New Delhi, 2008

References

1. A. R. Santhakumar, *Concrete Technology*, Oxford University Press, New Delhi, 2007
2. Sushilkumar, *Building Construction,* Standard Publishers Distributors, 2001
3. B. L. Gupta and Amit Gupta, *Construction Management and Accounts*, Standard Publishers Distributors, New Delhi, 1997

ELECTIVE III

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ELECTIVE IV

3 0 0 3.0

11C707 COMPUTER AIDED ANALYSIS AND DESIGN, DRAWING AND DETAILING OF STRUCTURES

0 0 3 1.5

COURSE OBJECTIVES

- To impart fundamental knowledge on AutoCAD, Staad Pro and Strud.
- To impart a clear understanding on the computer aided analysis and design of structural components.
- To enhance the computing capability of the students to draw the plan, elevation and sectional view of various structural elements.

PROGRAMME OUTCOMES (POs)

3. Able to design and conduct experiments, as well as to analyze and interpret data.
5. Able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.
11. Able to perform economic analysis, labour/time/material management, construction schedules and activities related to design, construction, operations and maintenance of systems in the technical specializations of Civil Engineering.

COURSE OUTCOMES (COs)

1. Design of building components
2. Design of T beam bridges
3. Design of Industrial Components
4. Design of special structures

PREREQUISITES:

Knowledge of Computer Aided Drawing –I, Structural analysis, Design of RCC Structures and Steel Structures

ASSESSMENT PATTERN

	Internal Assessment	Semester End Examination
Preparation	10	15
Observation and Results	15	20
Record	10	-
Mini-Project / Model Examination/ Viva-Voce	15	15
Total	**50**	**50**

LIST OF EXERCISES

Design and Detailing of

1. Floor slab system with T beam
2. Combined rectangular footing
3. Counter fort retaining wall
4. Elevated circular water tank with staging
5. Reinforced concrete T beam bridge deck
6. Plate Girder
7. Gantry Girder
8. Roof Truss
9. Columns with gusseted bases
10. Columns with Battens

Mini Project **Total: 45 Hours**

PRACTICAL SCHEDULE

Sl. No.	Exercises	Hours
1	Design and Detailing of Floor slab system with T beam	3
2	Design and Detailing of Combined rectangular footing	3
3	Design and Detailing of Counterfort retaining wall	6
4	Design and Detailing of Elevated circular water tank with staging	6
5	Design and Detailing of Reinforced Concrete T Beam Bridge Deck	6
6	Design and Detailing of Plate Girder	6
7	Design and Detailing of Gantry Girder	6
8	Design and Detailing of Roof Truss	3
9	Design and Detailing of Columns with gusseted bases	3
10	Design and Detailing of Columns with Battens	3

11C708 ENVIRONMENTAL ENGINEERING LABORATORY

0 0 3 1.5

COURSE OBJECTIVES

- To provide basic knowledge on the various methods of analysis of water and wastewater
- To emphasize the need for water and wastewater treatment

PROGRAMME OUTCOME (PO)

3. Able to design and conduct experiments, as well as to analyze and interpret data.

COURSE OUTCOMES (COs)

1. Demonstrate the various characteristics of water and wastewater sample
2. Analyze a water sample.

PREREQUISITES:

Knowledge of WaterSupply Engineering and Waste Water treatment

ASSESSMENT PATTERN

	Internal Assessment	Semester End Examination
Preparation	10	15
Observation and Results	15	20
Record	10	-
Mini-Project / Model Examination/ Viva-Voce	15	15
Total	**50**	**50**

LIST OF EXPERIMENTS

1. Determination of various forms
   - Hardness
   - pH
   - Acidity
   - Alkalinity
   - Turbidity and Dissolved and comment in water and wastewater samples
2. Estimation of chlorides and total dissolved solids in water and wastewater
3. Determination of available chlorine in bleaching powder
4. Analysis of sulphates in water and wastewater samples
5. Evaluation of iron and fluoride in given water sample
6. Calculation of amount of nitrates present in drinking water for a given sample.
7. Estimation of BOD and COD
8. To examine whether a given water sample is potable as per Indian Standards

Mini Project

Total: 45 Hours

PRACTICAL SCHEDULE

S. No.	Exercise	Hours
1	Determination of various forms of hardness and pH in water and wastewater	3
2	Identification of acidity and alkalinity in various forms in water and wastewater	3
3	Estimation of chlorides and total dissolved solids in water and wastewater	3
4	Determination of available chlorine in bleaching powder	3
5	Determination of turbidity of water and wastewater	3
6	Analysis of sulphates in water and wastewater	3
7	Assessment of fluoride in drinking water	3
8	Evaluation of iron and manganese in given water sample	3
9	Determination of nitrates in drinking water	3
10	Estimation of DO and BOD	6
11	To examine whether a given water sample is potable as per Indian Standards	6
12	Mini Project – Design of Waste water treatment in stages	6

11C709 PROJECT WORK PHASE I

- - - 3.0

PROGRAMME OUTCOME (POs)

5. Able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability. 8. Able to function on multidisciplinary teams.
2. Able to identify, formulate and solve Civil Engineering problems in accordance with Indian Standard codes of practice.
7. Able to understand the role of Civil Engineers and ethical responsibility.
11. Able to perform economic analysis, labour/time/material management, construction schedules and activities related to design, construction, operations and maintenance of systems in the technical specializations of Civil Engineering.

PREREQUISITES:

Knowledge of all Courses taught

110801 PROFESSIONAL ETHICS
(Common to all Branches)

2 0 0 2.0

COURSE OBJECTIVES

- To study the basic issues in Professional Ethics
- To appreciate the rights of others and to instill moral, social values and loyalty
- To enable the student in their engineering profession who explore the ethical issues in technological society

PROGRAMME OUTCOMES (POs)

6. Able to work on the basis of broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context.
7. Able to understand the role of Civil Engineers and ethical responsibility

COURSE OUTCOMES (COs)

1. Ability to propose possible solutions using articulated ethical theories
2. Ability to form opinions based on reasoned ethical positions, supported with facts and evidence
3. Increase in awareness of the ethical component of daily engineering decisions

ASSESSMENT PATTERN

S. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	30	30	30	30
2	Understand	40	40	40	40
3	Apply	30	30	30	30
4	Analyze/Evaluate	-	-	-	-
5	Create	-	-	-	-
Total		**100**	**100**	**100**	**100**

Unit I
Human Values
Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – Caring – Sharing – Honesty – Courage – Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence
Character – Spirituality in business

6 Hours

Unit II
Engineering Ethics
Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral autonomy – Kohlberg's theory – Gilligan's theory – Consensus and controversy – Models of Professional Roles – Theories about right action
Self-interest – Uses of ethical theories.

6 Hours

Unit III

Engineering as Social Experimentation

Engineering as experimentation – Engineers as responsible experimenters – Codes of ethics – A balanced outlook on law – The Challenger case study – Bhopal Gas Tragedy – The Three Mile Island and Chernobyl case studies

Safety aspects in Nuclear Power plants

6 Hours

Unit IV

Responsibilities and Rights

Fundamental Rights, Responsibilities and Duties of Indian Citizens – Collegiality and loyalty – Respect for authority – Collective bargaining – Confidentiality – Conflicts of interest – Occupational crime – Professional rights – Employee rights – Discrimination

Right to Information Act

6 Hours

Unit V

Global Issues

Multinational corporations – Environmental ethics and Environmental Protection Act – Computer ethics – Engineers as managers – Consulting engineers – Engineers as expert witnesses and advisors – Moral leadership – Sample code of ethics like IETE, ASME, ASCE, IEEE, Institution of Engineers (India), Indian Institute of Materials Management

Weapons development

6 Hours

Total: 30 Hours

Textbook

1. M. Govindarajan, S. Natarajan and V. S. Senthil Kumar, Engineering Ethics, PHI Learning Private Ltd, New Delhi, 2012.

References

1. Charles D. Fleddermann, Engineering Ethics, Pearson Education/ Prentice Hall of India , New Jersey, 2004.
2. Mike W. Martin and Roland Schinzinger, Ethics in Engineering, Tata McGraw Hill Publishing Company Pvt Ltd, New Delhi, 2003.
3. Charles E. Harris, Michael S. Protchard and Michael J. Rabins, Engineering Ethics – Concepts and Cases, Wadsworth Thompson Learning, United States, 2005.
4. http://www.slideworld.org/slidestag.aspx/human-values-and- Professional-ethics
5. www.mne.psu.edu/lamancusa/ProdDiss/Misc/ethics.ppt

ELECTIVE V

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ELECTIVE VI

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11C804 PROJECT WORK PHASE II

- - - 12.0

PROGRAMME OUTCOME (POs)

5. Able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability. 8. Able to function on multidisciplinary teams.
2. Able to identify, formulate and solve Civil Engineering problems in accordance with Indian Standard codes of practice.
7. Able to understand the role of Civil Engineers and ethical responsibility.
11. Able to perform economic analysis, labour/time/material management, construction schedules and activities related to design, construction, operations and maintenance of systems in the technical specializations of Civil Engineering.

11O10B BASIC ENGLISH I *

3 0 0 3.0

COURSE OBJECTIVES

- To offer students the basics of the English Language in a graded manner.
- To promote efficiency in English Language by offering extensive opportunities for the development of four language skills (LSRW) within the classroom.
- To give an intense focus on improving and increasing vocabulary.
- To improve Spelling and Pronunciation by offering students rigorous practice and exercises.

PROGRAMME OUTCOME (PO)

9. Able to deliver effective verbal, witten and graphical communications.

COURSE OUTCOMES (COs)

1. Listening
2. Reading
3. Writing
4. Speaking

PREREQUISITES:

Knowledge of English taught in High School

Unit I

Module	Vocabulary/ Grammar	Skills Sets	COURSE LEARNING OUTCOME (CLO)s
1	Basic words- 12 most used words in English, usage and pronunciation	Starting a conversation and talking about what one does	Sentence construction bolstered by mother tongue
2	Basic words- 20 oft used words, usage and pronunciation	Analysing an action plan	Creating and presenting one's own action plan
3	Basic words with a focus on spelling	Discriminative listening	Informal conversation
4	Basic words- 10 oft used words, usage and pronunciation	Content listening and Intonation	Reading comprehension
5	Tutorial		

Unit II

Module	Vocabulary/ Grammar	Skills Sets	COURSE LEARNING OUTCOME (CLO)s
6	Basic words + greetings to be used at different times of the day	Formal conversation	Intonation to be used in formal address
7	Last 28 of the 100 most used words	Informal conversation between equals	Reading practice and peer learning
8	Using the 14 target words to form bigger words	Informal dialogues using contracted forms	Guided speaking- talking to peers using contracted

* Subject to continuous assessment

			forms
9	Palindromes, greetings- good luck, festivals	Placing a word within its context- culling out meaning	Offering congratulations
10	Tutorial		

Unit III

Module	Vocabulary/ Grammar	Skills Sets	COURSE LEARNING OUTCOME (CLO)s
11	Homophones	Formal and informal methods of self-introduction	Let's Talk is a group activity that gives them some important pointers of speech
12	Homophone partners, matching words with their meanings	Contracted forms of the –be verbs, 've and 's	Translating English sentences to Tamil
13	Briefcase words- finding smaller words from a big word	Formal and informal ways of introducing others	Team work- speaking activity involving group work, soft skills
14	Compound words and pronunciation pointers	Giving personal details about oneself	Using the lexicon
15	Tutorial		

Unit IV

Module	Vocabulary/ Grammar	Skills Sets	COURSE LEARNING OUTCOME (CLO)s
16	Proper and common nouns	Asking for personal information and details	Pronunciation pointers- an informal introduction to the IPA
17	Pronouns	Telephone skills and etiquette	Reading aloud and comprehension
18	Abstract and common nouns	Dealing with a wrong number	Reading practice and comprehension
19	Group names of animals, adjectives	Taking and leaving messages on the telephone	Pronunciation pointers
20	Test		

Unit V

Module	Vocabulary/ Grammar	Skills Sets	COURSE LEARNING OUTCOME (CLO)s
21	Determiners	Interrupting a conversation politely- formal and informal	Pair work reading comprehension
22	Conjugation of the verb 'to be'- positive and negative forms	Thanking and responding to thanks	Comprehension questions that test scanning, skimming and deep reading
23	Am/is/are questions	Giving instructions and seeking clarifications	Small group activity that develops dialogue writing
24	Present continuous tense-form and usage	Making inquiries on the telephone	Finishing sentences with appropriate verbs
25	Tutorial		

Unit VI

Module	Vocabulary/ Grammar	Skills Sets	COURSE LEARNING OUTCOME (CLO)s
26	Words with silent 'b' Present continuous questions	Calling for help in an emergency	Dialogue writing
27	Words with silent 'c' Simple present tense- form and usage	Making requests and responding to them politely	Identifying elements of grammar in text extract
28	Simple present tense- rules	Describing people	Guided writing
29	Words with silent 'g' Questions in the simple present tense	Describing places	Filling in the blanks with correct markers of tense
30	Tutorial		

Total: 45 Hours

Resources

1. *Basic English Module*, L&L Education Resources, Chennai, 2011.

11O10C COMMUNICATIVE ENGLISH *

3 0 0 3.0

COURSE OBJECTIVES

- To equip students with effective speaking and listening skills in English
- To help the students develop speaking skills in Business English

PROGRAMME OUTCOME (PO)

9. Able to deliver effective verbal, written and graphical communications.

COURSE OUTCOME (CO)

1. Students will develop the fluency and language competence of learners of Business English at the lower intermediate level

Unit I

Grammar and Vocabulary

Vocabulary for describing different company structures and company hierarchy – Practice using *wh* – questions; *there is / there are*, Definitions of Quality, Vocabulary of quality management – Using nouns and adjectives to form group nouns – Phrases for offering and accepting help and invitations – Telephone terms – Verb tenses – Questions and responses – Conditionals – Gap Filling Exercises.

9 Hours

Unit II

Listening

Business Presentation – Conversation between old friends; introducing a stranger – A Quality Manager talks about his work – Conversation between acquaintances – Sales talk at a sports equipment stand – Small talk among colleagues – A tour of a factory in Italy – Lunch in the factory canteen – A meeting to improve the efficiency of internal communication – A phone conversation arranging to meet – A credit card salesman talks to the bank – A conversation between business acquaintances - A management meeting about a recent merger – A conversation about a town, a country and its people.

9 Hours

Unit III

Speaking

Pronunciation Practice – Describing organizations - A company presentation — Practicing of conversation starters and closers with friends and strangers – Practice of simple language and step – by – step procedures to describe complex ideas – Explaining visual information – The language of increase and decrease applied to graphs and bar charts - Presenting a work – related graph – Making a telephone call – A sports equipment buyer and a manufacturer's sales representative talk business – Entertaining a visitor in your country – A short marketing meeting – Negotiating to meet around a busy schedule – Pairs or small groups discuss the implications of problems at an electronics factory – Finding out all you can about a partner – Chairing and holding meetings – Pairwork on questions and answers about places and people.

9 Hours

Unit IV

Reading

Signalling the structure of a presentation – introducing, sequencing and concluding a talk - Explaining concepts and ideas – The pattern of phone call conversations – Giving, getting and checking information – Common Business phrases – Giving encouragement: phrases for positive feedback; more emphatic adjectives and adverbs – Giving facts and explaining functions and processes – Asking for and clarifying information – How to state your point, agree and disagree – Practice of frequency, quantity and number - A short marketing meeting – Suggesting and agreeing times and places – Phrases for the Chairperson – People at work: their emotions, skills and attitudes.

9 Hours

* Subject to continuous assessment

Unit V

Writing

Making conditions using the present and future conditional Phrases for stalling for time - Common telephone phrases and responses - Business Communication – Calling for Quotation – Letter asking for Clarification – Transcoding – Rearranging the sentences – Cloze – Explaining visual information – Explaining concepts and ideas – Giving, getting and checking information – Business description – Informal negotiations.

9 Hours

Total: 45 Hours

Textbook

1. Jeremy Comfort, Pamela Rogerson, Trish Stott, and Derek Utley, *Speaking Effectively – Developing Speaking Skills for Business English*, Cambridge University Press, Cambridge, 2002.

References

1. Brook-Hart Guy, *BEC VANTAGE: BUSINESS BENCHMARK Upper-Intermediate – Student's Book*, Cambridge University Press, New Delhi, 2006.
2. Aruna Koneru, *Professional Communication*, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2008.
3. P. Kiranmai Dutt, Geetha Rajeevan and CLN Prakash, *A Course in Communication Skills*, Cambridge University Press, New Delhi, 2008.
4. Krishna Mohan Balaji, *Advanced Communicative English*, Tata McGraw-hill Education Private Limited, New Delhi, 2009.

11O20B BASIC ENGLISH II *

3 1 0 3.5

COURSE OBJECTIVES

- To promote fluency even downplaying accuracy
- A tacit acquisition of Basic English Grammar through ample listening, reading and writing inputs with direct theory or wherever relevant
- Specific focus on speaking and conversation skills with an aim to increase speaking confidence
- To nurture the capacity to express lucidly and articulate their thoughts and impressions on a wide gamut of topics both through speaking and writing
- To improve spelling and pronunciation by offering rigorous practice and exercises
- To correct common mistakes and to teach self-assessment techniques

PROGRAMME OUTCOME (PO)

9. Able to deliver effective verbal, written and graphical communications.

COURSE OUTCOMES (COs)

1. Listening
2. Reading
3. Writing
4. Speaking

PREREQUISITES:

Knowledge of English I

Unit I

Module	*Vocabulary/ Grammar*	*Skills Sets*	*COURSE LEARNING OUTCOME (CLO)s*
31	Difference between present continuous and simple present tense.	Calling for help in an emergency	Reporting an event- journalistic style
32	Verbs 'have' and 'have got'	Describing animals	Asking for and giving directions
33	Simple past tense	Inviting people, accepting and declining invitations	Self- enquiry and offering ones opinion on a given topic.
34	Spelling rules & table of irregular verbs	Refusing an invitation	Reading and practicing pre-written dialogues
35	Tutorial		

Unit II

Module	*Vocabulary/ Grammar*	*Skills Sets*	*COURSE LEARNING OUTCOME (CLO)s*
36	Questions and the negative forms of the simple past tense	Apologizing and responding to an apology	(Reading) conversation practice
37	Asking questions in the simple past tense	Reading comprehension	Seeking, granting and refusing permission.

* Subject to continuous assessment

38	Past continuous tense	Paying compliments and responding to them	Pair work: writing dialogues and presenting them
39	Difference between simple past and past continuous- when and where to use each	Describing daily routines	Reading and comprehension skills.
40	Tutorial		

Unit III

Module	*Vocabulary/ Grammar*	*Skills Sets*	*COURSE LEARNING OUTCOME (CLO)s*
41	Simple future tense	Talking about the weather	Making plans- applying grammar theory to written work
42	Simple future tense- more aspects, possessive pronouns	Talking about possessions	Opening up and expressing one's emotions
43	Future continuous	Talking about current activities	Listening comprehension
44	Revision of future tense- simple and continuous forms, prepositions used with time and date	Asking for the time and date	Discussion- analyzing and debating a given topic.
45	Tutorial		

Unit IV

Module	*Vocabulary/ Grammar*	*Skills Sets*	*COURSE LEARNING OUTCOME (CLO)s*
46	Articles a/an	Writing, speaking and presentation skills	Transcribing dictation
47	Singular- Plural (usage of a/an)	Reading practice- independent and shared reading	Comprehension –logical analysis, process analysis and subjective expression
48	Countable and uncountable nouns- a/an and some	Listening comprehension	Vocabulary: using context tools to decipher meaning
49	Articles- the	Sequencing sentences in a paragraph	Listening to a poem being recited, answer questions on it and practice reciting the same
50	Tutorial		

Unit V

Module	*Vocabulary/ Grammar*	*Skills Sets*	*COURSE LEARNING OUTCOME (CLO)s*
51	Articles- the: usage and avoidance	Speaking: sharing stories about family, village/town, childhood etc. 10 students	Listening: comprehend and follow multiple step instructions read out by the teacher
52	Articles- the: usage and avoidance with like and hate	Speaking: sharing stories about family, village/town, childhood etc.- 10 students	Reading: make inferences from the story about the plot, setting and characters

53	Articles- the: usage and avoidance with names of places	Speaking: sharing stories about family, village/town, childhood etc.- 10 students	Comprehension passage
54	This/ that/ these and those	Writing a notice-announcement	Speaking: Debate
55	Tutorial		

Unit VI

Module	*Vocabulary/ Grammar*	*Skills Sets*	*COURSE LEARNING OUTCOME (CLO)s*
56	One and ones	Collaborative learning-problem solving	Writing short answers to questions based on reading
57	Capitalization and punctuation	Controlled writing	Listen to a story and respond to its main elements
58	Syntax and sentence construction- rearrange jumbled sentences	Guided writing	Listen to a poem and discuss its elements
59	Cloze	Free writing	Frame simple yet purposeful questions about a given passage
60	Tutorial		

45 + 15 Hours

Resource

1. Basic English Module, L&L Education Resources, Chennai, 2011.

11O20C ADVANCED COMMUNICATIVE ENGLISH*

3 1 0 3.5

COURSE OBJECTIVES)

- To take part in a discussion in an effective manner
- To listen to an explanation and respond
- To write a formal communication
- To read company literature or any document

PROGRAMME OUTCOME (PO)

9. Able to deliver effective verbal, written and graphical communications.

COURSE OUTCOMES (COs)

1. Read graphs and charts
2. Skim and scan texts like job adverts
3. Read business articles for specific information

* Subject to continuous assessment

4. Understand the structure of a text

PREREQUISITES:

Knowledge of Communicative English

Unit I

Grammar and Vocabulary

Comparison of adjectives and adverbs – tenses – simple and complex questions – countable/ uncountable nouns, *-ing* forms and infinitives – conditionals – comparing and contrasting ideas – modal verbs – *while and whereas* for contrasting ideas – passives – used to, articles, reported speech, relative pronouns and expressing cause and result – workplace-related vocabulary.

9 Hours

Unit II

Listening

Prediction - the ability to identify information – ability to spell and write numbers correctly – ability to infer, understand gist, topic, context, and function, and recognize communicative functions (complaining, greeting, apologizing, etc.) – ability to follow a longer listening task and interpret what the speakers say.

9 Hours

Unit III

Speaking

The ability to talk about oneself and perform functions such as agreeing and disagreeing – ability to express opinions, agree, disagree, compare and contrast ideas and reach a decision in a discussion – appropriate use of stress, rhythm, intonation and clear individual speech sounds - take an active part in the development of the discourse - turn-taking and sustain the interaction by initiating and responding appropriately.

9 Hours

Unit IV

Reading

The ability to skim and scan business articles for specific details and information – To understand the meaning and the structure of the text at word, phrase, sentence, and paragraph level – ability to read in detail and interpret opinions and ideas – to develop one's understanding and knowledge of collocations – ability to identify and correct errors in texts.

9 Hours

Unit V

Writing

The ability to write concisely, communicate the correct content and write using the correct register – ability to write requests, instructions, explanations, and ask for information by using the correct format in business correspondences like charts, memo, note, email, letter, fax, report, proposal – understanding formal and informal styles – responding to written or graphic input.

9 Hours

Total: 45 + 15 Hours

Textbook

1. Brook-Hart, Guy, *Business Benchmark: Upper Intermediate* – Student's Book, Cambridge University Press, New Delhi, 2006.

References

1. Whitby, Norman, *Bulats Edition: Business Benchmark,* Pre-Intermediate to Intermediate – Student's Book, Cambridge University Press, New Delhi, 2006.
2. Cambridge Examinations Publishing, *Cambridge BEC Vantage* – Self-study Edition, Cambridge University Press, UK, 2005.

11O20G GERMAN *

3 1 0 3.5

COURSE OBJECTIVES

- To help students acquire the basics of German language
- To teach them how to converse in German in various occasions

PROGRAMME OUTCOME (PO)

9. Able to deliver effective verbal, written and graphical communications.

COURSE OUTCOMES (COs)

1. Listening
2. Reading
3. Writing
4. Speaking

Unit I

Grammar & Vocabulary

Introduction to German language: Alphabets, Numbers – Nouns - Pronouns Verbs and Conjugations - definite and indefinite article - Negation - Working with Dictionary – Nominative - Accusative and dative case – propositions - adjectives - modal auxiliaries - Imperative case - Possessive articles.

9 Hours

Unit II

Listening

Listening to CD supplied with the books, paying special attention to pronunciation: Includes all lessons in the book – Greetings - talking about name – country – studies – nationalities - ordering in restaurants - travel office - Interaction with correction of pronunciation.

9 Hours

Unit III

Speaking

Speaking about oneself - about family – studies - questions and answers - dialogue and group conversation on topics in textbooks - talks on chosen topics.

9 Hours

Unit IV

Reading

Reading lessons and exercises in the class - pronunciation exercises: Alphabet – name – country – people – profession – family – shopping – travel – numbers – friends – restaurant – studies - festivals

9 Hours

Unit V

Writing

Alphabets – numbers - words and sentences - Exercises in the books - control exercises - writing on chosen topics such as one self – family – studies - country.

9 Hours

Total: 45 + 15 Hours

Textbooks

1. Grundkurs *DEUTSCH A Short Modern German Grammar Workbook and Glossary*, *VERLAG FUR DEUTSCH*, Munichen, 2007.
2. Grundkurs, *DEUTSCH* Lehrbuch Hueber Munichen, 2007.

* Subject to continuous assessment

References

1. *Cassel Language Guides – German*: Christine Eckhard – Black & Ruth Whittle, Continuum, London / New York, 1992.
2. Kursbuch and Arbeitsbuch, *TANGRAM AKTUELL 1 DEUTSCH ALS FREMDSPRACHE, NIVEAUSTUFE AI/1*, Deutschland, Goyal Publishers & Distributers Pvt. Ltd., New Delhi, 2005.
3. *Langenscheidt Eurodictionary* – German – English / English – German, Goyal Publishers & Distributers Pvt. Ltd., New Delhi, 2009.

11O20J JAPANESE *

3 1 0 3.5

COURSE OBJECTIVES

- To help students acquire the basics of Japanese language
- To teach them how to converse in Japanese in various occasions
- To teach the students the Japanese cultural facets and social etiquettes

PROGRAMME OUTCOME (PO)

9. Able to deliver effective verbal, written and graphical communications.

COURSE OUTCOMES (COs)

1. Listening
2. Reading
3. Writing
4. Speaking

Unit I

Introduction to Japanese - Japanese script - Pronunciation of Japanese(Hiragana) - Long vowels - Pronunciation of in,tsu,ga - Letters combined with ya,yu,yo - Daily Greetings and Expressions - Numerals. N1 wa N2 des - N1 wa N2 ja arimasen - S ka - N1mo - N1 no N2 - …….san - Kanji - Technical Japanese Vocabulary (25 Numbers)

9 Hours

Unit II

Introduction - Kore - Sore - are - Kono N1 - Sono N1 - ano N1 - so des - so ja arimasen - S1 ka - S2 ka - N1 no N1 - so des ka – koko - soko - asoko - kochira - sochira - achira - N1 wa N2 (Place) des – dhoko-N1 no N2 - Kanji-10 - ima….ji…fun des - Introduction of verb - V mas - V masen - V mashitha - V masen deshitha - N1(Time) ne V - N1 kara N2 des - N1 tho N2 / S ne Kanji-10 - Technical Japanese Vocabulary (25 Numbers) – Dictionary Usage.

9 Hours

Unit III

- N1(Place) ye ikimas - ki mas - kayerimasu - Dhoko ye mo ikimasen - ikimasendheshitha - N1(vehicle) de ikimasu - kimasu - kayerimasu - N1(Personal or Animal) tho V ithsu - S yo. - N1 wo V (Transitive) - N1 wo shimus - Nani wo shimasu ka - Nan & Nani - N1(Place) de V - V masen ka - V masho - Oo……. Kanji-10 , N1(tool - means) de V - " Word / Sentence " wa …go nan des ka - N1(Person) ne agemus - N1(Person) ne moraimus - mo V shimashitha - , Kanji-10 – Japanese Typewriting using JWPCE Software, Technical Japanese Vocabulary (25 Numbers)

9 Hours

Unit IV

Introduction to Adjectives - N1 wa na adj des. N1 wa ii adj des - na adj na N1 - ii adj ii N1 - Thothemo - amari - N1 wa dho des ka - N1 wa dhonna N2 des ka - S1 ka S2 – dhore - N1 ga arimasu - wakarimasu - N1 ga suki

* Subject to continuous assessment

masu - N1 ga kiraimasu - jozu des - hetha des - dhonna N1 - Usages of yoku - dhaithai - thakusan - sukoshi - amari - zenzen - S1 kara S2 - dhoshithe, N1 ga arimasu - imasu - N1(Place) ne N2 ga arimasu - iimasu - N1 wa N2(Place) ne arimasu - iimasu - N1(Person,Place,or Thing) no N2 (Position) - N1 ya N2, Kanji-10 - Japanese Dictionary usage using JWPCE Software, Technical Japanese Vocabulary (25 Numbers)

9 Hours

Unit V

Saying Numbers , Counter Suffixes , Usages of Quantifiers -Interrogatives - Dhono kurai - gurai – Quantifier-(Period) ne ….kai V - Quantifier dhake / N1 dhake Kanji - Past tense of Noun sentences and na Adjective sentences - Past tense of ii-adj sentences - N1 wa N2 yori adj des - N1 tho N2 tho Dhochira ga adj des ka and its answering method - N1 [no naka] de {nani/dhoko/dhare/ithsu} ga ichiban adj des ka - answering -N1 ga hoshi des - V1 mas form dhake mas - N1 (Place) ye V masu form ne iki masu/ki masu/kayeri masu - N1 ne V/N1 wo V - Dhoko ka - Nani ka – gojumo - Technical Japanese Vocabulary (25 Numbers)

9Hours

Total: 45 + 15 Hours

Textbooks

1. *Japanese for Everyone: Elementary Main Textbook 1-1*, Goyal Publishers and Distributors Pvt. Ltd., Delhi, 2007.
2. *Japanese for Everyone: Elementary Main Textbook 1-2*, Goyal Publishers and Distributors Pvt. Ltd., Delhi, 2007.

References

Software

1. Nihongo Shogo-1
2. Nihongo Shogo-2
3. JWPCE Software

Websites

1. www.japaneselifestyle.com
2. www.learn-japanese.info/
3. www.kanjisite.com/
4. www.learn-hiragana-katakana.com/typing-hiragana-characters/

11O20F FRENCH *

3 1 0 3.5

COURSE OBJECTIVES

- To help students acquire the basics of French language
- To teach them how to converse in French in various occasions

PROGRAMME OUTCOME (PO)

9. Able to deliver effective verbal, written and graphical communications.

COURSE OUTCOMES (COs)

1. Listening
2. Reading
3. Writing
4. Speaking

Unit I

Alphabet Français (alphabets) - Les accents français (the accents in French) – aigu – grave – circonflexe – tréma - cédille - écrire son nom dans le français (spelling one's name in French)

9 Hours

Unit II

Les noms de jours de la semaine (Days of the week) - Les noms de mois de l'année (Months) - numéro 1 à 100 (numbers 1 to 100)

9 Hours

Unit III

Moyens de transport (transport) - noms de professions (professions) - noms d'endroits communs (places) - nationalités (nationalities)

9 Hours

Unit IV

Pronoms (pronouns) - Noms communs masculins et de femme (common masculine and feminine nouns) - Verbes communs (common verbs)

9 Hours

Unit V

Présentation - même (Introducing Oneself) - narration de son nom - l'endroit où on vit - son âge - date de naissance - sa profession - numéro de téléphone - adresse (name - where one lives – age - date of birth – profession - telephone number and address) - Narration du temps (tellling the time)

9 Hours

Total: 45+15 Hours

Textbook

1. Angela Wilkes, *French for Beginners*, Usborne Language Guides, Usborne Publishing Ltd., Ohio, 1987.

References

1. Ann Topping, *Beginners French Reader*, Natl Textbook Co, 1975.
2. Stanley Applebaum, *First French Reader*, Dover Publications, 1998.
3. Max Bellancourt, *Cours de Français*, London: Linguaphone, 2000.

Software

1. Français Linguaphone, Linguaphone Institute Ltd., London, 2000.
2. Français I. Harrisonburg: The Rosetta Stone: Fairfield Language Technologies, 2001.

* Subject to continuous assessment

11O20H HINDI *

3 1 0 3.5

COURSE OBJECTIVES

- To help students acquire the basics of Hindi
- To teach them how to converse in Hindi in various occasions
- To help learners acquire the ability to understand a simple technical text in Hindi

PROGRAMME OUTCOME (PO)

9. Able to deliver effective verbal, witten and graphical communications.

COURSE OUTCOMES (COs)

1. Listening
2. Reading
3. Writing
4. Speaking

Unit I

Hindi Alphabet

Introduction - Vowels - Consonants - Plosives - Fricatives - Nasal sounds - Vowel Signs - Chandra Bindu & Visarg -Table of Alphabet -Vocabulary.

9 Hours

Unit II

Nouns

Genders (Masculine & Feminine Nouns ending in – ā,i,ī, u,ū)- Masculine & Feminine – Reading Exercises.

9 Hours

Unit III

Pronouns and Tenses

Categories of Pronouns - Personal Pronouns - Second person (you & honorific) - Definite & Indefinite pronouns - Relative pronouns - Present tense - Past tense - Future tense - Assertive & Negative Sentences - Interrogative Sentences.

9 Hours

Unit IV

Classified Vocabulary

Parts of body – Relatives – Spices – Eatables – Fruit & Vegetables - Clothes - Directions – Seasons - Professions.

9 Hours

Unit V

Speaking

Model Sentences – Speaking practice for various occasions.

9 Hours

Total: 45+15 Hours

Textbook

1. B. R. Kishore, *Self Hindi Teacher for Non-Hindi Speaking People*, Vee Kumar Publications (P) Ltd., New Delhi, 2009.

References

1. Syed, *Prayojan Mulak Hindi*, Rahamathullah Vani Prakasan, New Delhi, 2002.
2. Ramdev, *Vyakaran Pradeep*, Saraswathi Prakasan, Varanasi, 2004.

* Subject to continuous assessment

11C001 MUNICIPAL SOLID WASTE MANAGEMENT

3 0 0 3.0

COURSE OBJECTIVES

- To provide basic knowledge on the management practices of municipal solid waste
- To emphasize the need for municipal solid waste management
- To provide basic knowledge on the storage, treatment and processing techniques of municipal waste, and on the process of land filling and incineration.

PROGRAMME OUTCOMES (POs)

2. Able to identify, formulate and solve Civil Engineering problems in accordance with Indian Standard codes of practice.
7. Able to understand the role of Civil Engineers and ethical responsibility.

COURSE G OUTCOMES (COs)

1. Demonstrate the procedure for municipal solid waste
2. Identify the methods to collect, convey and disposal of municipal solid waste

PREREQUISITES:

Knowledge of Waste Water treatment

ASSESSMENT PATTERN

Sl. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	30	30	30	30
2	Understand	30	30	30	30
3	Apply	40	40	40	40
4	Analyze / Evaluate	-	-	-	-
5	Create	-	-	-	-
	Total	**100**	**100**	**100**	**100**

Unit I
Introduction

Solid wastes – Definition - Scope and importance – Land Pollution – Functional elements of solid waste management – Quantity assessment – Generation rate – Factors affecting sources – Methods of sampling – characterization – Effects of improper disposal of solid wastes – Public health effects – Social and economic aspects – Role of NGOs – Legislation.
Public awareness

9 Hours

Unit II
On – Site Storage and Processing

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks

On-site storage methods – Materials used for containers – On-site segregation of solid wastes – Public and economic aspects of storage options under Indian conditions – Critical evaluation options collection and transportations systems of collection - Collection equipment - Garbage chutes - Transfer stations – Bailing and compacting - Route optimization - Classification and characteristics – Municipal - Industrial waste disposal.
Hospital/biomedical

9 Hours

Unit III

Treatment and Processing Techniques

Components of separation - Volume reduction - Size reduction - Chemical reduction and biological processing - Disposal methods - open dumping – Selection of site - Ocean disposal - Feeding to hog – Incineration - Pyrolysis - Composting - Sanitary land filling – Merits and demerits.
Effect of Ocean disposal

9 Hours

Unit IV

Sanitary Land Filling

Definition –Methods - Trench area - Ramp and pit method - Site selection - Basic steps involved - Cell design - Prevention of site pollution - Leachate collection and control methods - Gas collection systems - Composting – Biological method aerobic and anaerobic composting – Factors affecting composting – Indore and Bangalore processes - Mechanical and semi mechanical composting processes - Vermi-composting.
Effect of Leachate in ground water table

9 Hours

Unit V

Incineration

Processes – 3 T's - Factors affecting incineration process - Incinerators – Types – Prevention of air pollution - Recycle and reuse material and energy recovery operations - Reuse in other industries - Plastic wastes - Environmental significance and reuse.
Case study of Recycle and reuse material

9 Hours
Total: 45 Hours

Textbook

1. P. Sincero and A. Sincero, *Environmental Engineering,* PHI Learning Pvt. Ltd., 2010

References

1. C. Bhatia, *Solid and Hazardous Waste Management,* Atlantic Publishers, 2007
2. K. Sasiikumar and Sanoop Gopi Krishna , *Solid Waste Management*, PHI Learning Pvt. Ltd., 2009

11C002 SOLID AND LIQUID INDUSTRIAL WASTE MANAGEMENT

3 0 0 3.0

COURSE OBJECTIVES

- To provide basic knowledge on the management practices of solid and liquid waste
- To impart knowledge on the collection, transport and disposal of solid waste
- To emphasize the need for solid and liquid waste management

PROGRAMME OUTCOMES (POs)

2. Able to identify, formulate and solve Civil Engineering problems in accordance with Indian Standard codes of practice.
7. Able to understand the role of Civil Engineers and ethical responsibility.

COURSE OUTCOMES (COs)

1. Demonstrate the procedure for solid and liquid industrial waste
2. Identify the methods to collect, convey and for the disposal of municipal solid waste

PREREQUISITES:

Knowledge of Water Supply Engineering , Waste water treatment and Environmental Science

ASSESSMENT PATTERN

Sl. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	30	30	30	30
2	Understand	30	30	30	30
3	Apply	40	40	40	40
4	Analyze / Evaluate	-	-	-	-
5	Create	-	-	-	-
Total		**100**	**100**	**100**	**100**

Unit I

Introduction

Types of industries and industrial pollution - Characteristics of industrial wastes - Population equivalent - Bioassay studies - sewer- land - sewage treatment plants and human health - Environmental legislations related to prevention and control of industrial effluents - Waste management Approach - Waste Audit -Volume and strength reduction - Material and process modifications - Recycle - reuse and byproduct recovery - Applications.
Effects of industrial effluents on streams

9 Hours

Unit II

Pollution from Major Industries

Sources - Characteristics - waste treatment flow sheets for selected industries such as Textiles - Tanneries- Pharmaceuticals- Electroplating industries - Dairy - Sugar - Paper - distilleries - Steel plants- Refineries -

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks

fertilizer - thermal power plants - Wastewater reclamation concepts - Equalization – Neutralization – Removal of suspended and dissolved organic solids - Chemical oxidation - Adsorption - Removal of dissolved inorganic - Combined treatment of industrial and municipal wastes - Residue management - Dewatering - Disposal.
Field visit

9 Hours

Unit III

Solid Waste Management

Legal and organizational foundation - Definition of solid waste - waste generation in a technological society - major legislation - monitoring responsibilities - sources and types of solid waste - Sampling and characterization - Determination of composition of MSW - Storage and handling of solid waste.
Future changes in waste composition.

9 Hours

Unit IV

Collection and Transport of Solid Waste

Unit operations used for separation and processing - Materials Recovery facilities - Waste transformation through combustion and anaerobic composting - anaerobic methods for materials recovery and treatment - Energy recovery - Incinerator need for transfer operation- transport means and methods - transfer station types and design requirements - Landfills - Site selection- design and operation - drainage and leachate collection systems - requirements and technical solutions - designated waste landfill remediation.
Effect of landfill method

9 Hours

Unit V

Disposal of Solid Waste

Industry specific solid waste management - Agriculture - Process Industry - Mineral and Metallurgical industry - Disposal of industrial and mill tailings - Resource and energy recovery: Recycling of solid waste.
Integrated waste management.

9 Hours
Total: 45 Hours

Textbooks

1. S. K. Garg, *Sewage Disposal and Air Pollution Engineering*, Khanna Publishers, New Delhi. 2001
2. P. Aarne Vesilind, William A Worrel and Debra R Reinhart, *Solid Waste Engineering*, Thomson Brooks/Cole, 2002

References

1. P. Arcadio Sincero and A. Gregoria Sincero, *Environmental Engineering A Design Approach*, Prentice Hall India, 1996
2. George Tchobanoglous and Hilary Theisen, *Integrated Solid Waste Management*, McGraw Hill Publishers, New Delhi.

11C003 HAZARDOUS WASTE MANAGEMENT AND SITE REMEDIATION

3 0 0 3.0

COURSE OBJECTIVES

- To provide basic knowledge on the theory and management practices of hazardous waste
- To impart knowledge on treatment methods of hazardous waste
- To emphasize the need for hazardous waste management

PROGRAMME OUTCOMES (POs)

2. Able to identify, formulate and solve Civil Engineering problems in accordance with Indian Standard codes of practice.
6. Able to work on the basis of broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context.

COURSE OUTCOMES (COs)

1. Identify the best treatment method for hazardous waste management
2. Capability to manage e-waste disposal

PREREQUISITES:

Knowledge of Environmental Science

ASSESSMENT PATTERN

Sl. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	30	30	30	30
2	Understand	30	30	30	30
3	Apply / Evaluate	40	40	40	40
4	Analyze	-	-	-	-
5	Create	-	-	-	-
	Total	**100**	**100**	**100**	**100**

Unit I

Introduction

Impact of hazardous waste on health and society - Basics of hazardous waste management - Waste generation and quantification - Hazardous characteristics - Classification of hazardous waste

Control of hazardous waste

9 Hours

Unit II

Treatment Methods

Treatment methods – Neutralization – Oxidation – Reduction – Precipitation – Solidification and stabilization – Incineration

Control of radioactive pollution

9 Hours

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks

Unit III

Disposal of Hazardous Wastes

Final disposal of radioactive wastes – Risk assessment – Carcinogenesis – Dose - Response assessment - Risk exposure assessment

Safe disposal techniques

9 Hours

Unit IV

Biomedical and Plastic Wastes

Biomedical wastes: Definition – Source and generation of biomedical waste-Biomedical waste management. Plastic waste: Dangers of plastic waste – Recycling of plastic waste

Disposal of plastic waste

9 Hours

Unit V

E-Waste

Introduction – Health hazards – E-waste management - Recycle of electronic materials – Disposal of e-waste

Case studies

9 Hours

Total: 45 Hours

Textbook

1. P. Sincero and A. Sincero, *Environmental Engineering,* PHI Learning Pvt. Ltd., 2010

References

1. C. Bhatia, *Solid and Hazardous Waste Management,* Atlantic Publishers, 2007
2. K. Sasikumar and Sanoop Gopi Krishna , *Solid Waste Management*, PHI Learning Pvt. Ltd., 2009

11C004 ENVIRONMENTAL IMPACT ASSESSMENT

3 0 0 3.0

COURSE OBJECTIVES

- To emphasize the need for EIA.
- To provide basic knowledge on the components, methods and quality control measures of EIA
- To make the students understand the importance of documentation and monitoring of EIA along with case studies.

PROGRAMME OUTCOMES (POs)

2. Able to identify, formulate and solve Civil Engineering problems in accordance with Indian Standard codes of practice
6. Able to work on the basis of broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context.
7. Able to understand the role of Civil Engineers and ethical responsibility.
11. Able to perform economic analysis, labour/time/material management, construction schedules and activities related to design, construction, operations and maintenance of systems in the technical specializations of Civil Engineering

COURSE OUTCOMES (COs)

1. Demonstrate the legal and regularity aspects of EIA in India
2. Evaluate the EIA practice

PREREQUISITES:

Knowledge of Environmental Science, Water Supply Engineering and Waste water treatment

ASSESSMENT PATTERN

Sl. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	30	30	30	30
2	Understand	30	30	30	30
3	Apply / Evaluate	40	40	40	40
4	Analyze	-	-	-	-
5	Create	-	-	-	-
	Total	**100**	**100**	**100**	**100**

Unit I

Introduction

Environmental Impact Assessment (EIA) - Environmental Impact Statement (EIS) - Environmental Risk Assessment (ERA) - Legal and Regulatory aspects in India - Types and limitations of EIA - - Issues in EIA - National - Cross sectoral - Social and cultural

Terms of Reference in EIA

8 Hours

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks

Unit II

Components and Methods

Components - Screening - Setting - Analysis - Prediction of impacts – Mitigation - Matrices - Networks – Checklists - Importance assessment techniques - Cost benefit analysis - Analysis of alternatives - Methods for Prediction and assessment of impacts - Air - Water - Soil - Noise - Biological - Cultural - Social - Economic environments - Standards and guidelines for evaluation - Public Participation in environmental decision making
Questionnaires for decision making

20 Hours

Unit III

Quality Control

Trends in EIA practice and evaluation criteria - Capacity building for quality assurance - Expert System in EIA - *Use of regulations*

6 Hours

Unit IV

Documentation and Monitoring

Document planning - Collection and organization of relevant information - Use of visual display materials – Team writing - Reminder checklists - Environmental monitoring - Guidelines - Policies - Planning of monitoring programmes - Environmental Management Plan
Post project audit **6 Hours**

Unit V

Case Studies

Case studies of EIA of developmental projects
Case study

5 Hours
Total: 45 Hours

Textbook

1. L. W. Canter, *Environmental Impact Assessment*, McGraw Hill, New York, 1996.

References

1. J. Petts, Handbook *of Environmental Impact Assessment Vol. I and II*, Blackwell Science, London, 1999.
2. The World Bank Group, *Environmental Assessment Sourcebook Vol. I, II and III*, The World Bank, Washington, 1991.

11C005 GROUND IMPROVEMENT TECHNIQUES

3 0 0 3.0

COURSE OBJECTIVES

- To introduce engineering principles of ground modification, grouting and improvement techniques.
- To impart knowledge on the design methods of ground improvement.
- To enhance knowledge on different tests to be carried out on soils.

PROGRAMME OUTCOMES (POs)

3. Able to design and conduct experiments, as well as to analyze and interpret data.
4. Able to use the techniques, skills and modern Civil Engineering tools necessary for engineering practice.
5. Able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.

COURSE OUTCOME (CO)

1. Select suitable ground improvement techniques to improve soil properties for structures.

PREREQUISITES:

Knowledge of Soil Mechanics

ASSESSMENT PATTERN

Sl. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	20	20	20	20
2	Understand	40	40	40	40
3	Apply	40	40	40	40
4	Analyze	-	-	-	-
5	Create	-	-	-	-
Total		**100**	**100**	**100**	**100**

Unit I

Ground Water Lowering and Drainage Techniques

Overview of: Design input parameters: existing ground water level and fluctuations – Zone of groundwater lowering – Permeability – Transmissibility – Storage capacity – Flow nets and estimation.

Construction of dewatering and permanent dewatering

9 Hours

Unit II

Underpinning

Basic principles of underpinning – Grouping – Requirements - Shoring and temporary support – Grillages – Design considerations for underpinning – Slurry walls in lieu of underpinning – Pre founded columns –

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks.

Intermittent lateral underpinning – Element wall underpinning.
Conventional underpinning techniques

9 Hours

Unit III

Grouting

Grouting: Hydrofracture grouting – Compaction grouting – Permeation grouting – Cost considerations - Jet grouting – Applications: Vertical/Sub vertical and Horizontal/Sub horizontal – Design aspects – Selection of grout – Selection of jet grout parameters with respect to soil types – Characteristics of jet grouted soils.
Preliminary site investigation and testing

9 Hours

Unit IV

Soil Compaction and Consolidation

Introduction:– Preloading – Consolidation drainage – Compaction grouting– Stone columns – Consolidation of Fine grained soils – Deformation of cohesionless soils – Design considerations.
Conventional compaction – Vibrocompaction

9 Hours

Unit V

Miscellaneous Topics

Geotechnical verification testing – Performance monitoring – Optical survey techniques – Settlement plates and Deep settlement markers – Peizometers.
Standard penetration tests (SPT) – Cone penetration tests (CPT)

9Hours
Total: 45 Hours

Textbook

1. Petros P. Xanthakos, Lee W. Abramson and Donald A. Bruce, *Ground Control and Improvement,* John Willey & Sons Inc., 1994

References

1. Hsai Yang Fang, *Foundation Engineering Handbook,* Van Nostrand Reinhold, NY, 1991
2. M. R. Hausman, *Engineering Principles of Ground Modification,* McGraw Hill Book Co., Singapore, 1990

11C006 EARTH RETAINING STRUCTURES

3 0 0 3.0

COURSE OBJECTIVES

- To introduce various theories of earth pressure
- To impart a clear understanding on the design considerations of earth retaining structures
- To impart a fundamental knowledge on the analysis and design of rigid, flexible and reinforced earth retaining structures and deep cuts.

PROGRAMME OUTCOMES (POs)

1. Able to apply the fundamental knowledge of mathematics, science and engineering.

COURSE OUTCOMES (COs)

1. Select a suitable earth retaining structure based for a given soil condition.
2. Design of Earth retaining structures.

PREREQUISITES:

Knowledge of Design of RCC elements and Structures

ASSESSMENT PATTERN

Sl. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	25	25	25	25
2	Understand	25	25	25	25
3	Apply/ Evaluate	50	50	50	50
4	Analyze	-	-	-	-
5	Create	-	-	-	-
Total		**100**	**100**	**100**	**100**

Unit I

Theories of Earth Pressure

Introduction - State of stress in retained soil mass - Earth pressure theories - Classical and graphical techniques - Active, passive and at rest cases, empirical methods - Wall movement and complex geometry.

Earth pressure due to external loads

9 Hours

Unit II

Compaction, Drainage and Stability Considerations

Retaining structure - Selection of soil parameters - Strain softening - Wall flexibility - Earth pressure due to earthquake forces - Stability of retaining structure - Design of cantilever and counterfort retaining wall.

Lateral pressure due to compaction- Influence of drainage

9 Hours

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks.

Unit III

Sheet Pile Walls and Cofferdam

Lateral pressure on sheeting in braced excavation - Analysis and design of cantilever and anchored sheet pile walls - Deadman and continuous anchor. Cofferdam: design in rock and soil strata.

Types of sheet pile walls – Types of cofferdam

9 Hours

Unit IV

Supported Excavations and Conduits

Stability against piping and bottom heaving - Earth pressure around tunnel lining, Soil arching, shaft and silos - Soil anchors - Under pinning - Soil nailing - Basic design concepts. Conduits - action of surface loads on conduits.

Types and construction of conduit

9 Hours

Unit V

Slurry Supported Trenches

Stability analysis and design - Specification of slurry.

Basic principles - Diaphragm and bored pile walls

9 Hours

Total: 45 Hours

Textbooks

1. Gopal Ranjan and A. S. R. Rao, *Basic and Applied Soil Mechanics*, New Age International, 2000
2. B. M. Das, *Principles of Geotechnical Engineering*, The PWS Series in Civil Engineering, 1998

References

1. J. E. Bowles, *Foundation Analysis and Design*, TMI, 1998
2. Swami Saran, *Analysis and Design of Substructures*, Oxford & IBH Publishing Company Pvt. Ltd., 2006
3. R. W. Day, *Geotechnical and Foundation Engineering: Design and Construction*, McGraw Hill, 1999

11C007 MACHINE FOUNDATION

3 0 0 3.0

COURSE OBJECTIVES

- To enhance the knowledge on structural dynamics
- To introduce the principles of construction of machine foundations.
- To impart knowledge on the construction of machine foundations

PROGRAMME OUTCOMES (POs)

1. Able to apply the fundamental knowledge of mathematics, science and engineering.
2. Able to identify, formulate and solve Civil Engineering problems in accordance with Indian Standard codes of practice.
5. Able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.

COURSE OUTCOMES (COs)

1. Select a suitable type of foundation.
2. Design and analysis of machine foundation system.

PREREQUISITES:

Knowledge of Soil Mechanics and Foundation Engineering

ASSESSMENT PATTERN

Sl. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	25	25	25	25
2	Understanding	25	25	25	25
3	Apply	50	50	30	30
4	Analyze / Evaluate	-	-	-	-
5	Create	-	-	20	20
Total		**100**	**100**	**100**	**100**

Unit-I

Basic Dynamics

Introduction to Structural Dynamics – Basic theories of vibrations – D'Alembert's principle-Simple harmonic motion – Free vibration of mass and spring system without damping – Free vibration with viscous damping – Forced frequency dependant exciting force with viscous damping.

Determination of dynamic properties of soil

9 Hours

Unit-II

Introduction to Machine Foundations

Types of machine foundation – Basic definitions – Degree of freedom of a block foundation – General criteria for design of machine foundation – Determination of natural frequency – Design criteria for foundations of reciprocating machines.

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks.

Permissible amplitude of vibrations for different types of machines **9 Hours**

Unit-III

Block Type Machine Foundations

Modes of vibration of a block foundation – Methods of Dynamic analysis of block foundation – Review – Analysis of block foundation – Foundation for machines inducing periodical forces – Foundations subject to impact type forces.

Analysis under different modes of vibration

9 Hours

Unit-IV

Miscellaneous Machine Foundations

Analysis and design of framed foundations for high speed machinery – Rotary type machines with low frequency – Machine tools – Impact type machines – Hammers - Fans and blowers – Looms – Testing machines with pulsator –Machines installed on building floors.

Foundation for special structures

9 Hours

Unit-V

Construction of Machine Foundations

Concreting – Reinforcements – Construction details – Expansion joints – Connecting elements – Method of laying spring absorbers – Provision for tuning – Methods of vibration isolation in machine foundations – Controls.

Active passive isolation tests

9 Hours

Total: 45 + 15 Hours

Textbooks

1. P. Srinivasulu and C. V. Vaidhyanathan, *Handbook of Machine Foundation*, Tata McGraw Hill Publishing company Ltd, New Delhi, 2000.

References

1. V. N. S. Murthy, *Advanced Foundation Engineering*, CBS publishers, New Delhi, 2007
2. Madhujith Mukopadhayay, *Structural Dynamics*, Ane books India, 2006.

11C008 OPEN CHANNEL FLOW

3 0 0 3.0

COURSE OBJECTIVES

- To impart the knowledge of elements of open channel
- To provide a broad exposure to the students on various types of fluid flow
- To disseminate the knowledge on the application of fluid mechanics to open channel flow problems

PROGRAMME OUTCOMES (POs)

1. Able to apply the fundamental knowledge of mathematics, science and engineering.
5. Able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability**.**

COURSE OUTCOMES (COs)

1. Understand the various types of open channel flow
2. Determine cross sections of different types of channels
3. Understand the creation of hydraulic jumps and its advantages
4. Design the canals and channels

PREREQUISITES:

Knowledge of Fluid Mechanics

ASSESSMENT PATTERN

S. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	20	20	20	20
2	Understand	20	20	20	20
3	Apply	60	60	60	60
4	Analyze / Evaluate	-	-	-	-
5	Create	-	-	-	-
Total		**100**	**100**	**100**	**100**

Unit I

Introduction

Geometrical elements of open channel - Velocity distribution, Coefficients and their determination - Pressure distribution - Specific energy.

Design of open channels

9 Hours

Unit II

Uniform Flow

Energy and momentum principles applied to prismatic and non-prismatic channels - Critical flow - Computation - Uniform flow - Manning's and Chezy's equations - Determination of Manning's and Chezy's constants - Computation of uniform flow

. *Applications of uniform flow concepts.*

9 Hours

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks.

Unit III

Gradually Varied Flow

Dynamic equation of gradually varied flow - Assumptions - Characteristics of flow profiles - Drawdown and backwater curves - Profile determination - Graphical integration, direct step, standard step method.
computational methods to analyze flow in open channels

9 Hours

Unit IV

Spatially and Rapidly Varied Flow

Spatially varied flow - Dynamic equation - analysis flow profile - Numerical integration and isoclinal method - Rapidly varied flow - Characteristics
Flow over spillways

9 Hours

Unit V

Unsteady Flow

Unsteady flow - Dynamic equation for unsteady gradually varied flow - uniformly progressive flow - Wave propagation - Rapidly varied unsteady flow - Hydraulic jump - Positive and negative surges - Transitions.
Application of unsteady flows

9 Hours
Total: 45 Hours

Textbooks

1. K. Subramanya, *Flow in Open Channels*, Tata McGraw Hill, 2009
2. K. G. Ranga Raju, *Flow through Open Channels*, Tata McGraw Hill, 2002

References

1. V. T. Chow, *Open Channel Hydraulics*, Tata McGraw Hill, 2009
2. R. H. French, *Open Channel Hydraulics*, Tata McGraw Hill, 1986

11C009 WATER RESOURCES PLANNING AND MANAGEMENT

3 0 0 3.0

COURSE OBJECTIVES

- To emphasize the need for water resources planning
- To disseminate the knowledge on the reservoir management and economic analysis aspects

PROGRAMME OUTCOMES (POs)

5. Able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.
7. Able to understand the role of Civil Engineers and ethical responsibility.

COURSE OUTCOMES (COs)

1. Demonstrate the Principles and practice of water resources planning and management
2. Identify the importance of Stakeholder involved in planning processes.

PREREQUISITES:

Knowledge of Hydrology

ASSESSMENT PATTERN

S. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	10	10	10	10
2	Understand	20	20	20	20
3	Apply	20	20	20	20
4	Analyze / Evaluate	40	40	40	40
5	Create	10	10	10	10
	Total	**100**	**100**	**100**	**100**

Unit I

Introduction

Water Resources Survey - Water resources of India and Tamilnadu - Description of water resources planning - Economics of water resources, planning, physical and socioeconomic data - National water policy - Collection of meteorological and hydrological data for water resources development.

Regulatory Programs and their Impact on Planning Processes

9 Hours

Unit II

Network Design

Hydrologic measurements - Analysis of hydrologic data - Hydrologic station network - Station network design - Statistical techniques in network design.

Rainfallcomputation, estimation and determination

9 Hours

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks.

Unit III

Water Resource Needs

Consumptive and non-consumptive water use - Estimation of water requirements for irrigation, for drinking and navigation - Water characteristics and quality - Scope and aims of master plan - Concept of basin as a unit for development -Water budget and development plan.

Sustainable water resource planning

9 Hours

Unit IV

Reservoir Planning and Management

Reservoir - Single and multipurpose - Multi objective - Fixation of storage capacity -Strategies for reservoir operation - Sedimentation of reservoirs - Design flood - Levees and flood walls - Channel improvement.

Optimization techniques for water resource operations

9 Hours

Unit V

Economic Analysis

Estimation of cost and evaluation of benefits - Discount rate - Discounting factors - Discounting techniques

Software for economic analysis of water resources

9 Hours

Total: 45 Hours

Textbooks

1. R. K. Linsley and J. B. Franzini, *Water Resources Engineering*, McGraw Hill Inc., New York, 2000
2. K. N. Duggal and J. P. Soni, *Elements of Water Resources Engineering*, New Age International Publishers, New Delhi, 2004

References

1. J. L. Douglas and R. R. Lee, *Economics of Water Resources Planning*, Tata McGraw Hill Inc., New Delhi, 2000
2. M. C. Chaturvedi, *Water Resources Systems Planning and Management*, Tata McGraw Hill Inc., New Delhi, 1997
3. S. Goodman Alvin, *Principles of Water Resources Planning*, Prentice Hall, 1984

11C010 TRANSPORTATION PLANNING AND MASS TRANSPORTATION SYSTEM

3 0 0 3.0

COURSE OBJECTIVES

- To enhance the knowledge of students on traffic assignment techniques
- To impart knowledge on mass transportation system

PROGRAMME OUT COME (PO)

5. Able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.

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COURSE OUTCOMES (COs)

1. Analyze the present trip pattern
2. Forecast the future trips and assign the trips using trip assignment
3. Design a transportation network
4. Analyze the influence of each factor and design a mass transportation system.

PREREQUISITES:

Knowledge of Highway Engineering

ASSESSMENT PATTERN

Sl. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	20	20	20	20
2	Understand	20	20	20	20
3	Apply / Analyze / Evaluate	40	40	40	40
4	Create	20	20	20	20
	Total	**100**	**100**	**100**	**100**

Distribute the trips between the various zones for creating a new transportation network system.

Unit I

Introduction

Transportation planning process and concepts - Transportation problems - Urban travel characteristics - Concept of travel demand - Demand function - Demand estimation - Sequential, recursive and simultaneous processes.

Role of transportation

9 Hours

Unit II

Trip Generation

Trip generation analysis - Zoning - Types and sources of data - Expansion factors - Accuracy checks - Trip

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks

generation models - Zonal models - Household models - Category analysis - Trip attractions of work centers.
Various surveys for data collection

9 Hours

Unit III

Trip Distribution and Mode Choice Modeling

Trip distribution analysis - Trip distribution models - Growth factor models - Gravity models - Opportunity models - Mode split analysis - Mode split Models - Mode choice behaviour, competing modes, mode split curves, probabilistic models.
Factors influencing mode choices

9 Hours

Unit IV

Route Split Analysis

Traffic assignment - Route split analysis: Elements of transportation networks, nodes and links - Minimum path trees - All-or-nothing assignment - Multipath assignment - Capacity restraint.
Introduction to BPR

9 Hours

Unit V

Mass Transportation system

Urban transportation systems - Mass rapid transit system - Light rail transit - Personal rapid transit, guided way systems, cabin taxi, dual mode bus - Para transit systems - Demand responsive system - Intermediate public transport.
Historical development of urban transportation

9 Hours
Total: 45 Hours

Textbooks

1. C. Jotin Khisty and B. Kent Lall, *Transportation Engineering*, Prentice Hall of India, New Delhi, 2003
2. M. J. Bruton, *Introduction to Transportation Planning*, Hutchinson, London, 1992

References

1. B. G. Hutchinson, *Principles of Urban Transportation System Planning*, Tata McGraw Hill, 2007
2. C. S. Papacostas and Prevedouros, *Transportation Engineering and Planning*, Prentice Hall of India, New Delhi, 2002

11C011 RAILWAYS, AIRPORTS AND HARBOURS

3 0 0 3.0

COURSE OBJECTIVES

- To impart a basic knowledge on railway and harbour planning and its components.
- To provide a basic knowledge on planning and design of airports.

PROGRAMME OUTCOME (PO)

5. Able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability

COURSE OUTCOMES (COs)

1. Ability to assess and select the best track alignment
2. Geometric design of railway track
3. Planning of airport.
4. Orientation and design of runway
5. Demonstrate the importance of various harbor elements in harbor planning.

PREREQUISITES:

Knowledge of Highway Engineeirng, Survey I & II

ASSESSMENT PATTERN

Sl. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	20	20	20	20
2	Understand	40	40	40	40
3	Apply	40	40	40	40
4	Analyze / Evaluate	-	-	-	-
5	Create	-	-	-	-
	Total	**100**	**100**	**100**	**100**

Unit I

Railway Planning and Design

Engineering survey for track alignment – Conventional and modern methods (Remote Sensing, GIS & GPS) – Permanent Way – Components and functions of each component – Gauges in railway tracks – Coning of wheels – Geometric design of railway tracks – Gradient – Super-Elevation – Widening of gauges in curves – Transition curves – Vertical curves and grade compensation (Derivations of formulae and Problems)

Role of Indian railways in national development

9 Hours

Unit II

Railway Track Construction, Maintenance and Operation

Track construction and maintenance – Track drainage – Lay outs of railway stations and yards – Points and Crossings – Signals – Types of signals – Principles and mechanism of interlocking – Methods of interlocking – Track circuiting – Electric traction – Introduction to modern trends in Indian Railways in the design of high speed tracks

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks.

MRTS and suburban railways – BOT and BOLT (basic Concepts)

9 Hours

Unit III

Airport Planning and Visual Aids

Airport planning – Standards for planning of airports as per ICAO – Airport site selection – Aircraft characteristics and their impact on planning of an airport – Airport layout – Components of airports – Terminal area – Passenger facilities - Aprons – Hangars – Airport zoning – Air Traffic Control – Airport drainage – Aircraft parking system – Visual aids.

Importance of airports in national transportation sector – Case study of any Indian airport layout

9 Hours

Unit IV

Airport Design and Control Aids

Runway design – Orientation – Geometric design and Correction for gradients – Pattern of Runways – Runway configuration – Taxiway – Factors governing layout of taxiways – Rapid exit taxiways - Separation clearance – Parking and circulation area – Marking and lighting of runway and apron area – Wind and landing direction indicator

Case study of orientation of runway with the aid of wind rose diagram

9 Hours

Unit V

Harbour Engineering

Definition of terms – Harbours, ports, docks, tides and waves – Harbours – Site investigation – Planning, requirements and classification – Concept of satellite ports – Docks – Dry and Wet Docks – Dredgers and dredging – Terminal facilities – Shipping terminal facilities – Essentials of passenger terminal – Port Buildings – Warehouse – Transit sheds – Mooring accessories – Navigational aids – Piers – Breakwaters – Wharves – Jetties – Quays – Spring fenders – Littoral drift

Layout of harbours – History of port – Case study of selected Indian ports.

9 Hours

Total: 45 Hours

Textbooks

1. S. C. Saxena and S. P. Arora, Railway Engineering, Dhanapat Rai Publications Pvt. Ltd., New Delhi, 2010
2. S. K. Khanna, M. G Arora and S. S. Jain, *Airport Planning and Design*, Nem Chand and Bros., Roorkee, 2001
3. S. P. Bindra, *A Course Work in Docks and Harbour Engineering*, Dhanapat Rai Publications Pvt. Ltd., New Delhi, 2003

References

1. S. Chandra and M. M. Agrawal, *Railway Engineering*, Oxford, New Delhi, 2007
2. S. C. Saxena, *Airport Engineering – Planning and Design*, CBS Publishers, 2008
3. H. P. Oza and G. H. Oza, *A Course in Docks and Harbour Engineering*, Charotar Publishing House, 1999

11C012 DESIGN OF PRESTRESSED CONCRETE STRUCTURES

3 0 0 3.0

COURSE OBJECTIVES

- To impart knowledge on the basic principles of prestress concrete structures
- To impart the design philosophy of prestressed beams, tanks, pipes, poles etc

PROGRAMME OUTCOME (PO)

5. Able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability

11. Able to perform economic analysis, labour/time/material management, construction schedules and activities related to design, construction, operations and maintenance of systems in the technical specializations of Civil Engineering

COURSE OUTCOMES (COs)

1. Selection of various systems of prestressing.
2. Design of prestressed concrete members

PREREQUISITES:

Knowledge of Mechanics of Deformable Bodies I & II and Concrete Technology

ASSESSMENT PATTERN

Sl. No		TEST 1†	TEST †2	Model examination	Semester end examination
1	Remember	10	10	10	10
2	Understand	10	10	10	10
3	Apply	60	60	60	60
4	Analyze	-	-	-	-
5	Evaluate	-	-	-	-
6	Create	20	20	20	20
	Total	**100**	**100**	**100**	**100**

Unit I

Introduction

Basic principles of prestressing – Classification and types – Advantages over ordinary reinforced concrete – Materials – high strength concrete and high tensile steel – Methods of prestressing – Freyssinet, Magnel Blaton, Lee Mc Call and Killick anchorage systems – Analysis of sections for stresses by stress concept, strength concept and load balancing concept.

Losses of prestress

9 Hours

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks.

Unit II

Design for Flexure and Shear

Basic assumptions for calculating flexural stresses – Permissible stresses in steel and concrete as per I.S.1343 Code – Design of sections of Type I and Type II post – tensioned and pre - tensioned beams – Check for strength limit state based on I.S. 1343 Code –Location of wires in pre-tensioned beams – Design for shear based on I.S.1343 Code.

Layout of cables

9 Hours

Unit III

Deflection and Design of Anchorage zone

Factors influencing deflections – Short term deflections of uncracked members – Prediction of long term deflections due to creep and shrinkage – Check for serviceability limit state of deflection. Determination of anchorage zone stresses in post - tensioned beams by Magnel's method, Guyon's method and I.S. 1343 code – Design of anchorage zone reinforcement.

Check for transfer bond length in pre - tensioned beams

9 Hours

Unit IV

Composite Beams and Continuous Beams

Types of R.C.C. – P.S.C. composite beams – Analysis and design of composite beams– Analysis for secondary moments – Concordant cable and linear transformation - Calculation of stresses – Principles of design.

Methods of achieving Continuity in continuous beams

9 Hours

Unit V

Miscellaneous Structures

Design of tanks, sleepers and tension members – Use of non-prestressed reinforcement – Definition, methods of achieving, merits and demerits of partial prestressing.

Design of pipes, poles

9 Hours

Total: 45 Hours

Textbook

1. Krishna Raju, N., *Prestressed Concrete*, Tata Mc Graw Hill Publishing Company, New Delhi, 1995.

References

1. Lin, T.Y. and Ned.H.Burns, *Design of Prestressed Concrete Structures*, John Wiley & Sons, New York, 1982
2. Rajagopalan, N., *Prestressed Concrete*, Narosa Publishing House, New Delhi, 2002.
3. Mallik, S.K. and Gupta, A.P., *Prestressed Concrete*, Oxford & IBH Publishing Co., Pvt.Ltd., India, 1986.
4. Arthur H.Nilson, *Design of Prestressed Concrete*, John Wiley & Sons, New York, 1978.
5. Dayaratnam,P., *Prestressed Concrete Structures*, Oxford and IBH, New Delhi, 1982.
6. Sinha, N.C.and Roy, S.K., *Fundamentals of Prestressed Concrete*, S.Chand & Co., Ltd., 1994.

11C013 BRIDGE ENGINEERING

3 0 0 3.0

COURSE OBJECTIVES

- To impart basic knowledge on the codal provisions for design of bridges
- To introduce the design of reinforced concrete slab bridge decks, Tee beam and slab bridge decks, plate girder bridges, rigid frame bridge, balanced cantilever bridges, continuous bridges and prestressed concrete bridges
- To impact knowledge on the design of different types of bridge bearings, piers and abutments, and bridge foundations

PROGRAMME OUTCOME (PO)

5. Able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability

11.Able to perform economic analysis, labour/time/material management, construction schedules and activities related to design, construction, operations and maintenance of systems in the technical specializations of Civil Engineering

COURSE OUTCOMES (COs)

1. Design of reinforced bridge components
2. Design of Arch bridges
3. Design of steel bridge components
4. Design of pre-stressed bridge components
5. Design of bridge bearings
6. Design of Piers and abutments
7. Design of bridge foundations

PREREQUISITES:

Knowledge of R.C.C Structures, Steel Structures, Foundation Engineeirng and Prestressed Concrete Structures

ASSESSMENT PATTERN

S. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	20	20	20	20
2	Understand	20	20	20	20
3	Analyze	-	-	-	-
4	Apply / Evaluate	30	30	30	30
5	Create	30	30	30	30
	Total	**100**	**100**	**100**	**100**

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks

Unit I

Introduction

Types of bridges and Loading standards – Standard specifications for road bridges – Design of R.C.C solid slab bridges – Bearings – Types of bearings – Design of bearings for slab bridges – T-Beam and Slab bridges – Dynamic response of bridge decks

Design of Footpaths and Hand rails

9 Hours

Unit II

Other Reinforced Concrete Bridges

Design of balanced cantilever bridges – Continuous girder bridges – Rigid frame bridges – Arch bridges – Bow string girder bridges – Box culverts

Stone Masonry Bridges

9 Hours

Unit III

Steel Bridges

General – Railway loadings – Dynamic effect – Railway culvert with steel beams – Plate girder bridges – Box girder bridges – Truss bridges – Vertical and horizontal stiffeners.

Composite Bridges – Case studies: Suspension and Cable stayed bridges.

9 Hours

Unit IV

Substructures and Foundations

Design of piers and abutments of different Types – Foundations – Shallow foundations – Deep foundations – Piles – Well foundations.

Pneumatic caissons

9 Hours

Unit V

Prestressed Concrete Bridges

Design of prestressed concrete bridges – Preliminary discussions – Flexural and torsional parameters – Design of Girder Section – Cable layout – check for stresses at various sections.

Stressed Ribbon Bridges

9 Hours

Total: 45 Hours

Text books

1. N. Krishna Raju, *Design of Bridges*, Oxford and IBH Publishing Co., Pvt Ltd., New Delhi, 2009.

References

1. D. Johnson Victor, *Essentials of Bridge Engineering*, Oxford and IBH Publishing Co., New Delhi, 2001
2. S. Ponnuswamy, *Bridge Engineering*, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2003
3. I.S. 456-2000, *Plain and Reinforced Concrete-Code of Practice*
4. I.S. 800-2007, *Indian Standard Code of Practice for General Construction in Steel*
5. SP: 16 (S & T) - 1980, *Design Aids to I.S.456-1978*
6. IRC: 6, 18, 21, 22, 24, 78 and 83

11C014 DESIGN OF INDUSTRIAL STRUCTURES

3 0 0 3.0

COURSE OBJECTIVES

- To introduce the structure of folded plate and to design, and shell structures and other structures such as silos, bunkers and chimneys
- To impart knowledge on the design of power transmission structures

PROGRAMME OUTCOME (PO)

5. Able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability

11.Able to perform economic analysis, labour/time/material management, construction schedules and activities related to design, construction, operations and maintenance of systems in the technical specializations of Civil Engineering

COURSE OUTCOMES (COs)

1. Draw layout for any industrial buildings.
2. Demonstrate the functional requirements for any industry.
3. Design industrial RC structures.
4. Design storage structures.
5. Demonstrate the use of transmission towers and the steps involved in the design of towers.
6. Design of various types of machine foundations.

PREREQUISITES:

Knowledge of R.C.C Structures, Steel Structures, Foundation Engineeirng and Prestressed Concrete Structures

ASSESSMENT PATTERN

S. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	20	20	20	20
2	Understand	30	30	30	30
3	Apply	30	30	30	30
4	Analyze	-	-	-	-
5	Evaluate	-	-	-	-
5	Create	20	20	20	20
	Total	**100**	**100**	**100**	**100**

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks.

Unit I

General

Classification of Industries and Industrial Structures – Specific requirements for Industries like Engineering, Textiles, Chemicals, etc.

Site layout and external facilities required

9 Hours

Unit II

Functional Requirements

Natural and artificial lighting – protection from the sun light – Services – Electrical wiring fixtures – cable and pipe bridge – Electrical installations – substations – Effluent disposal – Fire expanse and chutes – fire alarm, extinguishers and hydrants – Guidelines from factories act**.**

Heating and Ventilation – Air conditioning

9 Hours

Unit III

Industrial RC Structures

Design and detailing of R.C. gable frames, corbels, nibs, bunkers, silos and chimneys – Cooling towers

Application of prefabrication techniques.

9 Hours

Unit IV

Power Transmission Structures

Cables – Transmission line towers – Tower Foundation – Testing of towers.

Substation Structures

9 Hours

Unit V

Other Structures

Design of Nuclear containment structures – Gantry girders – Machine Foundations – design procedure.

Types of machine foundation

9 Hours

Total: 45 Hours

Textbooks

1. N. Krishna Raju, *Advanced Reinforced Concrete Design*, CBS Publishers and Distributors, 2008
2. A. R. Santhakumar and S. S. Murthy, *Transmission Line Structures*, Tata McGraw Hill, 1992

References

1. P. Dayaratnam, *Deign of steel structures*, A.H. Wheeler & Co., Ltd., Allahabad, 2008
2. IS :4998 (part 1)
3. IS: 4995 (part 1 and part 2)
4. IS: 3483 and IS: 6060
5. S. N. Manokar, *Tall Chimneys – Design and Construction*, Tata McGraw Hill, 1986
6. Handbook on functional requirements of industrial buildings(Heating and ventilation)

11C015 ADVANCED R.C. DESIGN

3 0 0 3

COURSE OBJECTIVES

- To impart knowledge on the design of many complicated structures such as curved beams, gable frames, silos, bunkers and chimneys
- To impart knowledge on the advanced design of slabs and hyper static beams

PROGRAMME OUTCOME (PO)

5. Able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability

11.Able to perform economic analysis, labour/time/material management, construction schedules and activities related to design, construction, operations and maintenance of systems in the technical specializations of Civil Engineering

COURSE OUTCOMES (COs)

1. Demonstrate the responses of various structural systems for any loading condition
2. Design of various structures according to codal provisions
3. Analyze and determine the critical load for various types of slab
4. Know the importance of prefabrication techniques

PREREQUISITES:

Knowledge R.C.C Elements and Structures

ASSESSMENT PATTERN

Sl. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	10	10	10	10
2	Understanding	20	20	20	20
3	Apply	40	40	40	40
4	Analyze / Evaluate	-	-	20	-
5	Create	30	30	30	30
Total		**100**	**100**	**100**	**100**

Unit I
Special Structural Members
Design of continuous beams – Curved beams – Deep beams – Corbels.
Design of continuous deep beam

9 Hours

Unit II
Yield Line Theory

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks.

Assumptions made – Yield line patterns for various types of slabs with different boundary conditions – Analysis of square - Rectangular and circular slabs subjected to central concentrated load or uniformly distributed load by virtual work method and equilibrium method – Effect of corner lever – Hillerborg's strip method of analysis.
Design of slabs and detailing of reinforcements.

9 Hours

Unit III

Industrial R.C. Structures

Design of portal and gable frames – Silos – Chimneys.
Bunkers

9 Hours

Unit IV

Prefabrication

Principles of precast Construction – Merits and demerits – Dimensioning and detailing of joints for different structural connections – Constructions and expansion joints.
Production – Transportation - Erection

9 Hours

Unit V

Miscellaneous Structures

Design of flat slabs – Grid floors – Braced and unbraced r.c. walls – Limit analysis of hyperstatic structures – Fundamental principles – Moment redistribution – Moment – Rotation characteristics of RC sections – Plastic hingles.
Ultimate load analysis of fixed and continuous beams.

9 Hours
Total: 45 + 15 Hours

Textbooks

1. N. Krishnaraju, *Advanced Reinforced Concrete Design*, C. B. S. Publishers and Distributors, 2008
2. Ashok K. Jain, *Reinforced Concrete Limit State Design*, Nemchand & Bros., 1993

References

1. S. N. Sinha, *Reinforced Concrete Design*, Tata McGraw Hill Publishing Company Ltd., 2002
2. Varghese, *Advanced Reinforced Concrete Design*, Prentice Hall of India Pvt. Ltd., 2002
3. Jain and Jai Krishna, *Plain and Reinforced Concrete*, Vol. II, Nemchand Brothers, 1986

11C016 TALL STRUCTURES

3 0 0 3.0

COURSE OBJECTIVES

- To impart knowledge on the responses/behavior of tall buildings for various types of loading conditions
- To impart fundamental knowledge on the analysis and design of tall structures

PROGRAMME OUTCOME (PO)

4. Able to use the techniques, skills and modern Civil Engineering tools necessary for engineering practice.

COURSE OUTCOMES (COs)

1. Analysis and design of tall buildings with and without shear walls.
2. Demonstrate the functional use of various software packages.

PREREQUISITES:

Knowledge R.C.C Elements and Structures, Steel Structures, Structural Analysis I & II

ASSESSMENT PATTERN

Sl. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	30	30	30	30
2	Understand	40	40	40	40
3	Apply / Evaluate	30	30	30	30
4	Create	-	-	-	-
Total		**100**	**100**	**100**	**100**

Unit I

Introduction

Tall Building in the Urban Context - Tall Building and its Support Structure - Development of High Rise Building Structures - General Planning Considerations. Dead Loads - Live Loads-Construction Loads -Snow, Rain, and Ice Loads - Wind Loads-Seismic Loading –Water and Earth Pressure Loads - Loads - Loads Due to Restrained Volume Changes of Material - Impact and Dynamic Loads - Blast Loads.

Combination of Loads – Analysis using Finite Element based packages.

9 Hours

Unit II

The vertical structure plane

Dispersion of Vertical Forces- Dispersion of Lateral Forces - Optimum Ground Level Space - shear Wall Arrangement - Behaviour of Shear Walls under Lateral Loading. The Floor Structure or Horizontal Building Plane Floor Framing Systems-Horizontal Bracing- Composite Floor Systems The High - Rise Building as related to assemblage Kits Skeleton Frame Systems - Load Bearing Wall Panel Systems - Panel – Frame Systems. *Multistory Box Systems*

9 Hours

Unit III

Common high-rise building structures and their behavior under load

The Bearing Wall Structure- The Shear Core Structure - Rigid Frame Systems- The Wall -Beam Structure:

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks.

Interspatial and Staggered Truss Systems - Frame - Shear Wall Building Systems - Flat Slab Building Structures - Shear Truss - Frame Interaction System with Rigid - Belt Trusses - Tubular Systems-Composite Buildings - Comparison of High - Rise Structural Systems Other Design Approaches Controlling Building Drift Efficient Building Forms.
The Counteracting Force or Dynamic Response

9 Hours

Unit IV

Approximate structural analysis and design of buildings

Approximate Analysis of Bearing Wall Buildings The Cross Wall Structure - The Long Wall Structure The Rigid Frame Structure Approximate Analysis for Vertical Loading – Approximate Analysis for Lateral Loading - Approximate Design of Rigid Frame Buildings-Lateral Deformation of Rigid Frame Buildings The Rigid Frame - Shear Wall Structure - The Vierendeel Structure.
The Hollow Tube Structure

9 Hours

Unit V

Other high-rise building structure

Deep - Beam Systems -High-Rise Suspension Systems - Pneumatic High -Rise Buildings - Space Frame Applied to High - Rise Buildings.
Capsule Architecture

9 Hours
Total: 45 Hours

Textbooks

1. Woltang Schueller, *High - rise Building Structures*, John Wiley and Sons, New York, 1976
2. Bryan Stafford Smith and Alex Coull, *Tall Building Structures Analysis and Design*, John Wiley and Sons, Inc., 1991

References

1. A. Coull and B. Stafford Smith, *Tall Buildings*, Pergamon Press, London, 1997.
2. T. Y. Lin and Burry D. Stotes, *Structural Concepts and Systems for Architects and Engineers*, John Wiley, 1994
3. Lynn S. Beedle, *Advances in Tall Buildings*, CBS Publishers and Distributors, Delhi, 1996.
4. S. Taranath, *Structural Analysis and Design of Tall Buildings*, McGraw Hill, 1998.

11C017 REPAIR AND REHABILITATION OF STRUCTURES

3 0 0 3.0

COURSE OBJECTIVES

- To emphasize the importance of maintenance and inspection of structures
- To impart fundamental knowledge on various repairing strategies

PROGRAMME OUTCOME (PO)

2. Able to identify, formulate and solve Civil Engineering problems in accordance with Indian Standard codes of practice

COURSE OUTCOMES (COs)

1. Demonstrate the various types of distress in concrete structures.
2. Identify the effects due to climate, temperature, chemicals, wear and erosion on structures.
3. Analyze the failures in structure due to design and construction errors.
4. Recommend the best Materials and Techniques for Repair.

PREREQUISITES:

Knowledge of Concrete Technology, RCC Elements and Building Materials

ASSESSMENT PATTERN

Sl. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	20	20	20	20
2	Understanding	50	50	50	50
3	Apply	30	30	30	30
4	Analyze / Evaluate	-	-	-	-
5	Create	-	-	-	-
Total		**100**	**100**	**100**	**100**

Unit I

Maintenance and Repair Strategies

Maintenance, repair and rehabilitation - Facets of maintenance - Importance of maintenance - Diagnosis of distress - Assessment procedure for evaluating a damaged structure - Causes of deterioration.
Various aspects of inspection - structural and economic appraisal

9 Hours

Unit II

Distress in Concrete Structures - Causes, Effects and Remedial measures

Design and construction errors - Corrosion mechanism - Effects of cover thickness and cracking - Methods of corrosion protection - Corrosion inhibitors - Corrosion resistant steels - Coatings - Cathodic protection.
Effects due to climate, temperature, chemicals, wear and erosion

9Hours

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks.

Unit III

Serviceability and Durability of Concrete Structures

Durability of concrete in sea water - Thermal properties of concrete - Fire resistance - Resistance to freezing and thawing - Permeability of concrete - Sulphate attack - Methods of control.

Quality assurance - Need - Components - Conceptual bases for quality assurance schemes

9 Hours

Unit IV

Materials and Techniques for Repair

Expansive cement - Polymer concrete - Sulphur infiltrated concrete - Ferro-cement - Fibre reinforced concrete - Rust eliminators and polymer coating for rebars during repair - Foamed concrete - Vacuum concrete - Gunite or shotcrete - Epoxy injection, mortar repair for cracks.

Special concretes and mortars - Special cements for accelerated strength gain - Trenchless Technology for underground pipe laying

9 Hours

Unit V

Repairs to Structures and Demolition of Structures

Repair of structures distressed due to earthquake - Strengthening using FRP - Engineered demolition techniques for structures.

Case studies of Engineered demolition techniques for structures - Strengthening and stabilization techniques for repair.

9 Hours
Total: 45 Hours

Textbooks

1. M. S. Shetty, *Concrete Technology Theory and Practice*, S. Chand Co., New Delhi, 2005
2. Dension Campbell, Allen and Harold Roper, *Concrete Structures, Materials, Maintenance and Repair*, Longman Scientific and Technical Publications, UK, 1991

References

1. ACCE (I), Madurai Centre, *Workshop on Cracks, Corrosion and Leaks*, July, 2003
2. M. L. Gambhir, *Concrete Technology*, Tata McGraw Hill Publishing Co., New Delhi, 2003
3. Peter H. Emmons**,** *Concrete Repair and Maintenance Illustrated Problem Analysis, Repair Strategy, Techniques,* Galgotia Publication, 2001

11C018 FINITE ELEMENT METHOD

3 0 0 3

COURSE OBJECTIVES

- To impact basic knowledge on the various steps involved in finite element analysis.
- To introduce various types of one -, two -, three – dimensional elements.

PROGRAMME OUTCOMES (POs)

1. Able to apply the fundamental knowledge of mathematics, science and engineering
2. Able to identify, formulate and solve Civil Engineering problems in accordance with Indian Standard codes of practice
4. Able to use the techniques, skills and modern Civil Engineering tools necessary for engineering practice.
11. Able to perform economic analysis, labour/time/material management, construction schedules and activities related to design, construction, operations and maintenance of systems in the technical specializations of Civil Engineering.

COURSE OUTCOMES (COs)

1. Derive the shape functions for triangular elements
2. Derive the shape functions for rectangular elements
3. Analysis and design of plate and shell structures using finite element method

PREREQUISITES:

Knowledge Structural Analysis I& II

ASSESSMENT PATTERN

Sl. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	20	20	20	20
2	Understand	30	30	30	30
3	Apply / Evaluate	50	50	50	50
4	Analyze	-	-	-	-
5	**Total**	**100**	**100**	**100**	**100**

Unit I

Introduction

Concept of an element - Various element shapes - one, two and three dimensional elements - Finite Element procedure, variational principles and method of weighted residual - Principle of virtual work - Rayleigh Ritz method - Galerkin's method of weighted residual. Displacement, stress and hybrid models - Principle of minimum potential energy - Principle of minimum complementary energy - Reissner's principle. Convergence and compatibility requirements - Assumed displacement field – Pascal's Triangle - Melosh criteria

9 Hours

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks

Unit II

Two Dimensional Elements

Triangular Elements - Constant strain triangle - Rectangular Elements - Serendipity family - Hermitian family. Sub-Iso-Super Parametric elements - Shape function - Mapping.

9 Hours

Unit III

Three Dimensional Elements

Numerical Integration using Gaussian Quadrature - Weights and Gauss points. Selective and reduced integration. - Tetrahedran element family - parallelopiped element - Hexahedran Element family.

9 Hours

Unit IV

Plate/Shell Elements and Finite Strip Method

Triangular and Rectangular elements - BFS Element - Faceted element for shells - Semi - loof elements - Degenerated shell elements - Finite strip method

9 Hours

Unit V

Non-Linear Analysis and Computer Applications

Types of non-linearities - Stability analysis - Load deformation response - Solution techniques - Newton Raphson method - Modified Newton Raphson method, Alpha constant method, Riks Wempner method - Classical Eigen Value analysis

9 Hours

Total: 45 + 15 Hours

Textbooks

1. S. Rajasekaran, *Finite Element Methods in Engineering Design*, Wheeler, 1993.
2. C. S. Krishnamoorthy, *Finite Element Method - Theory and Programming*, Tata McGraw Hill Publishing Company, New Delhi, 1994.

References

1. Tirupathi R. Chandrupatla and Ashok D. Belegundu, *Introduction to Finite Elements in Engineering*, Prentice Hall of India Pvt. Ltd., New Delhi, 2002
2. K. J. Bathe, *Finite Element Procedure*, Prentice Hall of India, and New Delhi, 2007
3. O. C. Zienkiewinz, *The Finite Element method Vol. 1 & 2*, TMH, New York, 2002

11C019 ADVANCED STEEL DESIGN

3 0 0 3

COURSE OBJECTIVES To impart knowledge on steel constructions

- To impart the knowledge on codal provisions for design of steel structures

PROGRAMME OUTCOME (POs)

1. Able to apply the fundamental knowledge of mathematics, science and engineering
2. Able to identify, formulate and solve Civil Engineering problems in accordance with Indian Standard codes of practice
4. Able to use the techniques, skills and modern Civil Engineering tools necessary for engineering practice.
11. Able to perform economic analysis, labour/time/material management, construction schedules and activities related to design, construction, operations and maintenance of systems in the technical specializations of Civil Engineering.

COURSE OUTCOMES (COs)

1. Design of Industrial Components
2. Design of cold formed light gauge sections
3. Plastic analysis of structures

PREREQUISITES:

Knowledge of Design of Steel Structures

ASSESSMENT PATTERN

Sl. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	10	10	10	10
2	Understand	20	20	20	20
3	Apply / Evaluate	30	30	30	30
4	Analyze	-	-	-	-
5	Create	40	40	40	40
	Total	**100**	**100**	**100**	**100**

Unit I

Structural Connections

Design of high strength function grip bolts - Design of bolted connections at the junctions of beams and columns in frames - Design of un-stiffened & stiffened seat connections - Welded connections - Eccentric connections - Beam end connections - Direct web fillet welded connections - Direct web Butt welded connection - Double plate web connection - Double angle web connection - Un-stiffened and stiffened seat connection – Continuous beam to column connection – Tubular connections - Continuous beam to beam to connection.

Moment resistant connections

9 Hours

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks

Unit II

Industrial Building

Industrial building frames – Section of roofing and wall materials - General - Framing - Bracing – Design of gantry girders and crane columns - Analysis of Trussed bents - Design example - Design of rigid joints knee for gable frames.

Design of slabs on grade

9 Hours

Unit III

Analysis and Design of Special Structures

Design of steel bunkers and silos - Janssen's theory - Airy's theory - Design parameters-design criteria - Design and detailing of guyed steel chimneys - Transmission line towers – Introduction - Types of towers - Tower configuration – Design and analysis the Thin shell structures

Design of rectangular steel water tank **9 Hours**

Unit IV

Light Gauge Sections

Design of cold formed sections - Concepts - Effective width - Stiffened sections - Multiple stiffened sections - Design for flexure - Design of light gauge columns – Torsional – Flexural buckling – Tension Members - Beam column – Connections – Design folded plates – Design of light gauge steel studs.

Design light gauge tubular section

9 Hours

Unit V

Plastic Analysis and Design

Plastic design of tension & compression members - Theory of plastic bending - Plastic hinge – Redistribution of moments - Failure mechanisms - Plastic analysis and design of fixed beams, continuous beams and portal frames by mechanism method.

Analysis the grid structures

9 Hours

Total: 45 + 15 Hours

Textbooks

1. N. Subramanian, *Design of Steel Structures*, Oxford University Press 2008
2. S. K. Duggal, *Limit State Design of Steel Structures*, Tata , Mc Graw Hill Education Pvt Ltd, New Delhi

References

1. M. R. Shiyekar, *Limit State Design in Structural Steel*, PHI Learning Private Limited, New Delhi, 2010
2. K. S. Sai Ram, *Design of Steel Structures*, Dorling Kindersley (India) Pvt. Ltd, Pearson Education in South Asia.
3. IS 800 – 2007, *General Construction in Steel – Code of Practice*, BIS, New Delhi
4. IS 875- 1987 *Code of practice for design loads for buildings and structures* (second revision) BIS, New Delhi.
5. IS 811 – 1987, Specification for cold formed light gauge structural steel sections (Second revision) BIS, New Delhi.
6. IS 801 – 1975, code of practice for use of cold formed light gauge steel structural members in general building construction , BIS , New delhi.
7. R. Murugesan and A. P. Arulmanickam, *Steel Tables in SI Units*, Pratheeba Publishers, Coimbatore, 2009.

11C020 BUILDING SERVICES

3 0 0 3.0

COURSE OBJECTIVES

- To impart knowledge on the various aspects of pumps and machinery involved in Civil Engineering practice
- To impart knowledge on the principles of electrical and air conditioning facilities involved.
- To emphasize the importance of fire safety

PROGRAMME OUTCOME (PO)

5. Able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.

COURSE OUTCOMES (COs)

1. Design of the electrical installation.
2. Planning consideration of the building.

PREREQUISITES:

Knowledge of Building Materials and Basics of Mechanical and Electriacal Engineering

ASSESSMENT PATTERN

Sl. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	20	20	20	20
2	Understand	50	50	50	50
3	Apply / Analyze / Evaluate	30	30	30	30
5	Create	-	-	-	-
Total		**100**	**100**	**100**	**100**

Unit I

Machineries

Hot Water Boilers – Lifts and Escalators – Special features required for physically handicapped and elderly – Conveyors – Vibrators – Concrete mixers – DC motors – Generators – Laboratory services – Gas, water, air and electricity.

AC motors

8 Hours

Unit II

Electrical Systems in Buildings

Basics of electricity – Single / Three phase supply – Protective devices in electrical installations – Earthing for safety – Types of earthing – ISI specifications – Types of wires, wiring systems and their choice – Planning

† The marks secured in Test I and II will be converted to a maximum of 20and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks.

electrical wiring for building – Main and distribution boards – Transformers and switch gears. *Layout of substations*

10 Hours

Unit III

Principles of Illumination & Design

Visual tasks – Factors affecting visual tasks – Modern theory of light and colour – Synthesis of light – Additive and subtractive synthesis of colour – Luminous flux – Candela – Solid angle illumination – Utilisation factor – Depreciation factor – MSCP – MHCP – Lans of illumination – Classification of lighting – Artificial light sources – Spectral energy distribution – Luminous efficiency – Colour temperature – Colour rendering - Design of modern lighting – Lighting for stores and house lighting - Elementary idea of special features required and minimum level of illumination required for physically handicapped and elderly in building types.
Lighting for offices, schools, hospitals

8 Hours

Unit IV

Refrigeration Principles & Applications

Thermodynamics – Heat – Temperature, measurement - Transfer – Change of state – Sensible heat – Latent heat of fusion, evaporation, sublimation – Saturation temperature – Super heated vapour – Subcooled liquid – Pressure temperature relationship for liquids – Refrigerants – Vapour compression cycle – Compressors – Evaporators – Starters – Air handling units – Cooling towers – Window type and packaged air-conditioners – Chilled water plant – Fan coil systems – Water piping – Cooling load – Air conditioning systems for different types of buildings – Protection against fire.
Refrigerant control devices – Electric motors

10 Hours

Unit V

Fire Safety Installation

Causes of fire in buildings – Safety regulations – NBC – Planning considerations in buildings like non-combustible materials, construction, staircases and lift lobbies, fire escapes and A.C. systems - Special features required for physically handicapped and elderly in building types – Heat and smoke detectors – Fire lighting pump and water storage – Dry and wet risers – Automatic sprinklers.
Fire alarm system, snorkel ladder

9 Hours

Total: 45 Hours

Textbooks

1. C. P. Arora, *Refrigeration and Air Conditioning*, Tata McGraw Hill, New Delhi, 1988
2. G. Steffy, *Architectural Lighting Design*, John Wiley and Sons, 2008
3. J. Killinger and L. Killinger, *Heating and Cooling Essentials*, Goodheart-Wilcox Publishers, 2003

References

1. Jones, *Air Conditioning Engineering*, Edward Amold Publication, 2007
2. National Building Code of India, NBC, 2005
3. ASHRAE, *Fundamentals and Equipment*, ASHRAE Inc., 2005

11C021 DISASTER MANAGEMENT

3 0 0 3.0

COURSE OBJECTIVES

- To provide an exposure on the various elements of natural disasters
- To impart knowledge on measurement, effect and management techniques for different disasters

PROGRAMME OUTCOMES (POs)

4. Able to use the techniques, skills and modern Civil Engineering tools necessary for engineering practice.

6. Able to work on the basis of broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context.

COURSE OUTCOMES (COs)

1. Analyze the various methods to mitigate the effect due to disasters
2. Demonstrate the importance of various disaster management techniques
3. Demonstrate the importance of deforestation.

PREREQUISITES:

Knowledge of Environmental Science and Aseismic Design of Structures

ASSESSMENT PATTERN

Sl. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	20	20	20	20
2	Understand	60	60	60	60
3	Apply	20	20	20	20
4	Analyze	-	-	-	-
5	Evaluation	-	-	-	-
6	Create	-	-	-	-
	Total	**100**	**100**	**100**	**100**

Unit I

Introduction to Disaster Management

Contemporary natural and man-made disasters - Fundamentals of disasters - Causal factors of disasters – Poverty - Population growth - Rapid urbanization - Transitions in cultural practices - Environmental degradation - War and civil strife – Earthquakes - Tropical cyclones – Floods – Droughts - Environmental pollution – Deforestation - Desertification – Epidemics - Chemical and industrial accidents

Fundamentals of disasters, Environmental pollution

9 Hours

Unit II

Coastal and Marine Diasters

Hydrological - Coastal and marine disasters - Flood hazards - Control and management - Dams and dam bursts - Tsunami - Water and groundwater hazards - Sea level rise - Coastal and marine degradation - Marine

† The marks secured in Test I and II will be converted to a maximum of 20and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks.

pollution - Techniques of marine pollution control
Coastal and marine degradation

9 Hours

Unit III

Atmospheric Disasters

Atmospheric disasters - Greenhouse effect and global climate - Air pollution and acid rain - Ozone depletion - Forest related disasters - Biodiversity extinction - Deforestation and loss of biological diversity – genetic manipulation -Biosafety and CBD
Genetic manipulation

9 Hours

Unit IV

Land Disasters

Geological - Mass movement and land disasters – Earthquake -Volcanism - Mass movement hazards - Land degration and land use - Droughts and famines- Deserts and desertification – Groundwater over- exploitation- dryness and wildfires - Technological disasters -Mining disasters - War - chemicals and the environment
Droughts and famines, mining disasters

9 Hours

Unit V

Miscellaneous Topics

Wind and water driven disasters -Flood forecasting mitigation planning and management -Tropical cyclones – Storms – Hurricanes –Tornadoes - Lightning and frost disasters. Case studies – Regulating hazardous industries in India - Control of toxic chemicals and chemical pollution in India
Regulating hazardous industries in India

9 Hours
Total: 45 Hours

Textbooks

1. B. K. Khanna, *All you wanted to know about disasters*, New India Publishing Agency, New Delhi, 2005
2. William L Waugh, *Living with hazards, dealing with disasters: An Introduction to Emergency Management*, Amazon Publications, 2002

References

1. Patrick Leon Abbott, *Natural Disasters*, Amazon Publications, 2002
2. Ben Wisner, *At Risk: Natural Hazards, People vulnerability and disasters*, Amazon Publications, 2001
3. D. B. N. Murthy, *Disaster management: text and case studies*, Deep & Deep Publications, 2007

11CO22 CONCEPTS OF ENGINEERING DESIGN

3 0 0 3.0

COURSE OBJECTIVES

- To provide a broad exposure to the students about the concepts of designs necessary in Civil Engineering practice
- To make the students familiar with National Building Code of India and other relevant codes for the functional design of flats, residential and industrial buildings

PROGRAMME OUTCOME (PO)

5. Able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.

COURSE OUTCOMES (COs)

1. Determine the solutions for engineering problems
2. Analyze the functional design of buildings as per Indian Standards

PREREQUISITES:

Knowledge of Engineering Mechanics , Mechanics of Deformable Bodies I & II

ASSESSMENT PATTERN

Sl. No		TEST 1†	TEST 2†	Model examination	Semester end examination
1	Remember	20	20	20	20
2	Understand	30	30	30	30
3	Apply	20	20	20	20
4	Analyze	30	30	30	30
5	Evaluate	-	-	-	-
6	Create	-	-	-	-
Total		**100**	**100**	**100**	**100**

Unit I

Engineering Design and Problem Identification

Engineering design introduction and definition, Design process, Engineering design interfaces, Principles of Engineering Design– PDS criteria, Content of a PDS, Sample PDS, Principles, Exercises.

Problem Identification

9 Hours

Unit II

Concept Generation and Selection

Introduction – Creativity Principle, Psychological ‘set’, Inversion, Analogy, Fantasy, Technological advances, Brainstorming, Morphological analysis, Presentation, Exercises. Concept selection – Subjective decision-

† The marks secured in Test I and II will be converted to 20 and Model Examination will be converted to 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks.

making, Criteria ranking, Criteria weighting, Datum method, EVAD (Design Evaluation) method, Concept selection method, Exercises.
Principles of Computer aided decision making

9 Hours

Unit III

Design Process

Embodiment design - Introduction, Size and strength, Scheme drawing, Form design, Provisional material and process determination, Design for assembly and manufacture, Principles. Modeling – Introduction, Mathematical modeling, Optimization, Scale models, Simulation, Principles, Exercises.
Industrial design

9 Hours

Unit IV

Functional Design of Buildings

Functional design of Residential buildings – Rules and regulations related to flats as per National Building Code of India – Functional design of Industrial Buildings and factories – as per Indian Standards.
Functional design of other buildings

9 Hours

Unit V

Reports and Intellectual Property Rights

Presentation Techniques – Introduction, Concept sketches, Scheme drawing, Design report, Principles. Intellectual Property Rights – Introduction, Write the description of the invention, Pursue application.
Study prior inventions

9 Hours
Total: 45 Hours

Textbooks

1. Ken Hurst, *Engineering Design Principles*, Elsevier Science & Technology Books, May 1999.
2. National Building Code of India.

Reference Books:

1. Richard Birmingham, Graham Cleland, Robert Driver & David Maffin, Understanding Engineering Design, Prentice Hall of India, 1998.
2. NPTEL (\\http:lib.bitsathy.ac.in)
3. www.howstuffworks.com
4. www.patentoffice.nic.in
5. ep.espacenet.com/advancedSearch.

11C023 CREATIVITY AND INNOVATIONS

3 0 0 3.0

COURSE OBJECTIVES

- To emphasize the importance of creativity and innovation in the field of engineering
- To introduce the fundamental knowledge on TRIZ and patenting
- To emphasize the importance of patenting

PROGRAMME OUTCOME (PO)

4. Able to use the techniques, skills and modern Civil Engineering tools necessary for engineering practice.

COURSE OUTCOMES (COs)

1. Application of creative techniques in solving engineering problems
2. Ability to analysis and evaluate a project
3. Understanding the importance of Patenting and Intellectual Property Rights (IPR)

PREREQUISITES:

Knowledge of Project Phase I & II

ASSESSMENT PATTERN

S. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	20	20	20	20
2	Understand	30	30	30	30
3	Analyze	10	10	10	10
4	Apply / Evaluate	30	30	30	30
5	Create	10	10	10	10
	Total	**100**	**100**	**100**	**100**

Unit I

Creativity

Concept and - Need for creativity - Creative environment - Stages of creativity process - Creativity and intelligence - Creativity in various contexts - Economic view of creativity - Measuring creativity - Fostering creativity - Creative problem solving – Brain storming and various techniques - Lateral thinking.

History of creativity

9 Hours

Unit II

Innovation

Definition - Creativity vis-à-vis innovation - Conceptualizing innovation - Types of innovation - Sources of innovation - Goals of innovation - Process of technological innovation - Diffusion of innovation - Factors contributing to successful technological innovation - Failure of innovations- innovation management - Measures of innovation.

Case studies of applying innovative principles

9 Hours

† The marks secured in Test I and II will be converted 20 and Model Examination will be converted to 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks

Unit III

Project Innovation through TRIZ –Theory to Resolve Inventive Problems

Theory to Resolve Inventive Problems- TIPS – Theory of inventive problem solving – About the author – Genrich Altshuller - Essence of TRIZ – Ideal final result – Problem formulation and functional analysis – Concept of ideality – Contradiction - Physical and technical – 39 contradicting parameters – Contraction matrix – 40 inventive principles – 76 standard solutions – Technology evolution trends – Case studies.

History and origin of TRIZ

9 Hours

Unit IV

Product Development and Evaluation

Research and new product development – Process and types of new products - Creative design - Design of prototype – Purpose – Process and types - Model preparation - Testing and quality evaluation - Marketing research – Purpose and process - Types and methods - Introducing new products - Cost evaluation.

Case studies of marketing research

9 Hours

Unit V

Protection of Innovation

Intellectual property (IP) - Classes of IP – Industrial property and copyrights - Intellectual Property Rights (IPR) – Patents - Patentability- Patent acts - Governing laws - History of patent laws and acts - Patent administration - Patenting process – Patent application - Patent search – Prosecution – Publication – Examination – Opposition – Grant - Renewal - Patent rights - International code for patents.

Introduction to Patents vis-à-vis economics

9 Hours

Total: 45 Hours

Textbooks

1. Tom Kelly, *The Art of Innovation*, Doubleday- Random House Inc., USA, 2001.
2. *Managing Creativity and Innovation* (Harvard Business Essentials), Harvard Business School, 2003

References

1. Brain Twiss, *Managing Technological Innovation*, Pitman Publishing Ltd., 1992.
2. Harry B. Watton, *New Product Planning*, Prentice Hall Inc., 1992.
3. Paul Birch and Brian Clegg, *Business Creativity – A Guide for Managers*, Kogan Page- London- 1995.
4. Leigh L. Thompson and Hoon-Seok Choi, *Creativity and Innovation in Organizational Teams*, Lawrence Erlbaum Associates, USA, 2006.
5. Paul E. Plsek, *Creativity- Innovations and Quality*, Irwin Professional, USA, 1997.
6. Alan G. Robinson and Sam Stern, *Corporate Creativity: How Innovation and Improvement Actually Happen*, Berrett-Koehler Publishers, USA, 1998.

11C024 REMOTE SENSING AND GIS

3 0 0 3.0

COURSE OBJECTIVES

- To impact knowledge on the principles of Remote Sensing and its limitations
- To impact knowledge on the basic characteristics of remote sensing imagery
- To provide a basic understanding of GIS modeling concepts, components, requirements and applications

PROGRAMME OUTCOMES (POs)

1. Able to apply the fundamental knowledge of mathematics, science and engineering.
4. Able to use the techniques, skills and modern Civil Engineering tools necessary for engineering practice.
8. Able to function on multidisciplinary teams.

COURSE OUTCOMES (COs)

1. Analyze a remotely sensed data using the scientific method to address an inquiry based study
2. Acquire and create spatial data from satellite imagery, printed maps, online sources, GPS, etc.
3. Develop spatial and temporal models for presentation, analysis and decision-making
4. Achieve competency in the use of the RS and GIS software packages
5. Designing and executing a workflow using RS and GIS techniques appropriate to an applied field

PREREQUISITES:

Knowledge of Survey I & II

ASSESSMENT PATTERN

S. No.		Test I†	Test II†	Model Examination†	Semester End examination
1	Remember	20	20	20	20
2	Understand	60	60	60	60
3	Apply	20	20	20	20
4	Analyze / Evaluate	-	-	-	-
5	Create	-	-	-	-
	Total	**100**	**100**	**100**	**100**

Unit I

Remote Sensing

Definition and its components - Electromagnetic spectrum – wavelength regions important to remote sensing – Wave theory, Particle theory, Stefan-Boltzman and Wein's Displacement Law – Atmospheric scattering, absorption – Atmospheric windows – spectral signature concepts – typical spectral reflective characteristics of earth surface, water, vegetation and soil- – Platform and Sensors.

Indian remote sensing satellites

9 Hours

† The marks secured in Test I and II will be converted to a maximum of 20and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks

Unit II

Image Interpretation and Analysis

Types of Data Products – Types of image interpretation – Basic elements of image interpretation - Visual interpretation keys – Digital Image Processing – Pre-processing – Image enhancement techniques – Multispectral Image classification – Supervised and unsupervised.

Indian remote sensing data policy

9 Hours

Unit III

Geographic Information System

Maps –Map projections – Types of map projections- GIS definition – Basic components of GIS –- Data type – Spatial and non-spatial data – Database concepts – Files and data formats – Vector and Raster data structures, Data compression, Edge matching.

Standard RS and GIS packages

9 Hours

Unit IV

Data Input Editing and Analysis

Data stream – Input methods –GPS for data capture-Editing- Data Retrieval – Query – Simple Analysis – Spatial Analysis – Overlay – Vector Data Analysis – Raster Data Analysis- Topological analysis – Modeling surfaces – DEM –DTM – Slope Model - Integration of Remote Sensing and GIS.

Data input by digitization and scanning

9 Hours

Unit V

RS and GIS Applications in Resource Management

Fields of Applications- Land use and Land cover classification – Natural Resources – Agriculture – Soil – Water Resources – Wasteland Management - Social Resources - Cadastral Records – Land Information System.

RS and GIS applications in Highway alignment

9 Hours

Total: 45 Hours

Textbook

1. M. Anji Reddy, *Remote sensing and Geographical Information Systems*, Third Edition, BS Publications, India, 2002.

References

1. T.M. Lillesand and R.W. Kicter, *Remote Sensing and Image interpretation*, John Willey and sons, inc. New York, 2002.
2. Sabins, F.F.Jr, *Remote sensing principles and interpretation*, W.H.Freeman & Co., 1978.
3. Paul A Longley, Michael F Goodchild, *Geographical Information Systems Volume I and II*, Second Edition, John Wiley Publications, 1999.
4. P.A, Burrough, *Principles of GIS for Land Resources Assessment*, Oxford Publication, 2000
5. Michael N Demers, *Fundamentals of Geographical Information Systems*, Second Edition, John Wiley Publications, 2002

11C025 GREEN BUILDINGS

3 0 0 3.0

COURSE OBJECTIVES

- To impart knowledge on the sustainable construction strategies.
- To introduce the concept of green buildings.

PROGRAMME OUTCOMES (POs)

5. Able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.
6. Able to work on the basis of broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context.
8. Able to function on multidisciplinary teams.

COURSE OUTCOMES (COs)

1. Select a suitable sustainable construction strategies and to introduce the concept of green buildings .
2. Determine the building rating systems and the process and implementation of green buildings

PREREQUISITES:

Knowledge of Building Materials, Environmental Science and Physics

ASSESSMENT PATTERN

Sl. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	20	20	20	20
2	Understand	30	30	30	30
3	Apply	30	30	30	30
4	Analyze	20	20	20	20
5	Evaluate	-	-	-	-
6	Create	-	-	-	-
	Total	**100**	**100**	**100**	**100**

Unit I

Sustainable Construction and Green Building Requirements

Ethics and sustainability – Increased Co_2 trade – Sustainable construction – Major environmental and resource concerns – Green building movement and obstacles – Green building requirements – Perceived use – Relationship between comfort level and performance ability

Perceived use of green building

9 Hours

Unit II

Green Building Process and Assessment

Conventional versus green building delivery systems – Execution of green building process – Integrated design process – Ecological design – Merits and demerits – Historical perspective – Contemporary and future

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks

ecological designs – LEED building assessment standard – LEED certification process – International building assessment standards – Building rating system and its future – Case study of a green building
Case study of a green building

9 Hours

Unit III

Sustainable landscaping, Energy and Atmosphere

Land and landscape approaches for green buildings – sustainable landscapes – Enhancing ecosystems – Storm water management – Heat island mitigation – Building energy issues – Building energy design strategies – Building envelope – Active mechanical systems – Electrical power systems – Innovative energy optimization strategies – Smart buildings and energy management systems – Ozone depleting chemicals in HVAC&R and fire suppression
Storm water management

9 Hours

Unit IV

Building Hydrologic System and Material Loops

Energy policy act of 1992 – High performance building hydrologic strategy – High performance building water supply strategy – High performance building wastewater strategy – Landscaping water efficiency – Green building materials issues and priorities – Difference between green building buildings and green building materials – LCA of building materials and products - Emerging construction materials and products – Design for deconstruction and disassembly – Closing material loops in practice
High performance building wastewater strategy

9 Hours

Unit V

Green Building Implementation

Site protection planning – Health and safety planning – Construction and demolition waste management – Reducing the footprint of construction operations – Essentials of building commissioning – Costs and benefits of building commissioning – Case for high performance green buildings – The economics of green buildings – Quantifying green building costs – Future directions in green buildings
Case for high performance green buildings

9 Hours
Total: 45 Hours

Textbooks

1. Charles. J. Kibert, Sustainable Construction: Green Building Design and Delivery, John Wiley & Sons, Inc., New Jersey, 2008
2. M. Bauer, P. Mosle and M. Schwarz, Green Building: Guidebook for Sustainable Architecture, Springer - Verlag Berlin Heidelberg, 2010

References

1. Jerry Yudelson, Marketing Green Building Services: Strategies for success, Elsevier, 2008
2. Jerry Yudelson, Marketing Green Buildings: Guide for Engineering, Construction and Architecture, The Fairmont Press Inc., 2006
3. Angela. M. Dean, Green by Design: Creating a Home for Sustainable Living, Gibbs Smith Publication, 2003

11C026 PREFABRICATED STRUCTURES

3 0 0 3

COURSE OBJECTIVES

- To impart knowledge on prefabricated elements and the technologies used for fabrication and erection
- To impart knowledge on the applications of prefabricated elements in construction

PROGRAMME OUTCOMES (POs)

5. Able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.

COURSE OUTCOMES (COs)

1. Understand the general principles of fabrication
2. Design of simple rectangular beams and I beams
3. Demonstrate the suitable techniques for erection of different types of members like beams, slabs, wall panels and columns

PREREQUISITES:

Knowledge of Concrete Technology, Design of RCC Elements and Structures

ASSESSMENT PATTERN

Sl. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	20	20	20	20
2	Understand	40	40	40	40
3	Apply/ Evaluate	40	40	40	40
4	Analyze	-	-	-	-
5	Create	-	-	-	-
Total		**100**	**100**	**100**	**100**

Unit I

General Principles of Fabrication

Comparison with monolithic construction – Types of prefabrication – site and plant prefabrication - Economy of prefabrication – Modular coordination – Standardization – Planning for Components of prefabricated structures – Disuniting of structures – Design of simple rectangular beams and I beams – Handling and erection stresses – Elimination of erection stresses – Beams, columns – Symmetrical frames

9 Hours

Unit II

Prefabricated Elements

Roof and floor panels, ribbed floor panels – wall panels – footings – Joints for different structural connections – Effective sealing of joints for water proofing – Provisions for non-structural fastenings – Expansion joints in pre-cast construction.

9 Hours

† The marks secured in Test I and II will be converted to a maximum of 20and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks.

Unit III

Production Technology

Choice of production setup – Manufacturing methods – Stationary and mobile production – Planning of production setup – Storage of precast elements – Dimensional tolerances – Acceleration of concrete hardening.

9 Hours

Unit IV

Hoisting Technology

Equipments for hoisting and erection – Techniques for erection of different types of members like Beams, Slabs, Wall panels and Columns – Vacuum lifting pads.

9 Hours

Unit V

Applications

Designing and detailing of precast unit for factory structures – Purlins, Principal rafters, roof trusses, lattice girders, gable frames – Single span single storeyed frames – Single storeyed buildings – slabs, beams and columns.

9 Hours

Total: 45 + 15 Hours

Textbook

1. L. Mokk, *Prefabricated Concrete for Industrial and Public Structures*, Publishing House of the Hungarian Academy of Sciences, Budapest, 2007.

References

1. T. Koncz, *Manual of Precast Concrete Construction*, Vol. I, II, III & IV, Berlin, 1971
2. B. Lewicki, *Building with Large Prefabricates*, Elsevier Publishing Company, Amsterdam, London, New York, 1998
3. *Structural Design Manual, Precast Concrete Connection Details*, Society for the Studies in the use of Precast Concrete, Netherland Betor Verlag, 2009

11C027 CONTEMPORARY LANDSCAPES

3 0 0 3.0

Unit I

Introduction

Introduction to Landscape Architecture

3 Hours

Unit II

Designs

Contemporary designs- design, shape, and nourish greenscapes within existing ecosystems

6 Hours

Unit III

Features of Landscapes

Types of Gardens - Garden Designs - Paving - Retaining Walls - Decks & Pergolas - Water Features - Lighting Systems - Irrigation Systems.

6 Hours

Unit IV

The Evolution of the Modern Landscape

Industrialization and urbanization – impacts and development of the concept of public open spaces, open space development in new towns, parks movement. Open space development and its urban design and planning context, Early industrial towns and the garden city movement. Public park as a major component of urban landscape, the works of F.L.Ohmstead, and other pioneers. Open space development and Close conceptual relationship between Town planning, urban design and landscape architecture. Examples.

15 Hours

Unit V

Modern Landscape Concepts

The Modern Movement, Contemporary Concepts And Concerns Changing concepts of space and the relationship of architecture to landscape. Study of selected works of modern architects and landscape architects. Postwar development in Europe. The influence of Ian Mcharg on Landscape architecture. The works of Jellicoe, Burle Marx and others. Concept of sustainable landscape development, Cultural landscapes their definition, identification, characteristics, policies, Artistic sensibility in landscape architecture and land art, New development in urban Landscape design.

15 Hours

Total: 45 Hours

Books and References

1. Geoffrey and Susan Jellico, The landscape of Man, Thames & Hudson Publication, 1995
2. Robert Holden, New landscape Design, Lawrence king publishing, UK, 2003

11C028 SUSTAINABLE LANDSCAPE AND GREEN BUILDING DESIGN DESIGNS

3 0 0 3.0

Unit I
Introduction

Attitudes to architecture: a historical perspective- General premises and strategies for sustainable and green design- COURSE OBJECTIVES (COs) and basis- Eco-mimicry as a design tool based on ecosystem analogytheoretical basis for a sustainable and eco friendly design.

9 Hours

Unit II
Eco House

The form of the house: the building as an analogy- design from first principles: conserving energy; working with climate: passive solar design; minimizing new resources; respect for users; respect for site and holism- photovoltaics and solar hot water systems; water usage; small scale wind systems and hydro power; Case studies- Studio project on design of eco houses: context specific.

9 Hours

Unit III
Environmental Impact of Building Materials

Measuring the impact of building materials- calculating embodied energy- recycling and embodied energy- processing and embodied energy- time and embodied energy- embodied energy of different building materials- low energy building and masonry materials- life cycle analysis- Case studies and analysis.

9 Hours

Unit IV
Green Construction and Environmental Quality

Sustainable architecture and Green Building: definition- Green building Evaluation Systems; LEED Certification; Green Globe Certification; Case studies which look at the environmental approach- renewable energy- controlling the water cycle- impact of materials on the environment – optimizing construction- site management- environmental management of buildings

9 Hours

Unit V
Sustainable and Green Building Design Studio

This studio will explore collaborative learning to explore, investigate and apply various parameters of sustainability for design development of projected building/ urban scenarios

9 Hours
Total: 45 Hours

Books and References

1. Ken Yeang; Eco design - A Manual for Ecological design, Wiley- Academy; 2006
2. Thomas E Glavinich; Green Building Construction; Wiley; 2008
3. Brenda and Robert Vale; Green Architecture- Design for a Sustainable Future; Thames and Hudson; 1996
4. Daniel Vallero and Chris Brasier; Sustainable Design- The science of sustainability and Green Engineering; Wiley; 2008

11CO29 ECOLOGICAL LANDSCAPE PLANNING

3 0 0 3.0

Unit I

Ecology

Understanding the ecosystem and their functioning — components of ecosystem - natural process- Fundamentals of ecology - Ecological processes and dynamics– understanding ecological concepts like population growth, regulation, carrying capacity- colonization and succession - stability and resilience of ecosystem – ecosystem degradation.

9 Hours

Unit II

Landscape Ecology

Introduction to landscape ecology – formation of various landforms – landforms and landscape process – pattern and structure of landscapes– concepts of patch, corridor and matrix - landscape dynamics and function – topological and chorological process within landscape - concept of landscape metrics – understanding dynamic interaction between landscape structure and function – ecological services of landscape.

9 Hours

Unit III

Landscape Planning

Relationship between man and nature – analytical aspect of landscape - the natural and cultural setting - evolution of landscape planning –concepts and projects of McHarg, Carl Steinite, Warren Manning, Augus Hills, Phil Lewis – Izank Zonneveld, Ervin Zube - landscape planning models – METLAND concept

9 Hours

Unit IV

Process in Landscape Planning

The purpose of landscape planning – domain and context for landscape planning – principles of planning – procedure in landscape planning - problem defining, goal setting, inventory and analysis - basic of collecting and analyzing, projecting and presenting data in landscape planning, visual assessment and aesthetic dimension.– Suitability analysis – techniques for identifying preferences - Planning options – proposing landscape plan.

9 Hours

Unit V

Case Studies: Landscape Planning

Reclamation and restoration of derelict landscapes - conservation and preservation of ecological fragile areas such as wetlands, creeks etc. - conservation ordinances. Case studies on landscape regional planning - policies and landscape.

9 Hours

Total: 45 Hours

Books and References

1. Richard T.T.Forman & Michel Godron , Landscape Ecology, John Wiley & Sons; 1986
2. Tom Turner, Landscape Planning and Environmental Impact Design, UCL Press, London, 1998.
3. Geoffrey and Susan Jellico, The landscape of Man, Thames & Hudson Publication, 1995
4. Robert Holden, New landscape Design, Lawrence king publishing, UK, 2003
5. Design for Human Ecosystems: Landscape, Land Use and Natural Resources, Van Nostrand Rheinhold

11CO30 LANDSCAPE CONSTRUCTION I

3 0 0 3.0

Unit I

Landscape Graphics

Symbols of representation of landscape elements in plan, elevation and section.

5 Hours

Unit II

Design of Landforms

Contours – representation of landforms and landform design, interpolation of contours, slope analysis, uses and function.

Grading – symbols and abbreviations, basic grading exercises, grading alignment of paths/roads, angle of repose and use of retaining walls.

15 Hours

Unit III

Earthwork Formation

Earth works – principles of earth work, cut and fill calculations – borrow pit method, average end area method, average spot level method, precautions taken in cut and fill methods in relation to soil conditions, amount of precipitation etc.,

12 Hours

Unit IV

Hard Landscapes

Design and detail of hard landscapes – Roads, paving, barriers, edge conditions – functions, types, criteria for selection, design aspects, details.

12 Hours

Unit V

Outdoor Furniture

Criteria for the selection of materials and specifications for the street furniture in various environments. Design of signage and simple outdoor structures like pavilions, gazebos etc., Use of waste materials in landscape, recycling and reuse of materials, their impact on landscape design. Preparation of working drawings for hard landscaping and services.

16 Hours

Total: 45 +15 Hours

LIST OF STUDIO WORKS

1. Simple site planning exercises - use of plant materials for defining and structuring the open spaces, landscape treatment in relation to the buildings, understanding the aesthetic qualities of the plant materials and their associations.
2. Campus landscape Design
3. Group Housing Design - specialized human landscapes at different situations
4. Park and Garden Design - Understanding the function and structuring of outdoor space would be the underlying theme

Books and References

1. Strom Steven, Site engineering for landscape Architects, John wiley and sons Inc.,2004.
2. Charles.W.Harris & Nicholas T. Dines, Time saver Standards for Landscape Architecture, Mc. Graw Hill.
3. Jack E. Ingels, Landscaping – Principles & Practices , Pelmer Publishers Inc., 1992
4. Grant W Reid, Landscape Graphics, Watson – Guptill publication, New York, 1987.
5. David Sauter, Landscape Construction, Pelmer Thomson Learning, 2000.
6. Michael Little wood, Landscape Detailing Volume I -IV, Architectural Press, 1993.
7. Naoki Mukoda, Street furniture, Bijutsu shuppan – sha Ltd., 1990.

11C031 LANDSCAPE PLANTING DESIGN

3 0 0 3.0

Unit I
Introduction to Planting Design

Introduction to planting design. Plants as living materials, landscape architect's view of plants. Plants as structural, functional and decorative elements. Structural characteristics of plants. Spatial functions of plants, ground level planting, below knee height, knee to eye level, above eye level planting, tree planting.

9 Hours

Unit II
Creating Spaces with Plants

Experience of spaces, use of planting to manipulate spatial experience, elements of spatial composition – enclosure, dynamics and focus. Plant associations. Plant communities, Designing with canopy layers – 3 layers, 2 layers and single layer. Plants as a part of integral habitats.

9 Hours

Unit III
Visual Composition in Planting Design

Subjective and objective responses to plant material. A study on form, shape, colour, texture, growth characteristics and suitability to different environments. Principles of visual composition- harmony and contrast, Balance, Emphasis, Sequence, Scale, Unity and variety in planting design.

9 Hours

Unit IV
Planting Design for Habitat Creation

Planting strategies and species for various types of habitats – wooded areas, grassland and meadows, wetlands, coastal edges, waterside and aquatic planting, slope retention, and plants for restoration of disturbed habitats.

9 Hours

Unit V
Applications in Practice

Study of local plant materials, their botanical, common and regional names, growth characteristics and application in design. Visit to nurseries. Introduction to soft landscape working drawings, planting plans, specifications and estimation.

9 Hours
Total: 45 Hours

References:

1. Nick Robinson, The Planting Design Hand book, Gower Pub., 1998
2. Brian Hackett, Planting Design, McGraw hill, 1979.
3. Bose. T. K. and Choudhary, Tropical Garden Plants in Colour, Horticulture and Allied Publishers, 1991.
4. Iyengar Gopalaswamy, Complete Gardening in India, Gopalaswamy Partha sarathy, 1991.
5. M.S. Randhawa, Flowering trees of India, National Book Trust , India, 1983.
6. Design with Nature, by Ian McHarg
7. Landscape Graphics By Grant Reid

11C032 ADVANCED LANDSCAPE CONSTRUCTION II

3 0 0 3.0

Unit I

Outdoor Lighting

Definition of technical terms, types of electrical lighting, types of fixtures, auxiliary fixtures. Principles of design for outdoor illumination, design and type of effects with electrical lighting. Safety precautions and drawbacks of electrical lighting, electrical accessories and their installation. Solar energy and lighting.

12 Hours

Unit II

Play Area and Terrace Landscaping

Design of play areas -Totlots to play grounds. Design and detail of play equipments. Considerations, design and detail for terrace landscaping, concept of green roof - intensive and extensive.

12 Hours

Unit III

Water Features

Design of water features such as swimming pools, cascades, fountains etc., and their technical requirements. Consideration for design and detail. Water bodies and natural ponds. Design of irrigation system – landscape area types, COURSE OBJECTIVES (COs) and design, water needs and sources, application, methods of installation. Control systems, scheduling and maintenance.

12 Hours

Unit IV

Storm Water Management

Drainage – surface drainage, calculation of surface run off, design of surface and storm water drainage, design of swales and gutters.

12 Hours

Unit V

Water Resources Planning

Water shed and their characteristics, urban storm water drainage systems, protection of natural water bodies, water retention structures, water harvesting techniques and devices.

12 Hours

Total: 45 + 15 Hours

LIST OF STUDIO WORKS

1. The studio exercises involving urban context
2. Exercise on historical, industrial, Instutional and recreational landscape
3. Exercise on ecologically sustainable development

Books and References:

1. David Sauter, Landscape Construction, Pelmer Thomson Learning, 2000.
2. Michael Little wood, Landscape Detailing Volume I-IV, Architectural Press, 1993.
3. Roger Narboni, Lighting the Landscapes- Art Design technologies, Birkhauser, Switzerland, 2004.
4. Halpeth, T.Senthilkumar, G.Harikumar, Light Right, TERI, New Delhi, 2004.
5. Charles.W.Harris & Nicholas T. Dines, Time saver Standards for Landscape Architecture, Mc. Graw Hill.

11C033 LANDSCAPE PLANTING AND HORTICULTURAL PRACTICES

3 0 0 3.0

Unit I
Characteristics of Plant Materials

Classification of plant kingdom, rules of nomenclature and identification. Plant processes, water relation, mineral nutrition, photosynthesis and respiration. Stem, root and leaf relationship, growth and flowering, response to stimuli and modification. Plant multiplication and adaptation.

9 Hours

Unit II
Floristic Regions of India

Different floristic regions and forest types of India. Dominant, endemic, occasional, prevalent species in select types.

9 Hours

Unit III
Plant Propagation

Nursery establishment and plant propagation. Establishment and maintenance of grass, shrubs and trees with respect to ground preparation, planting and transplanting, protection of plants during and after planting.

9 Hours

Unit IV
Horticultural Practice

Plant nutrition and supplements. Fertilizers and Manures- types, methods of applications, advantages and disadvantages. Common plant pests, diseases and their control, insecticides and their application, weed control. Sustainable practices in pest management and weed control. Water budgeting .

9 Hours

Unit V
Landscape Maintenance

Maintenance methodology, maintenance economics and maintenance details for all soft landscape. Equipment for landscape maintenance.

9 Hours
Total: 45 Hours

Books and References:

1. Raunkier.C., the Life forms of Plants and statistical plant geography, 1934.
2. Venkateswaralu.V.A., Text book of Botany, Vol III, Guntur.
3. Lawrence.H.M., Taxonomy of vascular plants, Oxford, IBH, 1964.
4. Rao.K.N.R. and Krishnamurthy.K.N., Angiosperms, S.Viswanathan Printers and publishers.
5. G.S.Puri, Forest types of India.

11C034 URBAN LANDSCAPE DESIGN

3 0 0 3.0

Unit I
Introduction

City and pattern – hierarchy of streets and squares – spatial organization and land use – road net works and basic services. Open spaces with in urban environment.

9 Hours

Unit II
Urban Spaces

Cultural, social and aesthetic value of urban spaces and its perception, Imageability, Townscape elements. Urban space enhancement.

9 Hours

Unit III
Open Space System

Open space development in urban design context. Evolution of public park as a major component of urban landscape. Open space development in new towns. Park systems, water fronts. Green infrastructure. Urban ecology, urban water sheds.

9 Hours

Unit IV
Elements in Urban Landscape

Design of public parks, roads, green ways, parkways, promenade and plaza. Public art.
Plant selection criteria, furnishings and lighting of public space, maintenance and management of public spaces and parks.

9 Hours

Unit V
Case Studies

Contemporary urban landscape issues. Case studies-Study, understanding and analysis of known examples at the national and international levels.

9 Hours
Total: 45 Hours

Books and References:

1. Garden Cullen, The concise Townscape, Architectural press, London.
2. Kevin Lynch, Image of City, Cambridge, MA, 1961.
3. Henry F. Arnold, Trees in Urban Design, Van Nostrand Reinhold Company.
4. Matthew Carmona, Tim Heath, Public places – Urban spaces, Architectural press, 2003.
5. Michael Hough, Cities and natural process, Routledge, 1995.
6. Donald Watson, Alan plattns, Roberta shibley, Time savers standards for urban design, McGraw hill, 2003.
7. Elements and total concept of urban landscape design, Graphic –sha publishing Co, 2001.
8. Tom turner, city as landscape, Eand FN spon, 1996.
9. Cliff Tandy, Handbook of urban Landscape, Architectural Press, 1970.
10. Landscape Architecture Design By D.K Ching

11O0PA NANO SCIENCE AND TECHNOLOGY

3 0 0 3.0

COURSE OBJECTIVES

- To impart knowledge on nanoscience and technology.
- To create an awareness on the nanomaterials.
- At the end of the course the students are familiar with nanomaterials and their applications.

PROGRAMME OUTCOME (PO)

1. an ability to apply knowledge of mathematics, science, and engineering

COURSE OUTCOMES (COs)

1. Making to learn properties of nanomaterials.
2. Study the different types of techniques used to develop the nanomaterials.
3. Understanding the various applications of nanomaterials in day-to-day life.
4. Utilization of nanomaterials into medical and industries to develop technology.

ASSESSMENT PATTERN

S.No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	25	25	20	20
2	Understand	25	25	25	25
3	Apply	20	20	20	20
4	Analyze	20	20	20	20
5	Evaluate	10	10	15	15
6	Create	-	-	-	-
Total		**100**	**100**	**100**	**100**

Unit I

Nano Scale Materials

Introduction-classification of nanostructures, nanoscale architecture – effects of the nanometer length scale – changes to the system total energy, changes to the system structures– effect of nanoscale dimensions on various properties – structural, thermal, chemical, mechanical, magnetic, optical and electronic properties.

Differences between bulk and nanomaterials and their physical properties. **9 Hours**

Unit II

Nanomaterials Synthesis Methods

Fabrication methods – top down processes – milling, litho graphics, machining process – bottom-up process – vapor phase deposition methods, plasma-assisted deposition process, colloidal and solgel methods – methods

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks

for templating the growth of nanomaterials – ordering of nanosystems, self-assembly and self-organization.

Magnetron sputtering process to obtain nanomaterials. **9 Hours**

Unit III

Nano Characterization Techniques

General classification of characterization methods – analytical and imaging techniques – microscopy techniques - electron microscopy, scanning electron microscopy, transmission electron microscopy, atomic force microscopy – diffraction techniques – spectroscopy techniques-X-ray spectroscopy.

Electrical properties of nanomaterials. **9 Hours**

Unit IV

Inorganic Semiconductor Nanostructures

Quantum confinement in semiconductor nanostructures - quantum wells, quantum wires, quantum dots, super lattices– fabrication techniques – requirements, epitaxial growth, lithography and etching, electrostatically induced dots and wires, quantum well width fluctuations, thermally annealed quantum wells and self-assembly techniques .

Quantum efficiency of semiconductor nanomaterials. **9 Hours**

Unit V

Nanodevices and Applications

Organic FET- principle, description, requirements, integrated circuits- organic LED's – basic processes, carrier injection, excitons, optimization - organic photovoltaic cells- carbon nano tubes- structure, synthesis and electronic properties -applications- fuel cells- nano motors -bio nano particles-nano – objects.

Applications of nano materials in biological field. **9 Hours**

Total: 45 Hours

Textbooks

1. Robert W. Kelsall, Ian W. Hamley, Mark Geoghegan, *Nanoscale Science and Technology*, John Wiley and Sons Ltd, 2005.
2. T. Pradeep, *NANO: The Essentials Understanding Nanoscience and Nanotechnology*, McGraw – Hill Education (India) Ltd, 2007.
3. *Handbook of Nanoscience, Engineering and Technology*, Kluwer publishers, 2002.
4. B. Wang, *Drug Delivery: Principles and Applications*,Wiley Interscience 2005.

References

1. Michael Kohler, Wolfgang Fritzsche, *Nanotechnology: An Introduction to Nanostructuring Techniques*, Wiley-VCH Verlag GmbH & Co.2004.
2. William Goddard, Donald .W.Brenner, *Handbook of Nano Science Engineering and Technology*, CRC Press, 2004.
3. Bharat Bhushan, *Springer Handbook of Nanotechnology*, 2004.
4. Charles P.Poole, Frank J Owens, *Introduction to Nanotechnology*, John Wiley and Sons, 2003.
5. Mark Ratner, Daniel Ratner, *Nanotechnology: A Gentle Introduction to the Next Big Idea*, Prentice Hall, 2003

11O0PB LASER TECHNOLOGY

3 0 0 3.0

COURSE OBJECTIVES

- To impart knowledge on laser principles.
- To create expertise on the applications of laser in various engineering fields.
- At the end of the course the students are familiar with generation and applications of laser in various engineering fields.

PROGRAMME OUTCOME (PO)

1. Able to apply the fundamental knowledge of mathematics, science and engineering**.**

COURSE OUTCOMES (COs)

1. Study the basic principle of laser and different types of lasers.
2. Analyze the function resonant cavity.
3. Describe the various techniques involved in the laser materials and determine the performance of laser materials.
4. Determine the measurement of distance, length, velocity, acceleration, current, voltage and atmospheric effect.
5. Design different types of lasers and apply in the medical field.

ASSESSMENT PATTERN

S.No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	25	25	20	20
2	Understand	25	25	25	25
3	Apply	20	20	20	20
4	Analyze	20	20	20	20
5	Evaluate	10	10	15	15
6	Create	-	-	-	-
Total		**100**	**100**	**100**	**100**

Unit I

Laser Fundamentals

Introduction - principle - spontaneous emission - stimulated emission - population inversion-Pumping mechanisms - characteristics. Types of lasers –principle, construction, working, energy level diagram and applications of dye laser – chemical laser – excimer laser.

Laser action. **9 Hours**

Unit II

Threshold Condition

Einstein coefficients A and B – spontaneous life time – light amplification – principle of laser action – laser oscillations – resonant cavity – modes of a laser.

Conditions involved in laser production. **9 Hours**

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks

Unit III

Laser Materials

Activator and host materials for solid lasers - growth techniques for solid laser materials - Bridgman and Stock-Berger technique – advantages and disadvantages - Czochralski and Kyropoulous techniques – merits and demerits.

Techniques of producing laser. **9 Hours**

Unit IV

Laser in Science

Introduction – harmonic generation – stimulated Raman emission – self focusing – laser and ether drift – rotation of the earth – photon statistics.

Applications of Laser in ranging. **9 Hours**

Unit V

Laser in Industry

Introduction – Applications in material processing: laser welding – hole drilling – laser cutting – laser tracking – Lidar – laser in medicines

Applications of Laser in sensors. **9 Hours**

Total: 45 Hours

Textbooks

1. K.Thiyagarajan and A.K.Ghatak, *LASER:Theory and applications.* Macmillan India Limited, 2000.
2. M. N. Avadhanulu, *An Introduction To Lasers Theory And Applications*, S. Chand Publisher, 2001.

References

1. K.P.R.Nair, *Atoms, Molecules and Lasers*, Narosa Publishing House, 2009.
2. K. R. Nambiar**,** *Lasers: Principles Types And Applications*, New Age International Publications, 2006.
3. Alphan Sennaroglu, *Solid-State Lasers and Applications*, CRC Press, 2006

11O0PC ELECTRO OPTIC MATERIALS

3 0 0 3.0

COURSE OBJECTIVES

- To impart knowledge on electro-optic materials.
- To develop fundamental understanding of various electro-optic materials in communication.

PROGRAMME OUTCOME (PO)

1. Able to apply the fundamental knowledge of mathematics, science and engineering.

COURSE OUTCOMES (CLOs)

1. Understanding the mechanism involved in the laser action.
2. Knowing the birefringence and optical property of the material.
3. Implementing the above phenomenon for modulators.
4. Realize the special optical properties of the system.

ASSESSMENT PATTERN

S.No.		Test I†	Test II†	Model E0mination†	Semester End Examination
1	Remember	25	25	20	20
2	Understand	25	25	25	25
3	Apply	20	20	20	20
4	Analyze	20	20	20	20
5	Evaluate	10	10	15	15
6	Create	-	-	-	-
Total		**100**	**100**	**100**	**100**

Unit I

Basics of Lasers

Introduction – Einstein coefficients – laser beam characteristics – spontaneous and stimulated emission population inversion - light amplification – threshold condition – laser rate equations – two level laser – three level laser – mode selection – transverse mode – longitudinal mode.

Spatial and temporal coherence.

9 Hours

Unit II

Wave Propagation in Anisotropic Media

Introduction – double refraction – polarization devices - Nicol prism – Glan-Thomson prism – retardation plates – Soleil Babinet compensator – Plane waves in anisotropic media – wave refractive index - ray refractive index - ray velocity surface – index ellipsoid.

Optical activity.

9 Hours

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks

Unit III

Electro Optic Effect

Introduction – KDP crystals – longitudinal mode – phase modulation – amplitude modulation – transverse mode. Acousto-optic effect – small Bragg angle diffraction – large Bragg angle diffraction – codirectional coupling – contradirectional coupling - applications.

Modulators.

9 Hours

Unit IV

Non Linear Optics

Introduction – self focusing phenomenon – second harmonic generation – phase matching – birefringent phase matching – quasi phase matching – frequency mixing. Semiconductors – measurement of third order optical non-linearities in semiconductors.

Frequency doubling nature of materials.

9 Hours

Unit V

Electro Optic Devices

Introduction – light emitting diode – direct and indirect band gap materials – homo junction – hetero junction – advantages – disadvantages – applications. Injection laser diode – characteristics – advantages – disadvantages. Liquid crystal displays – dynamic scattering – field effect – advantages – disadvantages.

Optoelectronic devices.

9 Hours

Total 45 Hours

Textbooks

1. Ajoy Ghatak and K. Thyagarajan, *Optical electronics*, Cambridge University Press, 7th reprint 2006.
2. B. Somanathan Nair, *Electronic devices and applications*, Prentice - Hall of India private limited, 2010.
3. Frank L. Pedrotti, S. J. Leno S. Pedrotti and Leno M. Pedrotti, *Introduction to optics*, Pearson Prentice Hall, 2008.

References

1. Ji - ping Huang and K.M.Yu, *New Non Linear Optical Materials*, Nova, Science Publishers, 2007.
2. S.C. Gupta, *Opto electronic devices and systems*, Prentice Hall of India, Pvt. Ltd, 2005

11O0PD VACUUM SCIENCE AND TECHNOLOGY

3 0 0 3.0

COURSE OBJECTIVES

- To impart a sound knowledge on the vacuum science.
- To develop the necessary background to perform projects involving vacuum and deposition techniques.

PROGRAMME OUTCOME (PO)

1. Able to apply the fundamental knowledge of mathematics, science and engineering.

COURSE OUTCOMES (COs)

1. Understanding the fundamentals of vacuum technology.
2. Understanding the various measuring instruments of vacuum.
3. Utilization of various components to create high vacuum.
4. Utilization of various components to measure the vacuum
5. Solution for the problems connected with high vacuum.

ASSESSMENT PATTERN

S.No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	25	25	20	20
2	Understand	25	25	25	25
3	Apply	20	20	20	20
4	Analyze	20	20	20	20
5	Evaluate	10	10	15	15
6	Create	-	-	-	-
Total		**100**	**100**	**100**	**100**

Unit I

Vacuum Systems

Introduction – units of vacuum – kinetic aspects of gases in a vacuum chamber – physical parameters at low pressures – classification of vacuum ranges – gas flow at low pressures – throughput and pumping speed – flow rate and conductance.

Evacuation rate – out gassing – gas flow – turbulent flow. **9 Hours**

Unit II

Production of Vacuum

Classification of vacuum pumps – rotary vane pumps – roots blowers – diffusion pumps – molecular drag and turbo-molecular pumps – sorption pumps – gettering and ion pumping – cryopumping measurement of pumping speed**.**

Noble pumps for inert gases. **9 Hours**

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks

Unit III

Pressure Measurement

Classification of gauges – mechanical gauges – McLeod gauge – thermal conductivity gauges – Hot cathode ionization gauges – Bayard - Alpert gauge – cold cathode ionization gauges – Penning gauge – magnetron gauge.

Measurement problems in partial pressure analysis. **9 Hours**

Unit IV

Vacuum Materials and Leak Detection

Sources of gases and vapours – materials for vacuum system – vacuum seals – vacuum valves – traps and baffles – leak detection – pressure test – spark-coil test – leak testing using vacuum gauges – halogen leak detector – mass-spectrometric leak detector.

Special design considerations – glass to metal seals – high voltage metal feedthrough. **9 Hours**

Unit V

Applications of Vacuum Systems

Design considerations – vacuum system for surface analysis – space simulators – vacuum based coating units for thin film deposition – thermal evaporation – sputtering process – chemical vapor deposition - metallurgical applications.

Plasma etching – pulsed vapour deposition – PE chemical vapour deposition. **9 Hours**

Total: 45 Hours

Textbooks

1. Rao V.V, Ghosh T.B, Chopra K.L, *Vacuum science and technology*, Allied Publishers Limited, 2005.
2. Dorothy M. Hoffman, John H. Thomas, Bawa Singh, *Handbook of Vacuum science and technology,* Elsevier Science & Technology Books, 1997.

References

1. David M. Hata, *Introduction to vacuum technology,* Pearson Printice Hall, 2007.
2. John F. O'Hanlon, *A user's guide to vacuum technology*, John Wiley & Sons, 2003.
3. Chambers.A, *Modern vacuum physic*, Chapman & Hall, CRC Press, 2005.

11O0PE SEMICONDUCTING MATERIALS AND DEVICES

3 0 0 3.0

COURSE OBJECTIVES

- To improve knowledge on semiconducting materials.
- To develop the necessary understanding of semiconducting materials and their applications.

PROGRAMME OUTCOME (PO)

1. Able to apply the fundamental knowledge of mathematics, science and engineering.

COURSE LEARNING OUTCOMES (COs)

1. Understanding the mechanism involved in the semiconductors.
2. Knowing the current components and current gain of the material.
3. Implementing the above phenomenon for transistors.
4. Realize the special properties of the semiconductors.

ASSESSMENT PATTERN

S.No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	25	25	20	20
2	Understand	25	25	25	25
3	Apply	20	20	20	20
4	Analyze	20	20	20	20
5	Evaluate	10	10	15	15
6	Create	-	-	-	-
Total		**100**	**100**	**100**	**100**

Unit I

Properties of Semiconductor

Energy bands – allowed and forbidden energy bands – Kronig Penny model – electrical conductivity in solids based on energy bands - band model – electron effective mass – concept of holes in semiconductor – density of states – extension to semiconductors.

k-space diagram **9 Hours**

Unit II

Carrier Transport Properties

Carrier drift – drift current density – mobility effects on carrier density – conductivity in semiconductor – carrier transport by diffusion – diffusion current density – total current density – breakdown phenomena – avalanche breakdown.

Graded Impurity Distribution **9 Hours**

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks

Unit III

P-N Junction Diode

Qualitative description of charge flow in p-n junction – boundary condition – minority carrier distribution – ideal p-n junction current – temperature effects – applications – the turn on transient and turn off transient.

Charge storage and diode Transients **9 Hours**

Unit IV

Bipolar Junction Transistor

Introduction to basic principle of operation – the modes of operation – amplification – minority carrier distribution in forward active mode – non-ideal effects – base with modulation – high injection emitter band gap narrowing – current clouding – breakdown voltage – voltage in open emitter configuration and open base configuration

Frequency Limitations **9 Hours**

Unit V

Opto Electronic Devices

Optical absorption in a semiconductor, photon absorption coefficient – electron hole pair generation - solar cell – homo junction and hetero junction - Photo transistor – laser diode, the optical cavity, optical absorption, loss and gain - threshold current.

Photoluminescence and Electroluminescence **9 Hours**

Total: 45 Hours

Textbooks

1. Donald A Neamen, *Semiconductor physics and devices,* Tata McGraw Hill, 2007.
2. Albert Malvino,David J Bafes, *Electronic Principles,* Tata McGraw Hill, 2007.

References

1. M.S. Tyagi, *Introduction to Semiconductor materials and devices*, John Wiley and sons, 2008.
2. S.M. Sze & K.Ng. Kwok, *Physics of semiconductor devices*, John Wiley and sons, 2008.
3. M. K. Achuthanand and K.N. Bhat, *Fundamentals of semiconductor devices*, Tata McGraw Hill, 2007.

11O0PF SOLAR CELLS

- - - 1.0

Course Objectives

• To gain knowledge about the solar radiation and solar cells
• To implement the application of solar cells

Course Learning Outcome (CO)

1. Able to apply the fundamental knowledge of mathematics, science and engineering

Programme Outcomes (POs)

1. Able to apply the fundamental knowledge of mathematics, science and engineering.
4. Able to use the techniques, skills and modern Civil Engineering tools necessary for engineering practice.
6. Able to work on the basis of broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context.

Solar cell: Introduction - fundamentals of photoelectric conversion: charge excitation, conduction, separation and collection. Design of solar cell: generation of photo voltage – I-V equation of solar cell – solar cell characteristics – optical properties – antireflection coating – light trapping. Types of solar cell – Si solar cells – Ga As solar cells – thin film solar cells – fabrication techniques - dye sensitized solar cells (DSSC) – operation and properties. Organic solar cell – schematic representation and material properties - flexible solar cells - quantum dot solar cells – principle and operation - hybrid solar cells. Commercial and emerging photovoltaic (PV) technologies – thermo photovoltaics (TPV). Case study: Generation of solar power in solar power plants.

Total: 15 Hours

References

1. Chetan Singh Solanki, *Solar Photovoltaics: Fundamentals, Technologies and Applications*, PHI Learning Private Limited, New Delhi, 2012.
2. Adrian Kitai *Principles of solar cells, LEDs and diodes: The role of the PN junction*, Wiley-Blackwell, 2011.
3. Tom Markvart and Luis Castaner, *Solar Cells: Materials, Manufacture and Operation*, Elsevier, 2010.
4. P. Wurfel, *Physics of Solar Cells - From Principles to New Concepts*, Springer, 2005.

11O0YA CHEMISTRY AND PROCESSING

3 0 0 3.0

COURSE OBJECTIVES

- To impart knowledge on the basic concepts and importance of polymer science, chemistry of polymers and its processing.
- To make understand the principles and applications of advanced polymer materials.
- Knowledge and application of different polymers and its processing.

PROGRAMME OUTCOME (PO)

1. Able to apply the fundamental knowledge of mathematics, science and engineering

COURSE OUTCOMES (COs)

1. Understanding the various types of polymers and its industrial application.
2. Compute the efficiency of polymer materials.
3. Development of eco-friendly materials.
4. Realize the advantages of nanocomposites polymers.

PREREQUISITES:

Knowledge of Environmental Science and Environmental Impact Assessment

ASSESSMENT PATTERN

S.No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	20	20	10	10
2	Understand	20	20	20	20
3	Apply	30	30	30	30
4	Analyze	20	20	20	20
5	Evaluate	10	10	20	20
6	Create	-	-	-	-
Total		**100**	**100**	**100**	**100**

Unit I

Principles of Polymer Science

Polymerization reactions - types – examples - degree of polymerization and average molecular weights. Thermoplastics and thermosetting resins - examples. Electrical - mechanical - thermal properties related to chemical structure. Insulating materials - polymer alloys - composites.

Importance of glass transition temperature.

9 Hours

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks

Unit II

Polymerization Mechanism

Addition polymerization - free radical mechanism - cationic and anionic polymerization - copolymerization - condensation polymerization –nylon 6,6, ring opening polymerization –nylon 6, coordination polymerization -. Preparation, properties and industrial applications of polystyrene and bakelite.

Application of industrial polymers.

9 Hours

Unit III

Polymerization Techniques

Homogeneous and heterogeneous polymerization – bulk polymerization- PMMA,PVC, solution polymerization - polyacrylic acid, suspension polymerization-preparation of ion exchange resins, emulsion polymerization-synthetic rubber. Melt solution and interfacial polycondensation. Salient features, advantages and disadvantages of bulk and emulsion polymerization.

Preparation of biodegradable polymers.

9 Hours

Unit IV

Additives for Polymers

Moulding constituents-fillers, plasticizers, lubricants, anti-aging additives, antioxidants, antiozonants, UV stabilizers, flame retardants, colorants, blow agents, crosslinking agents -functions-significance with suitable examples and applications in industrial processing.

Ecofriendly sustainable additives.

9 Hours

Unit V

Polymer Processing

Compression – injection - extrusion and blow mouldings. Film casting - calendering. Thermoforming and vacuum formed polystyrene, foamed polyurethanes. Fibre spinning - melt, dry and wet spinning. Composite fabrication - hand-layup - filament winding and pultrusion.

Application of fibre reinforced plastics.

9 Hours

Total: 45 Hours

Textbooks

1. V. R. Gowarikar, N. V. Viswanathan and Jayadev Sreedhar, *Polymer Science*, New Age International (P) Ltd., New Delhi, 2003.
2. Joel R. Fried, *Polymer Science and Technology*, Prentice Hall of India (P). Ltd., 2005.

References

1. F. W. Billmeyer, *Text Book of Polymer Science*, John Wiley & Sons, New York, 2007.
2. Barbara H. Stuart, *Polymer Analysis*, John Wiley & Sons, New York, 2002.
3. George Odian , *Principles of Polymerization*, John Wiley & Sons, New York, 2004.
4. R. J. Young and P. A. Lovell, *Introduction to Polymers*, Nelson Thornes Ltd., 2002.

11O0YB ENERGY STORING DEVICES AND FUEL CELLS

3 0 0 3.0

COURSE OBJECTIVES

- To make students understand the concept and working of different types of batteries and to analyze batteries used in electric vehicles.
- To make students learn about the concept of fuel cells, its types and to relate the factors of energy and environment.
- Students develop the skill of analyzing various energy storing devices and fuel cells at the end of the semester.

PROGRAMME OUTCOME (PO)

1. Able to apply the fundamental knowledge of mathematics, science and engineering

COURSE OUTCOMES (COs)

1. Understanding the various types of cells and energy storage devices.
2. Compute the efficiency of cells.
3. Development of eco-friendly energy sources.
4. Realize the advantages of energy storage and fuel cells.

PREREQUISITES:

Knowledge of Municipal Solid Waste management, Solid & Liquid Industrial Waste management and Hazardous waste management & Site Remediation

ASSESSMENT PATTERN

S.No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	20	20	10	10
2	Understand	20	20	20	20
3	Apply	30	30	30	30
4	Analyze	20	20	20	20
5	Evaluate	10	10	20	20
6	Create	-	-	-	-
Total		**100**	**100**	**100**	**100**

Unit I

Batteries

Characteristics - voltage, current, capacity, electricity storage density, power, discharge rate, cycle life, energy efficiency, shelf life. Primary batteries- zinc-carbon, magnesium, alkaline, manganous dioxide, mercuric oxide, silver oxide batteries-Recycling/Safe disposal of used cells.

Document the various batteries and its characteristics used in mobile phones and lap tops.

9 Hours

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks

Unit II

Batteries for Electric Vehicles

Secondary batteries- Introduction**,** cell reactions**,** cell representations and applications- lead acid, nickel-cadmium and lithium ion batteries - rechargeable zinc alkaline battery. Reserve batteries: Zinc-silver oxide, lithium anode cell, photogalvanic cells. Battery specifications for cars and automobiles.

Development of batteries for satellites.

9 Hours

Unit III

Types of Fuel Cells

Importance and classification of fuel cells - description, working principle, components, applications and environmental aspects of the following types of fuel cells: alkaline fuel cells, phosphoric acid, solid oxide, molten carbonate and direct methanol fuel cells.

Fuel cells for space applications.

9 Hours

Unit IV

Hydrogen as a Fuel

Sources of hydrogen – production of hydrogen- electrolysis- photocatalytic water splitting – biomass pyrolysis - gas clean up – methods of hydrogen storage- high pressurized gas -liquid hydrogen type -metal hydride – hydrogen as engine fuel – features, application of hydrogen technologies in the future- limitations.

Cryogenic fuels.

9 Hours

Unit V

Energy and Environment

Future prospects-renewable energy and efficiency of renewable fuels – economy of hydrogen energy – life cycle assessment of fuel cell systems. Solar Cells: Energy conversion devices, photovoltaic and photoelectrochemical cells – photobiochemical conversion cell.

Bio-fuels from natural resources.

9 Hours

Total: **45 Hours**

Textbooks

1. M. Aulice Scibioh and B. Viswanathan, *Fuel Cells*: *Principles and Applications*, University Press, India, 2006.
2. F. Barbir, *PEM fuel cells*: *Theory and practice*,Elsevier, Burlington, MA, 2005.
3. M. R. Dell Ronald and A. J. David, *Understanding Batteries*, Royal Society of Chemistry, 2001.

References

1. M. A. Christopher Brett, *Electrochemistry*: *Principles, Methods and Applications*, Oxford University, 2004.
2. J. S. Newman and K. E. Thomas-Alyea, *Electrochemical Systems*, Wiley, Hoboken, NJ, 2004.
3. G. Hoogers, *Fuel Cell Handbook*, CRC, Boca Raton, FL, 2003.
4. Lindon David, *Handbook of Batteries*, McGraw Hill, 2002.
5. H. A. Kiehne , *Battery Technology Hand Book*,. Expert Verlag , Renningen Malsheim, 2003.

11O0YC CHEMISTRY OF NANOMATERIALS

3 0 0 3.0

COURSE OBJECTIVES

- To impart knowledge on the basic concepts and importance of nanochemistry including synthesis.
- To make students understand the principles and applications of nanomaterials.
- Knowledge about the characterization and applications of nanomaterials.

PROGRAMME OUTCOME (PO)

1. Able to apply the fundamental knowledge of mathematics, science and engineering

COURSE OUTCOMES (COs)

1. Understanding the various methods of synthesis and characterization techniques of nanomaterials.
2. Compute new preparation methodologies.
3. Utilization of nanomaterials in various emerging fields.
4. Realize the importance of nanoscience and its applications in day to day life.

ASSESSMENT PATTERN

S.No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	25	25	15	15
2	Understand	25	25	25	25
3	Apply	20	20	20	20
4	Analyze	20	20	20	20
5	Evaluate	10	10	20	20
6	Create	-	-	-	-
Total		**100**	**100**	**100**	**100**

Unit I

Nanoworld

Introduction – History of nanomaterials – concepts of nanomaterials – size and confinement effects – nanoscience – nanotechnology – Moor's law. Properties – electronic, optical, magnetic, thermal, mechanical and electrochemical properties. Nanobiotechnology – molecular motors – optical tweezers.

First industrial revolution to the nano revolution.

9 Hours

Unit II

Synthesis of Nanoparticles

Introduction – hydrolysis-oxidation - thermolysis – metathesis - solvothermal methods. Sonochemistry: nanometals - powders of metallic nanoparticles - metallic colloids and alloys - polymer metal composites - metallic oxides - rare earth oxides - mesoporous materials - mixed oxides. Sono electrochemistry - nanocrystalline materials. Microwave heating - microwave synthesis of nanometallic particles.

Magnetron sputtering process to obtain nanomaterials.

9 Hours

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks

Unit III

Types and Functionalization of Nanomaterials

Polymer nanoparticles, micro, meso and nanoporous materials. Organic – inorganic hybrids, zeolites, nanocomposites, self-assembled monolayers, semiconductor quantum dots, nanofibres, supramolecular nanostructures. functionalization of nanomaterials – stabilization methods. Reactivity of ω-functional groups on ligand shells.

Implications of nanoscience and nanotechnology on society.

9 Hours

Unit IV

Physical and Chemical Characterization

Electron microscopes: scanning electron microscope (SEM) – transmission electron microscope (TEM) – atomic force microscope (AFM): working principle – instrumentation – applications. UV-visible spectroscopy: principle – instrumentation (block diagram only) – applications. FT-IR spectroscopy: introduction – instrumentation (block diagram only) – applications –merits and demerits.

Nanoscience and technology research institution.

9 Hours

Unit V

Applications of Nanomaterials

Nanocatalysis, colorants and pigments, self-cleaning – lotus effect, anti-reflective coatings, antibacterial coatings, photocatalysis, nanofilters for air and water purifiers. Thermal insulation – aerogels, smart sunglasses and transparent conducting oxides – molecular sieves – nanosponges.

Harnessing nanotechnology for economic and social development.

9 Hours

Total: 45 Hours

Textbooks

1. C N R Rao, *Nanoworld – An Introduction to Nanoscience and Technology*, Jawaharlal Nehru centre for advanced scientific research, Bangalore, India, 2010.
2. C N R Rao, A Muller and A K Cheetham, *The Chemistry of Nanomaterials: Synthesis, Properties and Applications*, Vol. 1 & 2, John-Wiley and Sons, 2005.
3. T Pradeep, *Nano: The Essentials, Understanding Nanoscience and Nanotechnology*, 1st Edn., Tata Mcgraw Hill publishing company, 2007.

References

1. Geoffrey A Ozin, André C Arsenault, *Nanochemistry*: *A Chemical Approach to Nanomaterials*, Royal Society of Chemistry, 2009.
2. G B Sergeev, *Nanochemistry*, 1st Edn.,Elsevier, 2006.
3. S Chen, *Functional Nanomaterials: A Chemistry and Engineering Perspective (Nanostructure Science and Technology)*, Springer, 2010.
4. Yury Gogotsi, *Nanomaterials Handbook*, Taylor and Francis group, USA, 2006.

11O0YD CORROSION SCIENCE AND ENGINEERING

3 0 0 3.0

COURSE OBJECTIVES

- To impart knowledge about the various types of corrosion and its mechanism.
- To make students understand the various methods of corrosion control, corrosion testing and monitoring.
- Students acquire the basic knowledge about corrosion and its control.

PROGRAMME OUTCOME (PO)

1. Able to apply the fundamental knowledge of mathematics, science and engineering

COURSE OUTCOMES (COs)

1. Understand why corrosion related problems are complex and interrelated in the engineering field.
2. Compare the mechanism of dry corrosion and electrochemical corrosion to support corrosion minimizing techniques in metals and its alloys.
3. Characterize and analyze different forms of corrosion and its study techniques.
4. Classify and understand about the relationship between corrosion and its environment.

ASSESSMENT PATTERN

S.No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	25	25	15	15
2	Understand	25	25	25	25
3	Apply	20	20	20	20
4	Analyze	20	20	20	20
5	Evaluate	10	10	20	20
6	Create	-	-	-	-
Total		**100**	**100**	**100**	**100**

Unit I

Introduction to Corrosion

Importance and cost of corrosion – spontaneity of corrosion – passivation - importance of corrosion prevention in various industries - the direct and indirect loss of corrosion- galvanic corrosion: area relationship in both active and passive states of metals - Pilling Bed worth ratio and its consequences - units of corrosion rate - mdd and mpy - importance of pitting factor - Pourbaix digrams of Mg, Al and Fe and their advantages and disadvantages .

Corrosion of metals by other gases.

9 Hours

† The marks secured in Test I and II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks

Unit II

Forms of Corrosion

Different forms of corrosion - uniform corrosion-galvanic corrosion, crevice corrosion, pitting corrosion, intergranular corrosion, selective leaching, erosion corrosion, stress corrosion- high temperature oxidation, kinetics of protective film formation and catastrophic oxidation corrosion.

Industrial boiler corrosion, cathodic and anodic inhibitors

9 Hours

Unit III

Mechanisms of Corrosion

Hydrogen embrittlement- cracking, corrosion fatigue - filliform corrosion, fretting damage and microbes induced corrosion. Mechanisms of various corrosion scale formation - thick layer and thin layer - *insitu* corrosion scale analysis.

Analyze the rust formation in mild steel using weight loss method

9 Hours

Unit IV

Cathodic and Anodic Protection Engineering

Fundamentals of cathodic protection - types of cathodic protection systems and anodes. Life time calculations - rectifier selection. Stray current corrosion problems and its prevention. Coating for various cathodic protection system and their assessment- inhibitors - corrosion of steels. Anodic protection-Design for corrosion control.

Role of paints and pigments to protect the corrosive environment

9 Hours

Unit V

Corrosion Testing and Monitoring

Corrosion testing and monitoring - electrochemical methods of polarization- Tafel extrapolation polarization, linear polarization, impedance techniques-Weight loss method - susceptibility test – testing for intergranular susceptibility and stress corrosion.

Analyze the instruments for monitoring the corrosion.

9 Hours

Total: 45 Hours

Textbooks

1. Zaki Ahmad, *Principles of Corrosion Engineering and Corrosion Control, Elsevier Science and Technology Books, 2006.*
2. R. Winstone Revie and Herbert H. Uhlig, *Corrosion and Corrosion Control: An Introduction to Corrosion Science and Engineering*, John Wiley & Science, 2008.
3. Mars G. Fontana, *Corrosion Engineering*, Tata McGraw Hill, Singapore, 2008.

References

1. ASM Hand Book, Vol. 13, *Corrosion*, ASM International, 2005.
2. Pierre R. Roberge, *Hand Book of Corrosion Engineering*, McGraw Hill, New York, 2000.
3. Denny A. Jones, *Principles and Prevention of Corrosion*, Prentice Hall Inc., 2004.
4. A.W. Peabody, *Control of Pipeline Corrosion*, NACE International, Houston, 2001.

11O0YE POLYMER ELECTRONICS

- - - 1.0

Course Objectives

• Students will gain knowledge about types of polymer electronics and their specific physical and chemical properties.
• Graduates will become familiar with the methods of preparation and characterization of specific physical properties of conducting polymers.
• The current state of theory and modeling of polymer electronics will be presented. At the end of the course, students will have enough understanding of the main concepts in polymer electronic chemistry and physics to allow them read and understand the most important research papers in this field.

Course Outcomes (COs)

1. • The course will create awareness among the students on the polymer electronics.
2. • The student will be able to understand the chemistry behind polymer processing.
3. • Analysis and ability to provide conducting, semiconducting and optical properties of polymers.

Programme Outcome (PO)

1. Able to apply the fundamental knowledge of mathematics, science and engineering

Conducting Polymers: Introduction – need of conducting polymers (CPs) – methods of synthesis of CPs: chemical
synthesis – electrochemical synthesis –template synthesis. Properties of conducting polymers, structure – property
relationship – types of conducting polymers – examples of CPs – polyaniline, polypyrrole – polythiophene.
Liquid crystalline polymers: Optical properties of cholesteric and chiral nematics – liquid crystal displays – optical
fibre materials.
Analytical Techniques for Characterization of CPs: Impedance spectroscopy – Fourier transform infrared spectroscopy, thermal methods of analysis –thermo gravimetric analysis – differential scanning colorimetry – four
probe method.
Applications –Lithium polymer battery–light emitting diodes – gas sensors – biosensors –polymer solar cells.

Total: 15 Hours

References

1. Skotheim A. Terje, John Reynolds, *Handbook of Conducting Polymers*, Volume 2, 3rd Edition, CRC Press, 2007.
2. V. R. Gowariker, N. V. Viswanathan, Jayadev Sreedhar, *Polymer Science*, New Age International (P) Ltd., Publishers, 2005.
3. A. M. Donald, A. H. Windle, S. Hanna, *Liquid crystalline polymers*, Cambridge University Press, 2006.

11O001 ENTREPRENEURSHIP DEVELOPMENT I

3 0 0 3.0

COURSE OBJECTIVES

- To gain knowledge on basics of Entrepreneurship
- To gain knowledge of business entity, source of capital and financially evaluate the project
- To gain knowledge on production and manufacturing system.

PROGRAMME OUTCOMES (POs)

4. Able to use the techniques, skills and modern Civil Engineering tools necessary for engineering practice.
6. Able to work on the basis of broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context.
8. Able to function on multidisciplinary teams.
9. Able to deliver effective verbal, written and graphical communications

COURSE OUTCOMES (COs)

1. Entrepreneurial thinking
2. Innovation techniques in developing business
3. Legal aspects of a business
4. Skills on finance and cash flow
5. Skills on planning operations

ASSESSMENT PATTERN

S. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	20	20	20	20
2	Understand	20	20	20	20
3	Apply	20	20	20	20
4	Analyze	10	10	10	10
5	Evaluate	20	20	20	20
6	Create	10	10	10	10
	Total	**100**	**100**	**100**	**100**

Unit I

Basics of Entrepreneurship

Entrepreneurship Competence, Entrepreneurship as a career, Intrapreneurship, Social entrepreneurship, Serial entrepreneurship (Cases), Technopreneurship.

Entrepreneurial Motivation

6 Hours

Unit II

Generation of Ideas

Creativity and Innovation (Cases), Lateral thinking, Generation of alternatives (Cases), Fractionation, Reversal Method, Brain storming

Utilization of Patent Databases

8 Hours

†The marks secured Test I and Test II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks.

Unit III

Legal Aspects of Business

Contract Act, Sale of Goods Act, Negotiable Instruments – Promissory Note, Bills and Cheques, Partnership, Limited Liability Partnership (LLP), Companies Act – Kinds, Formation, Memorandum of Association, Articles of Association (Cases).

Business Plan Writing

10 Hours

Unit IV

Business Finance

Project evaluation and investment criteria (Cases), Sources of finance, Financial statements, Break even analysis, Cash flow analysis.

Calculation of Return on Investment

11 Hours

Unit V

Operations Management

Importance – Functions –Deciding on the production system – Facility decisions: Plant location, Plant Layout (Cases), Capacity requirement planning – Inventory management (Cases) – Lean manufacturing.

Project Planning

10 Hours

Total: 45 Hours

Textbook

1. Donald F. kuratko, *Entrepreneurship – Theory, Process & Practice,* South western cengage learnng, USA, 2009.

References

1. Hisrich, *Entrepreneurship*, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2005.
2. Prasanna Chandra, *Projects – Planning, Analysis, Selection, Implementation and Reviews*, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2000.
3. Akhileshwar Pathak, *Legal Aspects of Business*, Tata McGraw Hill, 2006.
4. Norman Gaither and Greg Frazier, *Operations Management*, Thomson Learning Inc, 2007.
5. Edward De Bono, *Lateral Thinking*, Penguin Books, 1990.
6. http://www.enterweb.org
7. http://www.internationalentrepreneurship.com/asia_entrepreneur/India_entrepreneur.asp
8. http://indiakellogg.wordpress.com

11O002 ENTREPRENEURSHIP DEVELOPMENT II

3 0 0 3.0

COURSE OBJECTIVES

- Evolve the marketing mix for promoting the product / services
- Handle the human resources and taxation
- Understand Government industrial policies / support provided and prepare a business plan.

PROGRAMME OUTCOMES (POs)

4. Able to use the techniques, skills and modern Civil Engineering tools necessary for engineering practice.
6. Able to work on the basis of broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context.
8. Able to function on multidisciplinary teams.
9. Able to deliver effective verbal, written and graphical communications

COURSE OUTCOME (CO)

1. Increase in awareness of the entrepreneurship Development for engineering decisions.

ASSESSMENT PATTERN

S. No.		Test I†	Test II†	Model Examination†	Semester End Examination
1	Remember	30	30	30	30
2	Understand	30	30	25	25
3	Apply	20	20	20	20
4	Analyze	10	10	10	10
5	Evaluate	10	10	10	10
6	Create	--	--	05	05
	Total	**100**	**100**	**100**	**100**

Unit I

Marketing Management

Formulating Marketing strategies, The marketing plan, Deciding on the marketing mix (Cases), Interactive marketing, Marketing through social networks, Below the line marketing, International marketing - Modes of Entry, Strategies (Cases).

Five P's of marketing, SSI Policy Statement

10 Hours

Unit II

Human Resource Management

Human Resource Planning (Cases), Recruitment, Selection, Training and Development, HRIS, Factories Act 1948 (an over view)

Global Trends in Human Resource Management

10 Hours

† The marks secured Test I and Test II will be converted to a maximum of 20 and Model Examination will be converted to a maximum of 20. The remaining 10 marks will be calculated based on assignments. Accordingly internal assessment will be calculated for 50 marks.

Unit III

Business Taxation

Direct taxation – Income tax, Corporate tax, MAT, Tax holidays, Wealth tax, Professional tax (Cases). Indirect taxation – Excise duty, Customs, Sales and Service tax, VAT, Octroi, GST(Cases)

Recent Trends for a Troubled Tax, professional tax slab

8 Hours

Unit IV

Government Support

Industrial policy of Central and State Government, National Institute and Agencies, State Level Institutions, Financial Institution

Global Entrepreneurship Monitor, Excise Exemption Scheme

7 Hours

Unit V

Business Plan Preparation

Purpose of writing a business plan, Capital outlay, Technical feasibility, Production plan, HR plan, Market survey and Marketing plan, Financial plan and Viability, Government approvals, SWOT analysis.

Small Industry Cluster Development Programme, National Equity Fund Scheme

10 Hours

Total: 45 Hours

Textbook

1. S. S. Khanka, *Entrepreneurial Development*, S. Chand & Co, New Delhi, 2010

Reference (s)

1. Hisrich, Entrepreneurship, Tata McGraw Hill, New Delhi, 2005
2. Philip Kotler, Marketing Management, Prentice Hall of India, New Delhi, 2003
3. K. Aswathappa, Human Resource and Personnel Management – Text and Cases, Tata McGrawHill, 2007
4. P. C. Jain, Handbook for New Entrepreneurs, EDII, Oxford University Press, New Delhi, 2002
5. Akhileshwar Pathak, Legal Aspects of Business, Tata McGraw Hill, 2006
6. http://niesbud.nic.in/agencies.htm
7. http://www.planware.org/businessplan.htm
8. http://www.nenonline.org
9. www.forbes.com/managing
10. www.bizplanprep.com
11. http://business.gov.in/enterprises/govt_support.php

11C0XA AIR POLLUTION

- - - 1.0

COURSE OBJECTIVES

- To impart knowledge on sources and types of air pollutants
- To enhance the knowledge of students on control of air pollution measures
- At the end of the course, students acquire comprehensive knowledge on sources and effects of air pollutants and also learn the control measures of air pollution

PROGRAMME OUTCOMES (POs)

5. Able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.
6. Able to work on the basis of broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context.

Sources and classification of air pollutants – Natural contaminants – Nitrogen Oxides – Carbon Monoxide – Hydrocarbons – Sulfur Oxides – Air quality standards – Metrology and air pollution. Metrology and air pollution – Atmospheric stability – Inversions-mixing height-plume behavior. Aerosols and particles – General facts – Aerosol dynamics – Aerosols and clouds. Saturation vapour pressure of water – Relative Humidity – Wet point – Acid rains – Wet scavenging. Adsorption – Principal adsorbents – Principles – Description of equipment-packed and plate columns – PSA– Adsorption cycle-solvent recovery system – Continuous rotary bed-fluidized bed

Total: 20 Hours

Textbooks

1. R. W. Boubel, D. L. Fox, B. Turner and A. C. Stern, *Fundamentals of Air Pollution*, Academic Press, New York, 1994
2. M. N. Rao and V. H. N. Rao, *Air Pollution*, Tata McGraw-Hill, 1989

References

1. Noel De Nevers, *Air Pollution Control Engineering*, McGraw Hill, New York, 1995
2. B. S. N. Raju, *Fundamentals of Air Pollution*, Oxford, New Delhi, 1997

11C0XB E- WASTE MANAGEMENT

- - - 1.0

COURSE OBJECTIVES

- To provide basic knowledge on the management practices of e-waste
- To emphasize the need for e- waste management
- To create awareness among the students about the effects of e-waste

PROGRAMME OUTCOME (POs)

2. Able to identify, formulate and solve Civil Engineering problems in accordance with Indian Standard codes of practice.
7. Able to understand the role of Civil Engineers and ethical responsibility.

Introduction - E-waste pathways - composition of E-waste - Need for E-waste Management - E-waste generation in developing and developed countries - Current practices on collection - Storage - Segregation - Transportation system - Treatment system - Reduce - Recycle – Reuse - Legislation in India- restriction on import of e-waste under hazardous waste management rule - Green Electronics and Green Computing practices - Life cycle assessment.

Total: 20 Hours

Textbook

1. P. Sincero and A. Sincero, *Environmental Engineering,* PHI Learning Pvt. Ltd., 2010

References

1. C. Bhatia, *Solid and Hazardous Waste Management,* Atlantic Publishers, 2007
2. K. Sasiikumar and Sanoop Gopi Krishna , *Solid Waste Management*, PHI Learning Pvt. Ltd., 2009

11C0XC BUILDING INFORMATION MODELING

- - - 1.0

COURSE OBJECTIVES

- To understand the history of Building Information Modeling (BIM)
- To understand the workflow in developing BIM
- To understand the importance of sustainable BIM for various stakeholders

PROGRAMME OUTCOME (POs)

4. Able to use the techniques, skills and modern Civil Engineering tools necessary for engineering practice.
5. Able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.
9. Able to deliver effective verbal, written and graphical communications.
11. Able to perform economic analysis, labour/time/material management, construction schedules and activities related to design, construction, operations and maintenance of systems in the technical specializations of Civil Engineering**.**

PREREQUISITES:

Knowledge of Computer Aided Drawing, Building Materials and Estimation Lab

Building Information Modeling (BIM): Introduction - Definition - History of Building Information Modeling – Inefficiencies in documentation of Traditional approaches – History of Building Modeling Technology – Parametric Modelers – Overview of Major BIM Model – Interoperability – BIM for owners and facility Mangers – BIM for Architects and Engineers – BIM for Construction Industry – BIM for Subcontractors and Fabricators – Case Studies

Total: 20 Hours

Textbook

1. Chuck Eastman, Paul Teicholz, Rafael Sacks and Kathleen Liston, *BIM Handbook: A Guide to Building Information Modeling for Owners, Managers, Designers, Engineers and Contractors*, Wiley 2008

References

1. Dana K. Smith and Michael Tardif, *Building Information Modeling: A Strategic Guide for Architects, Engineers, Constructors, and Real Estate Asset Managers*, John Wiley & Sons, 2009
2. Willem Kymmell, *Building Information Modeling: Planning and Managing Construction Projects with 4D CAD and Simulations*, McGraw Hill Professional, 2007
3. Brad Hardin, *BIM and Construction Management: Proven Tools, Methods, and Workflows*, Wiley, 2009

11COXD COMPUTER AIDED ANALYSIS AND DESIGN - I

- - - 3.0

COURSE OBJECTIVE

- To impart knowledge on the analysis and design of structural components using Civil Engineering software packages

PROGRAMME OUTCOMES (POs)

1. Able to apply the fundamental knowledge of mathematics, science and engineering.
2. Able to identify, formulate and solve Civil Engineering problems in accordance with Indian Standard codes of practice
4. Able to use the techniques, skills and modern Civil Engineering tools necessary for engineering practice.
11. Able to perform economic analysis, labour/time/material management, construction schedules and activities related to design, construction, operations and maintenance of systems in the technical specializations of Civil Engineering.

Introduction to structural design-Behaviour of flexural and axial members –Types of loads-Load distribution and analysis of members-Load application for 2-D model-member property assignment and orientation-Member property assignment and orientation-Member release for beams-Floor load applications-Model of a multi-storey residential building-Model of a industrial truss structure-Meshing of flat slab dsign-Creation of shear walls- Design of concrete and steel members- Introduction to seismic design.

References

1. Manual of civil engineering softwares.

11C0XE INTERIOR DESIGN

- - - 1.0

COURSE OBJECTIVES

- To understand the history of Building Information Modeling (BIM)
- To understand the workflow in developing BIM
- To understand the importance of sustainable BIM for various stakeholders

PROGRAMME OUTCOME (POs)

(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(g) an ability to communicate effectively
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
(m) an ability to plan and prepare design and construction documents, such as specification, contracts, change orders, engineering drawings, and construction schedules

Plywoods , block boards & particle boards-Types of plywood-Grades of plywood-Woods used in plywood-Thickness & sizes of plywood-**Woods-**Varieties of wood-Woods used for joineries-Woods used for interiors-Seasoning of woods-Sizes, planks and allowances for processing-**Painting & polishing-**Types of priemer paints & putty-Types of polishing-Life of polish-**Hardwares-**Hinges, glass, tower bolts - sizes & thickness-Stoppers, closers, magnetic catchers and ball catchers,-Types of locks and keys-**Floorings, screens & curtains-**Types of flooring-Size & thickness of materials-Types of screens-Types of curtains

Total: 20 Hours

Textbook

1. Chuck Eastman, Paul Teicholz, Rafael Sacks and Kathleen Liston, *BIM Handbook: A Guide to Building Information Modeling for Owners, Managers, Designers, Engineers and Contractors*, Wiley 2008

References

1. Dana K. Smith and Michael Tardif, *Building Information Modeling: A Strategic Guide for Architects, Engineers, Constructors, and Real Estate Asset Managers*, John Wiley & Sons, 2009
2. Willem Kymmell, *Building Information Modeling: Planning and Managing Construction Projects with 4D CAD and Simulations*, McGraw Hill Professional, 2007
3. Brad Hardin, *BIM and Construction Management: Proven Tools, Methods, and Workflows*, Wiley, 2009

11CORA INNOVATIVE PRACTICES IN EARTHQUAKE RESISTANT DESIGN OF STRUCTURES

- - - 3.0

COURSE OBJECTIVES (COs)

- To impart knowledge on earthquake resistant design
- To emphasize the importance of usage of codes in earthquake resistant design of structures
- At the end of the course, the students will be able to analyze and design various structures by employing codes pertaining to earthquake resistant design

PROGRAMME OUTCOME (POs)

5. Able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.

Engineering Seismology - Elastic rebound theory - Theory of plate tectonics and movement of Indian plate - Seismic waves - Seismic intensity - Richter scale – Tsunami - Seismic zoning maps of India and comparison study - Response spectra - Strong motion characteristics

Earthquake effects on the structures - classification of loads - Seismic methods of analysis - seismic design methods - Seismic damages during past earthquakes and effect of irregularities and building architecture on the performance of RC structures - Mathematical modelling of multistoreyed RC buildings with modelling of floor diaphragms and soil-foundation - Winkler model.

Design of multi-story RC structure with foundation as per latest IS: 1893 by Equivalent static lateral load method and Response Spectrum Method - Introduction to Time history method - Capacity based design of soft story RC building - Design of Shear Walls - Ductile detailing as per latest IS:13920.

Seismic design of multi-storeyed steel structures with various bracing systems - Lateral load analysis and design of two- storied masonry buildings - P-delta analysis - Seismic design of Elevated RC Circular Water Tanks - Ductility requirements, types of ductility, factors affecting ductility - IS code provisions

Seismic retrofitting - Sources of weakness in RC framed buildings - Classification of retrofitting techniques - Conventional and non-conventional methods - Comparative study of various methods and case studies - Introduction to Base Isolation systems - IS code provisions for retrofitting of masonry structures - Failure modes of masonry structures and repairing techniques.

References

1. Bulletin of Earthquake Engineering
2. Earthquake Science
3. Geotechnical, Geological and Earthquake Engineering
4. Journal of Seismology
5. Natural Hazards
6. Resonance
7. Journal of Volcano logy and Seismology
8. Pure and applied Geophysics
9. Seismic Risk Mitigation
10. Journal of Earth System Science
11. Geotechnical Engineering and for disaster Mitigation and Rehabilitation
12. Geo Journal
13. Acta Seismologica Sinica
14. Chinese Science Bulletin

11C0RB ADVANCED CONCRETE TECHNOLOGY

- - - 3.0

COURSE OBJECTIVES (COs)

- To impart knowledge on high quality concrete and high strength concrete
- To introduce the concept of high quality materials
- At the end of the course, students will able to design and assess the performance of various cement-based materials

PROGRAMME OUTCOME (PO)

5. Able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability

Introduction to concrete – Review of cements including blended cements – Manufacture - Chemical composition - Chemical and physical processes of hydration - Modern methods of analysis
Admixtures - Review of types and classification - Chemical composition - Origin and manufacture – Usage - Effects on properties of concretes, mortars and grouts - Methods of test – Applications - Aggregates – Review of types - Production of artificial aggregates - Sampling and testing - Effects on properties of concretes - Mortars and grouts
Portland cement – Water – Hydration – Supplementary cements – Chemical admixtures – Microstructure of cement paste – Properties – Proportioning of Mix – Mix design – Construction, curing and maturity – Fracture – Shrinkage – Viscoelastic behavior
Durability concept - Reinforcement corrosion - Fire resistance - Frost damage - Sulfate attack - Alkali silica reaction - Delayed ettringite formation - Methods of providing durable concrete - Short-term tests to assess long-term behavior - Durability tests – Non destructive testing – Recycling practices
Lightweight concrete - Autoclaved aerated concrete - No-fines concrete - Lightweight aggregate - Concrete and foamed concrete - High strength concrete - Refractory concrete - High density and radiation-shielding concrete - Polymer concrete - Fibre-reinforced concrete – Mortars – Renders - Recycling practices.

References

1. Journal of Advanced Concrete Technology
2. Indian Concrete Journal
3. American Concrete Institute
4. Journal of Composites for Construction
5. ACI Materials Journal
6. Journal of Materials in Civil Engineering

11C0RC COMPOSITE STRUCUTRES

- - - 3.0

COURSE OBJECTIVES (COs)

- To introduce the concept of composite materials
- To emphasize the importance of composite structures
- At the end of the course, the students will be able to design the composite structures

PROGRAMME OUTCOME (PO)

5. Able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability

Introduction - Advantages and application of composite materials - reinforcements and matrices – Generalised Hooke's Law – Elastic constants for anisotropic, orthotropic and isotropic materials
Micro mechanics – Mechanics of materials approach - Elasticity approach to determine material properties – Macro Mechanics – Stress-strain relations with respect to natural axis, arbitrary axis – Determination of material properties - Experimental characterization of lamina
Governing differential equation for a general laminate, angle ply and cross ply laminates - Failure criteria for composites
Basic design concepts of sandwich construction - Materials used for sandwich construction - Failure modes of sandwich panels
Various Open and closed mould processes - Manufacture of fibers – Types of resins and properties and applications – Netting analysis

References

1. Applied Composite Materials
2. Composite Structures
3. Steel and Composite Structures
4. Journal of Composites for Construction

11C0RD SPACE STRUCTURES

- - - 3.0

COURSE OBJECTIVES

- To introduce the various methods and technologies employed in space structures
- To impart knowledge on fundamental equations of linear elasticity
- At the end of the course, students will be able to design and analysis space structures

PROGRAMME OUTCOME (PO)

5. Able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability

Review of statics - Deformable body mechanics - Beam buckling and Failure criteria - Elastic trusses - Matrix methods and design - Energy methods - Introduction to linear elasticity - Torsion of solid sections - Bending of beams with asymmetric cross sections - Torsion of thin-walled beams - Shear centers - Vibrations of beams

References

1. International Journal of Space Structures
2. Large Space Structures
3. Journal of the Japan Society for Aeronautical and Space Sciences

11CORE CASE STUDIES ON FAILURE OF STRUCTURES

- - - 3.0

COURSE OBJECTIVES

1. To impart knowledge on failure of structures
2. To emphasize the importance of proper design process
3. At the end of the course, the students will be able to understand the reasons for failure of various structures and the remedial measures to avoid such fauilures

PROGRAMME OUTCOMES (POs)

3. Able to design and conduct experiments, as well as to analyze and interpret data
5. Able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability

Analysis of determinate structures - Different methods including graphical methods - Analysis of indeterminate skeletal frames - Moment distribution - Slope-deflection - Stiffness and force methods, energy methods - Muller-Breslau principle and application - Plastic analysis of indeterminate beams and simple frames - Shape factors – Case studies – Reasons for failure – Remedial measures

References

1. Journal of Structural Engineering
2. The structural Engineer
3. Canadian Journal of Civil Engineering

11CORF ADVANCED TRANSPORTATION SYSTEM

- - - 3.0

COURSE OBJECTIVES

- To expose the recent developments in transport systems
- To introduce the concept of modeling and simulation techniques
- At the end of the course, the students will be able to design interchanges and rotaries

PROGRAMME OUTCOME (PO)

5. Able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.

Characteristics of Information, Constituents of Computer Based Information Systems, Element and functions of Management Information Systems in Urban Transportation Sectors – Development of Database and Management Information System – Concept of Database – Development of Transportation Database
Wireless Communication – Computational Technologies – Floating Car Data / Floating Cellular Data – Sensing Technologies – Inductive Loop Detection – Video Vehicle Detection – Advanced Traffic Sensors and Surveillance Systems – Dynamic Message Sign (DMS) Positioning Systems – Maps – Maps Matching – Path Finding and Route Guidance, Information Dissemination and Display Technologies
Capacity and LOS, Design of Rotary and Signalised Intersections, Vehicle Actuated Signals, Signal Co-ordination, Area Traffic Control System (ATCS), Pedestrian Planning at Grade Intersections
Basics of simulation – Simulation Model and Classification – Simulation o Urban Traffic Flow Characteristics - Application of Computer Simulation in Traffic Flow Studies – Future Traffic Simulation Model
System – Concepts, Theories – Classification – Models – Phases in model building process – System Approach – System Dynamics(S.D) View Points – Physical Flow – Information Flow – Flow Diagram.

References

1. ASCE – Journal of Transportation Engineering
2. Transportation Research Record, Washington D.C
3. European Journal of Transport and Infrastructure Research
4. International journal of Transport Management
5. Transport Reviews
6. Transportation Quarterly
7. Journal of Advanced Transportation

11C0RG URBAN TRANSPORTATION PLANNING

- - - 3.0

COURSE OBJECTIVES

- To impart knowledge on the transit systems
- To introduce the concept of route planning and scheduling for transit systems
- At the end of the course, the students will be able to plan and design mass rapid transit systems and parking facilities

PROGRAMME OUTCOME (PO)

5. Able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.

Introduction to Mass Transport – Role of various modes of Mass Transport – Problems and their Impact – Transport System Performance at National, State, Local and International levels – Evaluation of existing system – Transit Oriented Land Use Development - Case Studies

Urban Transport System – Public Transport System Re-genesis and Technology – Public Transport Demand and Supply – Physical performance of Public Transport System – Public Transport and Urban Development Strategies

Route Planning and Scheduling – Bus Transport System – Performance and Evaluation – Scheduling – Conceptual patterns of bus service – Network Planning and Analysis – Bus Transport System Pricing – Bus Transit System Integration – Analytical Tools and Techniques for Operation and Management – Bus Rapid Transit Systems – Case Studies

Urban Form, Land Use, Compact Development, Transport Integrated Urban Planning, Housing, and Household, Services and Industry, Guidelines for Environmentally sound Transportation

Parking – Demand – Characteristics – Space Inventory – Accumulation – Duration – Turn over – Index – Design of Multi Storeyed and Surface Parking facility

References

1. Transportation Research Part B
2. ASCE – Journal of Transportation Engineering
3. ASCE – Journal of Urban Planning and Development
4. Transportation Research Record, Journal of Transportation Research Board
5. Journal of Public Transportation
6. Mass Transit
7. Urban Studies

11CORH APPLICATION OF AI IN CIVIL ENGINEERING

- - - 3.0

COURSE OBJECTIVES

- To introduce the concept of fuzzy logic
- To impart knowledge on neural networks
- At the end of the course, the students will be able to understand the use of various computer applications in civil engineering

PROGRAMME OUTCOMES (POs)

1. Able to apply the fundamental knowledge of mathematics, science and engineering.
4. Able to use the techniques, skills and modern Civil Engineering tools necessary for engineering practice.
5. Able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.

AI programming languages and systems tools - Object-oriented programming - Fuzzy logic - Knowledge elicitation - Knowledge representation - Interfacing techniques - Pattern recognition - Intelligent databases - Natural language processing - Machine learning - Reasoning under uncertainty - Heuristic procedures - Distributed architectures - Genetic algorithms - Risk analysis - Neural networks - Integration of KBS and hypermedia - Case based design and reasoning - Agent technologies - Agent-based design - Neural networks - Reasoning - Integrated design - Conflict management - Soft computing - Virtual reality - Decision support systems - Java programming - Barriers to the introduction of Knowledge Based Systems and Artificial Intelligence to Practice - Information needs of designers

References

1. Applied Artificial Intelligence
2. Artificial Intelligence Review
3. Computational Optimization and Applications
4. IEEE Transactions on Fuzzy Systems