BACHELOR OF TECHNOLOGY B.Tech (Facilities Services and Planning) ACADEMIC REGULATIONS, COURSE STRUCTURE AND SYLLABUS (EFFECTIVE FROM ACADEMIC YEAR 2017-18)



SCHOOL OF PLANNING & ARCHITECTURE JAWAHARLAL NEHRU ARCHITECTURE AND FINE ARTS UNIVERSITY

Mahaveer Marg, Masab Tank, Hyderabad - 500 028

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JAWAHARLAL NEHRU ARCHITECTURE AND FINE ARTS UNIVERSITY

Mahaveer Marg, Masab Tank, Hyderabad – 500 028.

Academic Regulations for FSP Programs

(Under the CBCS, Effective from the Academic Year 2017-2018)

Preamble :

JNAFAU's Choice Based Credit System (CBCS) aims to provide comprehensive learning opportunities which takes into account individual interests and abilities of the students. Apart from the compulsory core courses, the students can choose from the elective courses on offer in the university or also from approved online platforms like the MHRD's SWAYAM or MOOCs.

These regulations are subject to amendments as may be decided by the Academic Council / Committee of the University 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 program) as may be decided by the Academic Council / Committee.

1. Glossary of Terms

- 1.1 **Program:** An educational program leading to award of a Degree in a discipline.
- 1.2. **Course:** Generally referred as a 'subject' offered under the degree program. Each course is identified by a unique course code and course title. A course may be designed to comprise lectures/ studio/ tutorials/ laboratory work/ fieldwork/ outreach activities/ project work/vocational training /seminars /term papers/ assignments/ presentations/ self-study etc. or a combination of some of these. All courses do not carry the same credits.
- 1.3. Choice Based Credit System (CBCS): In addition to the compulsory core courses in a program, CBCS provides choice for students to select from a number of elective courses offered. The term credit refers to the weightage given to the course and is usually the number of periods per week allotted to it.
- 1.4. **Re-admission:** When a student is detained in a course due to shortage of attendance or the student takes a break of study, the student has to take re- admission to continue the program.

- 1.5. **Re-registration :** When a student has failed in a course due to low internal assessment marks, but has satisfactory attendance, the student can re-register to improve performance in internal assessment as well as external evaluation.
- 1.6. **Re-appearance/ supplementary examinations:** When a student has failed in a course and wishes to improve performance only in end semester external examination he/she can register to reappear for the supplementary examination.
- 1.7. **Minimum Total Credits (MTC):** These are minimum total credits to be secured by a student to be considered eligible for award of the degree. This may be different for different disciplines.
- 1.8. Director of Evaluation (DE) means the Authority of the University who is responsible for all activities of the End Semester Examinations of the University.
- 1.9. Director, Academic and Planning (DAP) means the authority of the University who is responsible for all academic activities for the implementation of relevant rules and regulations.

2. Program Structure

- 2.1. **Category of Courses :** The program shall have a curriculum with syllabi consisting of courses as prescribed by the Board of Studies, and broadly categorized under :
 - 2.1.1. Compulsory Core (C) are courses deemed to be the core learning required for the discipline. These courses are part of the compulsory requirement to complete the program of study. A core course cannot be substituted by any other course. A core course offered in this program may be treated as a Professional or Open Elective by other programs.
 - 2.1.2. Professional Electives: (E) are courses which are elective courses relevant to the discipline. An Elective course is generally a course that can be chosen from a pool of courses on offer. Every student shall be required to opt for the electives from the list of electives offered. Students can also opt for the electives on offer from any of the other Programs, besides his / her own discipline courses, or even do online courses subject to the respective Program specific regulations.
 - 2.1.3. Open Electives (O) are chosen generally from an unrelated discipline/ subject, with an intention to seek exposure/ add generic proficiency. These may include Liberal Arts courses, Humanities and Social Science courses, etc. and essentially facilitate the student to do courses (including Core Courses or Professional Electives) offered by other departments/ programs / institutions or online. Open Electives need not be specified in the course structure and the University may

approve and offer any Open Elective courses in any semester as an option for the students.

- 2.1.4. Ability Enhancement Courses (AEC) or (A). These are mandatory courses based upon content that lead to general knowledge, ability and soft skills enhancement, such as, Environmental Studies, Communication Skills, Value Education, etc.
- 2.1.5. Non- Credit Courses / Activities mandatory for award of Degree: There are some non-credit courses / activity such as:
 1) English, 2) Co- Curricular Activity / Extension Activity (EA),
 2) Internship of 4 weeks or less, 3) any other as specified in the respective course structure / syllabus. A 'Satisfactory' grade in the above, is compulsory for the award of degree.
- 2.1.6. Online Courses : Students may be permitted, with the prior approval of the Department, to take online courses through SWAYAM or MOOCs or any other approved online facility, in lieu of the Electives (both E and O) offered in the University.

2.2. Credits:

- 2.2.1. Credits are indicative of the importance of the course. In the case of core courses 1 period of direct teaching per week (Theory / Tutorial/ Studio/ Practical) = 1 credit
- 2.2.2. In the case of other courses like the Electives and the AEC courses, the credits are based on their level of importance as decided by the Board of Studies and as described in their respective course structures.
- 2.3. **Pre-requisites :** Some of the courses may have pre-requisites (i.e. the student may be required to have registered and attended the course specified as a pre- requisite.)

2.4. Types of Courses and Learning Sources

Types of Courses	Learning Sources			
Compulsory Core (C)	Parent Department (PD)			
Professional Elective (E)	PD / OD / online			
Ability Enhancement Course (AEC)	PD / OD / online / Univ.			
Open Elective (O)	PD / OD / online / Univ.			
Extension Activity (EA)	PD, OD, Univ.			

Note: PD = Parent Department; OD = Other Departments / Institutions / Universities

3. Duration of Program

- 3.1. A student is normally expected to complete the Program in five academic years (10 Semesters) but in any case not more than 10 years (including break of study for personal reasons or suspension/ detention due to disciplinary action, etc.).
- 3.2. Each semester shall normally consist of 90 working days (excluding end semester examination days).
- 3.3. Gap Year: A student may be permitted to take a break of study for one academic year for starting an enterprise or for any personal or medical reason with prior approval. In exceptional cases, this may be extended to another year after an appraisal process approved by the State Govt. / University. In such cases also the student will be eligible for award of First Class with Distinction/ other awards. Rules of readmission will apply to such cases.

4. Registration for choice of Electives:

- 4.1. Each student shall be deemed to have registered for all the compulsory core and other mandatory (AEC) courses of every semester that he/she is admitted to / promoted to, on the payment of the requisite fees.
- 4.2. However, in the case of electives (as per the course structure), students shall submit their preferences from the list of electives on offer (including approved online courses), and after allotment of the elective course, register for elective courses of their choice both professional and open electives.
- 4.3. The information on the list of all the courses offered in every department specifying the course code, course title, credits, prerequisites, the timetable slots and the registration process with the time schedules will be made available on the University website. Every student is expected to go through the above information, consult the faculty members, understand the choices and select their choice of elective courses.
- 4.4. Every student shall submit their preferences from the list of electives on offer (including approved online courses), register / re-register as per the registration process and the schedule notified.
- 4.5. The departments shall put up the list of electives allotted to the students, using their (departments') discretion based on physical and other capacities, with first preference given to the students from the parent department and later, considering a first come first and/ or SGPA basis for students from other departments. However, students who have registered for elective courses previously are allowed to re-register for courses in which they have failed.
- 4.6. In case none of the student's preferred choices is allotted, or even

otherwise, the student may propose an alternative choice from among the available ones after due consultation with the respective faculty. In any case, the students shall register (which is effected only on their choice of elective being approved) for the courses within the given schedule/ deadline.

- 4.6 After registering for a course, a student shall attend the classes, satisfy the attendance requirements, earn Internal Assessment marks and appear for the End Semester Examinations.
- 4.7 A student is permitted to cancel his/her registration for the elective courses, within two weeks of starting of the semester.
- 4.8 To enable the students to choose electives from across the departments, the DAP shall in consultation with all the departments, facilitate the announcement of a common time-slot for the elective periods in the individual time tables of the departments.
- 4.9 No elective course shall be commenced unless a minimum number of students are registered (this number may be different for different courses and Programs and may be decided by the Departments / College/ University every semester).

5. Attendance Requirements

- 5.1 A student has to put in a minimum of 75% of attendance, in aggregate of all the courses registered in the semester (excluding approved online elective courses) for becoming eligible to register for the end examinations and for acquiring credits in each semester.
- 5.2 Shortage of attendance in aggregate up to 10% (65% and above, and below 75%) in each semester may be condoned by the College Academic Committee on genuine and valid (including medical grounds), based on the student's representation with supporting evidence.
- 5.3 Condonation of shortage of attendance as stipulated above, shall not be automatic but on the merits of the case to the satisfaction of the College Academic Committee.
- 5.4 A stipulated fee shall be payable along with the application for condonation.
- 5.5 Shortage of attendance below 65% in aggregate (including medical grounds) shall in no case be condoned.
- 5.6 A student will not be promoted to the next semester unless the attendance requirement of the present semester is satisfied. In case of such detention the student is not eligible to take the End Examination of that semester and the course registration shall stand cancelled. The student shall seek re admission for that semester when offered next.

5.7 In the case of re-registration (clauses 10.4 to 10.7) for a course/s, the attendance requirement is not applicable.

6. Assessment

- 6.1 Distribution of Internal Assessment and End Exam Marks
 - Performance in each course shall be evaluated as prescribed in the respective Program's course structure and syllabus. As a general pattern, 50% of the marks in a course are through internal assessment and 50% through end semester examinations. A few courses may have 100% of the assessment purely through internal assessment. The thesis, the internship courses and many of the studio courses are assessed through a jury and viva-voce for the end semester examination.
- 6.2 Schedule for Internal Assessment : The students shall diligently follow the given internal assessment schedule for the semester including submissions and tests.
- 6.3 The compiled cumulative internal assessment marks and attendance of the students will be displayed periodically at least twice during the Semester, for information to the students. 50% of the marks allotted for the internal assessment courses shall be submitted before the 12th week. All internal assessment marks have to be finalized and uploaded / submitted in the prescribed format, on or before the last day of End Semester Examinations of the semester.
- 6.4 Assessment for Online Courses: In case of credits earned through approved online modes, the credits and grades shall be assigned by a committee consisting of Head of the Department or a teacher nominated by the HoD and a senior faculty member nominated by the DAP/ Principal (in case the credits or grades are not included by the online course faculty).
- 6.5 Non-Credit, Mandatory Courses / Activity : Assessment in these courses or activity will be only in terms of "Satisfactory" or "Not Satisfactory". A 'Satisfactory' grade in these listed courses/ activities is compulsory for the award of degree. 6.5.1 English Course: A Test will be administered to the students after admission to assess proficiency in English. Students not passing this test of proficiency will study English as a bridge course (without credits) during the First Semester. They have to acquire a "Satisfactory" grade in the course to be considered eligible for award of a degree.
 - 6.5.2 Co-Curricular Activity / Extension Activity (EA) (for all round development) : Every student has to participate in any one of the following activities like NCC/ NSS/ Sports/ FSAI University's Pro-bono project activity/ any national or international student camp /any other community development activity listed by the University and acquire a "Satisfactory"

grade to be considered eligible for award of a degree. 6.5.2.1 The student's performance shall be examined by the faculty in- charge of the relevant extension activity along with the Head/ Coordinator of the Department/ activity.

6.5.2.2 Physically challenged students who are unable to participate in any of the above activities shall be required to take an appropriate test in the relevant area of any one of the above activities and be graded and certified accordingly.

- 6.5.3 Any other course or activity as specified (including the mode of assessment) in the respective course structure or syllabus.
- 6.5.4 Any other course or activity as specified (including the mode of assessment) in the respective course structure or syllabus.

7. Award of Letter Grades

7.1 The performance of a student will be reported using letter grades, each carrying certain points as detailed below:

S.	% of Ma	rks	Letter	Grade
No.	Minimum	Maximum	Grade	Points
1.	90.00	100.00	A+	10
2.	80.00	80.00 89.99		9
3.	70.00	79.99	В	8
4.	60.00	69.99	С	7
5.	50.00 59.99		D	6
6.	40.00 49.99		E	5
7.	00.00	39.99	F	0
8.	Shortage of attendance a prevented from writing e examination	SA	0	
8.	Absent for End semester	r examination	Ab	0
9.	Satisfacto	ory *	Satisfactory	0

Note: * Satisfactory grade will be given only for the non-credit courses/ activity such as mentioned in clause 6.5. A 'Satisfactory' grade in these listed course/ activities is compulsory for the award of degree.

JNAFAU_CBCS for B.Tech (FSP) Program, effective from 2017-18

Course Title	Int. Marks	End Exam	Total	Grade	Grade point (GP)
Course X1	22	25	47	E	5
Course X2	39	41	80	А	9
Course X3	37	34	71	В	8
Course X4	29	30	59	D	6
Course X5	25	24	49	E	5

Example of assignment of letter grade and grade points for marks:

- 7.2. A student who earns at least a D grade in a course is declared to have successfully completed the course, and is deemed to have earned the credits assigned to that course. A course successfully completed cannot be repeated.
- 7.3. Students who fail to appear for end semester examinations will be marked as 'Ab' (Absent) and should register for supplementary examination by paying the prescribed fees.
- 8. Academic Requirements: The following academic requirements have to be satisfied, in addition to the attendance requirements mentioned in clause 5.
 - 8.1 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course, if the student secures not less than 50% marks in the semester end examination, and a minimum of 50% of marks in the sum total or aggregate of the Internal Assessment and Semester End Examination taken together; in terms of letter grades, this implies securing 'D' grade or above in that subject/ course.
 - 8.2 A student eligible to appear in the end semester examination for any course, but absent from it or failed (thereby failing to secure 'D' grade or above) may reappear for that course in the supplementary examination as and when conducted. In such cases, the internal marks obtained earlier for that course will be retained, and added to the marks obtained in the end semester supplementary examination for evaluating performance in that course.

9. Promotion between Semesters:

- 9.1. A student shall be promoted from odd to even semester if the minimum requirement of attendance as in clause 5 is fulfilled.
- 9.2. A student shall be promoted from even to odd semester, if the minimum requirement of attendance as in clause 5 is fulfilled and as per the other requirements specified in the following table.
- 9.3. Table indicating promotion requirements from even to odd semesters :

From 2nd sem. to 3rd sem.	If the student does not have more than three backlog courses in the 1st semester.
From 4th sem. to 5th sem.	Secured all the credits upto 2nd semester and does not have more than three backlog courses in the 3rd semester
From 6th sem. to 7th sem.	Secured all the credits upto 4th semester and does not have more than three backlog courses in the 5th semester

Note: Upto the 4th semester all the credits have to be secured and optional (only for elective courses) credits are available only from the 7th semester onwards.

10. Re-admission and Re-registration

- 10.1 A student may be detained in a semester either due to shortage of attendance, or due to having more than the permissible number of backlog courses. Students detained due to shortage of attendance may be re-admitted when the same semester is offered in the next academic year for fulfillment of academic requirements.
- 10.2 A student detained due to not having enough credits or having more than the permissible number of backlog courses, shall be promoted to the next academic semester only after fulfilling the requirements as per Table 9.3.
- 10.3 No grade allotments or SGPA/ CGPA calculations will be done for the entire semester in which student has been detained.
- 10.4 The academic regulations under which a student has been first admitted shall be applicable in all cases of re-admission.
- 10.5 If a student fails in a Professional Elective or an Open Elective, the student may re-register for the same or register afresh for any other Professional Elective or Open Elective course respectively in the subsequent semesters. In case of re-registration in the same courses, attendance is not mandatory, whereas registration for any other elective course/s requires the student to attend the classes and fulfill the attendance requirements as per Clause 5.
- 10.6 A student who fails in any course may be permitted the option of reregistering in that subject only if the internal assessment marks are less than 40%, so as to enable him to improve/redo and resubmit the work for internal evaluation. In such cases of re-registration, the student's previous performance both in the internal evaluation and end evaluation in the particular subject/s shall stand cancelled and he/she shall be required to appear for the end semester evaluation again (end examination and /or external jury as the case may be).

- 10.7 The maximum number of courses a student may be permitted for 're-registration' in a semester, is limited to three. Re- registration of any course should be done within 7 days from the date of declaration of the relevant results. A stipulated fee shall be payable towards re registration in any subject.
- 10.8 The student may attend classes in the case of the re-registered courses, if the student wishes. However, the attendance requirement is not compulsory for such courses.

11. Grade Points, SGPA and CGPA Calculation

- 11.1. After the results are declared, Grade Sheets will be issued to each student which will contain the list of courses registered during the semester and the performance in each with details of whether passing or failing, credits earned promoted or not, letter grades, grade points, etc.
- 11.2. Grade Points : The grade points obtained in a subject multiplied by the credits for that subject will be the weighted grade points.

Weighted Grade Points (WGP) = C x GP

Where 'C' is the number of credits assigned for the subject and 'GP' is the Grade Point obtained as per the Table in clause 7.1 above.

11.3. SGPA: The sum of the weighted grade points divided by the total number of credits in a semester will give the Semester Grade Point Average (SGPA).

SGPA =
$$\Sigma$$
C iGPi / Σ Ci i = 1 to n

Where n is the number of courses the student registered for in the semester, 'C' is the number of credits allotted to each of the courses, and 'GP' is the grade-point obtained by the student in the respective courses.

An example follows:

Course Title	Credits (C)	Grade (GP)	Weighted Grade Points (WGP)
Course X1	3	7	21
Course X2	8	8	64
Course X3	8	7	56
Course X4	7	7	49
Course X5	2	6	12
Course X6	2	6	12
Total	30		214
Semester Grade Point Average (SGPA) = Total WGP/ Total credits =			7.13

11.4. CGPA: The Cumulative Grade Point Average (CGPA) will be computed for every student after he/she has secured 283 credits, as:

 $CGPA = \Sigma CiGPi / \Sigma Ci$ i = 1 to m

Where 'm' is the number of subjects registered for in all the semesters from the 1st semester onwards. 'C' is the number of credits allotted to each of the courses, and 'GP' is the grade-point obtained by the student in the respective courses.

- 11.5. The CGPA and SGPA will be rounded off to the second decimal place and recorded as such.
- 11.6. For the purpose of computation of the CGPA, award of degree, award of the class as in clause 14, and other honours if any, including medals, the performance in the best 283 credits only will be taken into account. For calculating the 'best' 283 credits, the credits secured in all the Core and AEC courses (which are compulsory) shall be included. The choice of 'best' credits to be included in the calculation shall be from only those credits secured in the Electives both Professional and Open Electives.
- 12. **Eligibility for the Award of Degree :** A student shall be eligible for the award of the "B.Arch." Degree in the specific discipline into which he/she was admitted, if the following academic regulations are fulfilled:
 - 12.1. Has pursued the program of study for not less than five academic years and not more than ten academic years. Students, who fail to fulfill all the academic requirements for the award of the degree within ten academic years from the year of their admission, shall forfeit their seat in the program and their seat shall stand cancelled.
 - 12.2. Successfully secured the Minimum Total Credits required for the respective Programs.

S.No.	B.Tech. Program Title	Total Credits Minimum Total Credits (MTC)*				
1	Planning	240	222			
2	Facilities and Services Planning (FSP)	240	222			
3	Digital Techniques for Design and Planning (DTDP)	240	222			
*(refer to clause 9.3 for details)						

B.Tech. Programs and Credits

- 12.3. Successfully secured "Satisfactory" grades in all the mandatory noncredit courses/ activity.
- 12.4. Has secured a minimum of 5.0 CGPA
- 12.5. No disciplinary action is pending against the student.

13. Withholding of the results : The results of a student may be withheld if:

13.1. He/she has not cleared any dues to the University/Institution/Hostel.

13.2. A case of disciplinary action against the student is pending disposal.

14. Classification of the Degree Awarded

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of the B.Arch. Degree in the Program to which he/she was admitted, he/she shall be placed in one of the four classes as shown in the Table.

First Class with	1. 8.0 and above of CGPA.				
Distinction	2. Should have passed the examination in all the courses of all the eight semesters within five years, which includes any authorized break of study of one year (clause 3.3).				
	3. Should NOT have been prevented from writing end semester examination due to lack of attendance in any of the courses.				
First Class	Below 8.0 but not less than 7.0 of CGPA and				
Second Class	Below 7.0 CGPA but not less than 6.0				

Note : In all the above cases CGPA shall be calculated from the Grade Points secured for the best 283 credits. For calculating the 'best' 283 credits, the credits secured in all the Core and AEC courses (which are compulsory) shall be included. The choice of 'best' credits to be included in the calculation shall be from only those credits secured in the Electives – both Professional and Open Electives.

15. **Malpractice :** If a student indulges in malpractice in any of the examinations, he/she shall be liable for punitive action as prescribed by the University from time to time.

16. General

- 16.1 In case of any doubt or ambiguity in the interpretation of the academic regulations, the decision of the Vice-Chancellor is final.
- 16.2 The University may from time to time revise, amend or change the Regulations, Curriculum, Syllabus and Scheme of Assessment.

TRANSITORY REGULATIONS (from Academic Year 2017-18)

(Approved on 6th Feb., 2018)

Preamble:

The CBCS regulations and courses (referred to collectively as R-17) introduced from the academic year 2017-18, have brought in significant changes in the course structures and academic regulations of the programs in the University as indicated below.

-		
	Aspects	Remarks
1	Course Codes	All changed
2	Course Names / Titles	Some changes
3	Course Structure	Major changes – introduction of AEC courses; electives from
		4th sem. onwards. Total No. of courses in a program have
		generally increased (Eg. B.Arch. from 53 to 62)
4	Pass Marks	Changed in BFA and BTech. programs
5	Promotional Requirements	Changed in all programs
6	Award of Degree	Changed in all programs
7	Performance Evaluation and	Changed in all programs – is now based on a system of letter
	Award of Class	grades, SGPA and CGPA
8	Choice in terms of credits	Changed – Now available in all programs

Considering the significant changes in all the aspects as indicated above, the following transitory regulations have been approved.

The following regulations shall be applicable for the students from the pre CBCS programs (referred to as pre R17) applying for 're-admission':

1. **Readmission into 1st semester of R-17**: Only students readmitted into the full 1st semester of R-17 will, for all purposes be subject to the entire provisions of R-17.

2. Readmission from 2nd semester onwards:

Students readmitted from the 2nd semester onwards will be subject to the provisions of the pre R-17 in which they were first admitted The student will be facilitated in completing the academic requirements by either permitting him/her to attend "equivalent" coursework in the R-17 (as approved by the respective Boards of Studies), wherever available, or if equivalent coursework is not available, then by special arrangement for conducting the coursework as per the regulations in which admitted.

Academic Regulations for Re-registration cases of Students admitted prior to 2017

- Students originally admitted in the pre R17 programs, may be assigned teacher/s wherever possible, to enable them to complete their internal assessment as per their pre R17 regulations. Student has to complete the courses whenever offered. Special arrangement for the course/s may be made in case it effects the time line of the student's academic engagement
- 2. Wherever "equivalent" courses are available in the CBCS programs, reregistered students may be permitted to attend such courses if they choose to, but the academic regulations (and course codes / course titles, marks, credits, etc.) shall be as per the older regulations into which they were first admitted.
- 3. Wherever there is a change of syllabi, end semester examinations based on the old syllabi will be conducted in order to enable the students to clear the backlogs.

NOTE :

- 1. The term "Prerequisites" implies having registered in the course/s specified as prerequisite/s and fulfilled the attendance requirements.
- The term "Open" mentioned in the remarks column in the courses structure indicates the courses that are open to students from other departments or Programs. These courses which are open may be taken by students from other programs, either as professional electives or open electives.
- 3. Abbrevations used in the course structure

In the case of Periods per week:

L = Lecture S = Studio

F = Fieldwork P = Practicals

T = Tutorial O = Others (including workshops, seminars, colloquiums, etc.)

In the case of type of End Semester Examination:

W = Written / Drawing J = Jury P = Practical

4. Course /Subject codes and type:

In the 9-digit alphanumeric course code:

a. the first two characters represent the Program or Department that offers the course:

- AR = Architecture
- AA = Applied Arts and Visual Communication
- AN = Animation;
- ID = Interior Design
- PL = Planning
- DT=Digital Techniques for Design and Planning
- · FS = Facilities and Services
- PA = Painting
- SC = Sculpture
- PH = Photography and Visual Communication

and in the case of common courses- FA = Fine Arts; GN = General

- b. The 3rd an 4th digits denote the Academic Year of starting the course structure,
- c. The 5th character denotes the level of the course (Bachelors / Masters/ Diploma),
- d. The 6th digit denotes the semester number followed by a decimal and a number indicating the serial number of the course in that semester.
- e. The last alphabet in the course code indicates the type of course.
- C = Core A = AEC E = Professional Elective
- O = Open Elective.

Course Structure for FSP

Under the CBCS	, Effective from	the Academic	Year 2017-2018)
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S.	Course	Course	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Marks			End Exam	marks					
INU.	Code	Tille	ney	L	S/F	P/T/0	Total	ō	Int.	Ext.	Total	W/J/P	Rei
1	FS17 B1.1C	Building Services Studio-I	-	2	6	-	8	8	100	100	200	J	
2	FS17 B1.2C	Graphics & Presentation Techniques	-	4	-	-	4	4	50	50	100	J	
3	FS17 B1.3C	Engineering Physics	-	3	-	-	3	3	50	50	100	W	
4	FS17 B1.4C	Engineering Chemistry	-	3	-	-	3	3	50	50	100	W	
5	FS17 B1.5C	Surveying and Leveling	-	2	-	2	4	4	50	50	100	W	
6	FS17 B1.6C	Computer Applications in FSP	-	-	-	2	2	2	50	50	100	Р	
7	BT17 B1.1C	Engineering Mathematics	-	4	-	-	4	4	50	50	100	W	
8	GN17 B1.2A	Environment Studies	-	2	-	-	2	2	50	50	100	W	
		Total					30	30	400	400	800		

Semester - I

* Note: W- Written, P- Practical, J-Jury (all Practical and Jury end semester exams for Facilities Services will be followed by Viva- Voce)

JNAFAU	CBCS	for B.	Tech	(FSP)	Program,	effective	from	2017-	18
				· /					

	Contractor												
S.	Course	Course	Pre	F	Period	s per We	eek	edits		Marks		End Exam	marks
INU.	Code	THE	ney	L	S/F	P/T/0	Total	ō	Int.	Ext.	Total	W/J/P	Re
1	FS17 B2.1C	Building Services Studio-II	-	2	8	-	10	10	100	100	200	J	
2	FS17 B2.2C	Structural Mechanics	-	3	-	-	3	3	50	50	100	W	
3	FS17 B2.3C	Fluid Mechanics & Hydraulics	FS17 B1.3C BT17 B1.1C	3	-	-	3	3	50	50	100	W	Open
4	FS17 B2.4C	Building Materials	-	3	-	-	3	3	50	50	100	W	
5	FS17 B2.5C	Basics of Electrical Engineering	-	3	-	-	3	3	50	50	100	W	
6	BT17 B2.1C	Mathematical Methods	-	4	-	-	4	4	50	50	100	W	
7	GN17 B2.1A	Communica- tion Skills	-	2	-	-	2	2	50	50	100	Р	Open
8	GN17 B2.2A	Value Educa- tion	-	2	-	-	2	2	50	-	50	-	
		TOTAL					30	30	400	350	850		

Semester - II

* Note: W- Written, P- Practical, J-Jury (all Practical and Jury end semester exams for Facilities Services will be followed by Viva- Voce)

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				· /					

S.	Course	Course	Pre	F	Period	s per We	eek	redits		Marks		End Exam	marks
NO.	COUC	THE	neq	L	S/F	P/T/0	Total	ō	Int.	Ext.	Total	W/J/P	Re
1	FS17 B3.1C	Building Services Studio-III	-	2	8	-	10	10	100	100	200	J	-
2	FS17 B3.2C	Electrical Systems	FS17 B2.5C	3	-	-	3	3	50	50	100	W	-
3	FS17 B3.3C	Fundamentals of Structural systems	-	3	-	-	4	4	50	50	100	W	-
4	FS17 B3.4C	Thermody- namics	FS17 B1.3C BT17 B1.1C FS17 B1.4C	4	-	-	4	4	50	50	100	W	Open
5	FS17 B3.5C	Water Supply Systems	-	3	-	-	3	3	50	50	100	W	Open
6	FS17 B3.6C	Waste Water Systems	-	3	-	-	3	3	50	50	100	W	Open
7	FS17 B3.xE	Elective - I	-	-	-	-	-	3	50	50	100	W/ P/ J **	-
		Total					27	30	400	400	800		

Semester - III

* Note: W- Written, P- Practical, J-Jury (all Practical and Jury end semester exams for Facilities Services will be followed by Viva- Voce)

	DT17 B1.4c	C Pro- gramming and Data Structure	-	-	-	3	-	3	50	50	100	Р	Open
7	FS17 B3.2E	Construction Workshop	-	-	-	3	-	3	50	50	100	Р	Open
	FS17 B3.3E	Renewable Energy Systems	-	3	-	-	-	3	50	50	100	W	Open

S.	Course	Course	Pre	F	Period	s per We	eek	edits		Marks		End Exam	narks
NO.	Code	Title	Req	L	S/F	P/T/0	Total	ũ	Int.	Ext.	Total	W/J/P	Bei
1	FS17 B4.1C	Building Services Studio-IV	-	2	8	-	10	10	100	100	200	J	-
2	FS17 B4.2C	Building Technology-l	-	3	-	-	3	3	50	50	100	W	-
3	FS17 B4.3C	Refrigeration Systems	FS17 B3.4C	4	-	-	4	4	50	50	100	W	-
4	FS17 B4.4C	Illumination Engineering	-	3	-	-	3	3	50	50	100	W	Open
5	FS17 B4.5C	Climatology and Built Environment	-	3	-	-	3	3	50	50	100	W	Open
6	FS17 B4.6C	CAD And 3D Modeling	-	-	-	4	4	4	50	50	100	Р	Open
7	AR17 B4.7C	Open Elective-I	-	-	-	-	-	-	-	-	-	-	-
		Total					27	30	350	450	800		

Semester IV

Note:- Practical: Where the student does a Practical work for a given problem and is evaluated

Studio Jury: Semester work Portfolio of the studio is evaluated

For open elective 4 periods per week and 3 credits or assumed to calculate the totals

- * Note: W- Written, P- Practical, J-Jury (all Practical and Jury end semester exams for Facilities Services will be followed by Viva- Voce)
- * Note: L-Lecture, S-Studio, P-Practical, T-Tutorial, O-Others, F-Fieldwork.

S.	Course	Course	Pre	F	Period	s per We	eek	edits		Marks		End Exam	marks
INO.	Code	Title	Req	L	S/F	P/T/0	Total	ũ	Int.	Ext.	Total	W/J/P	Bei
1	FS17 B5.1C	Building Services Studio-V	-	2	8	-	10	10	100	100	200	J	-
2	FS17 B5.2C	HVAC Systems	FS17 B2.3C FS17 B3.4C FS17 B4.3C	4	-	-	4	4	50	50	100	W	-
3	FS17 B5.3C	Building Technology-II	FS17 B4.3C	3	-	-	3	3	50	50	100	W	-
4	FS17 B5.4C	Fire Engineering and Science	-	3	-	-	3	3	50	50	100	W	Open
5	FS17 B5.5C	Building Information Modeling	-	3	-	-	3	3	50	50	100	Р*	Open
6	FS17 B5.6C	Building Automations and Controls	-	4	-	4	4	4	50	50	100	W	-
7	FS17 B5.xE	Elective-II	-	-	-	-	-	3	50	50	100	W/P ***	-
		Total					27	30	400	400	800		

Semester - V

* Note: W- Written, P- Practical, J-Jury (all Practical and Jury end semester exams for Facilities Services will be followed by Viva- Voce) * Note: L-Lecture, S-Studio, P-Practical, T-Tutorial, O-Others, F-Fieldwork.

7	FS17 B5.1E	Electrical Ener- gy System and Management	-	3	-	-	3	3	50	50	100	W	
	FS17 B5.2E	Energy Auditing	-	3	-	-	3	3	50	50	100	W	Open

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S.	Course	Course	Pre	F	Period	s per W	eek	edits		Marks		End Exam	narks
INO.	Code	Title	Req	L	S/F	P/T/0	Total	5	Int.	Ext.	Total	W/J/P	Ber
1	FS17 B6.1C	Building Services Studio-VI	-	2	8	2	12	12	100	100	200	J	-
2	FS17 B6.2C	Green Building	-	3	-	-	3	3	50	50	100	W	Open
3	FS17 B6.3C	O & M of Building Services	-	4	-	-	4	4	50	50	100	W	Open
4	FS17 B6.4C	Estimation, Costing and Specification	-	4	-	-	4	4	50	50	100	W	Open
5	FS17 B6.5C	Safety Health & Environment	-	4	-	-	4	4	50	50	100	W	Open
6	FS17 B6.6C	Internship-1*	-	-	-	-	-	-	-	-	-	J	-
7	FS17 B6.xE	Elective-III	-	-	-	-	-	3	50	50	100	W/P ***	-
		Total					27	30	350	350	700		

Semester - VI

* Note: W- Written, P- Practical, J-Jury (all Practical and Jury end semester exams for Facilities Services will be followed by Viva- Voce)

	FS17 B6.1E	Computer Applications in MEP	-	-	-	3	3	3	50	50	100	Р	
7	FS17 B6.2E	Advanced HVAC Sys- tems	FS17 B2.3C FS17 B3.4C FS17 B4.3C FS17 B5.2C	3	-	-	3	3	50	50	100	Ρ	

S.	Course	Course	Pre	F	Period	s per We	eek	edits		Marks		End Exam	narks
INO.	Code	Tue	Req	L	S/F	P/T/0	Total	ũ	Int.	Ext.	Total	W/J/P	Bei
1	FS17 B7.1C	Building Services Studio-VII	-	2	8	-	10	10	100	100	200	J	-
2	FS17 B7.2C	Mechanical Circulation Systems	-	4	-	-	4	4	50	50	100	W	Open
3	FS17 B7.3C	Contract, Tender and Procurement Management	-	4	-	-	4	4	50	50	100	W	-
4	FS17 B7.4C	Pre-Thesis Seminar	-	2	-	-	2	2	-	-	-	J	-
5	FS17 B7.5C	Project Management	-	4	-	-	4	4	50	50	100	W	Open
6	FS17 B7.xE	Elective-IV	-	-	-	-	3	3	50	50	100	W/P ***	-
7		Open elective - II	-	-	-	-	-	-	-	-	-	-	-
		Total					27	30	350	350	700		

Semester - VII

Note:- Practical: Where the student does a Practical work for a given problem and is evaluated

Studio Jury: Semester work Portfolio of the studio is evaluated

For open elective 4 periods per week and 3 credits or assumed to calculate the totals

- * Note: W- Written, P- Practical, J-Jury (all Practical and Jury end semester exams for Facilities Services will be followed by Viva- Voce)
- * Note: L-Lecture, S-Studio, P-Practical, T-Tutorial, O-Others, F-Fieldwork.

	FS17 B7.1E	Work shop MEP	-	-	-	3	3	3	50	50	100	Р	
6	FS17 B7.2E	Building Sim- ulation and Modeling	-	-	-	3	3	3	50	50	100	Р	
	FS17 B7.3E	Disaster Management in FSP	-	3	-	-	3	3	50	50	100	W	Open

S.	Course	Course	Pre	F	Period	s per We	eek	edits		Marks		End Exam	narks
INO.	Code	nue	Req	L	S/F	P/T/0	Total	ũ	Int.	Ext.	Total	W/J/P	Rei
1	FS17 B8.1C	Project	FS17 B7.4C	-	-	-	-	12	200	200	400	J	-
2	FS17 B8.2C	Internship-II**	-	-	-	-	-	8	-	100	100	J	-
3	FS17 B8.3C	Human Behavior in Buildings	-	4	-	-	4	4	50	50	100	W	Open
4	FS17 B8.4C	Grand Viva	-	-	-	-	-	-	-	-	-	J	-
5	FS17 B8.xE	Elective-V	-	-	-	-	-	3	50	50	100	W/P ***	-
6		Open elective - III	-	-	-	-	-	-	-	-	-	-	-
							4	30	350	450	800		
5	FS17 B8.1E	Energy Simulation and Modeling	FS17 B7.2E	-	-	3	3	3	50	50	100	Р	Open
	FS17 B8.2E	Project Finance	FS17 B7.5C	3	-	-	3	3	50	50	100	W	

Semester - VIII

Note:- Practical: Where the student does a Practical work for a given problem and is evaluated

Studio Jury: Semester work Portfolio of the studio is evaluated

For open elective 4 periods per week and 3 credits or assumed to calculate the totals

- * Note: W- Written, P- Practical, J-Jury (all Practical and Jury end semester exams for Facilities Services will be followed by Viva- Voce)
- * Note: L-Lecture, S-Studio, P-Practical, T-Tutorial, O-Others, F-Fieldwork.

List Of Electives Semester -III

S.	Course	Course	Pre	F	Period	s per W	eek	edits		Marks		End Exam	narks
INO.	Code	Title	печ	L	S/F	P/T/0	Total	5	Int.	Ext.	Total	W/J/P	Bei
1	DT17 B1.4C	C Programming and Data Structures	-	-	-	3	3	3	50	50	100	Ρ	Open
2	FS17 B3.2E	Construction Workshop	-	-	-	3	3	3	50	50	100	Р	Open
3	FS17 B3.3E	Renewable Energy Systems	-	3	-	-	3	3	50	50	100	W	Open

Semester - V

S. Course No. Code	Course	Course	Pre	F	Period	s per W	eek	edits	Marks			End Exam	marks
	Tille	ney	L	S/F	P/T/0	Total	5 D	Int.	Ext.	Total	W/J/P	Bel	
1	FS17 B5.1E	Electrical Energy System and Management	-	3	-	-	3	3	50	50	100	W	
2	FS17 B5.2E	Energy Auditing	-	3	-	-	3	3	50	50	100	W	Open

Semester - VI

S.	Course	Course	Pre	F	Period	s per We	eek	edits		Marks	End Exam	narks	
INO.	Code	The	neq	L	S/F	P/T/0	Total	δ	Int.	Ext.	Total	W/J/P	Rei
1	FS17 B6.1E	Computer Applications in MEP	-	-	-	3	3	3	50	50	100	Р	
2	FS17 B6.2E	Advanced HVAC Systems	FS17 B2.3C FS17 B3.4C FS17 B4.3C FS17 B5.2C	3	-	-	3	3	50	50	100	W	Open

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S.	Course	Course	Pre	Periods per Week						Marks	End Exam	narks	
INO.	Code	ппе	кер	L	S/F	P/T/0	Total	δ	Int.	Ext.	Total	W/J/P	Ber
1	FS17 B7.1E	Workshop MEP	-	-	-	3	3	3	50	50	100	Р	
2	FS17 B7.2E	Building Simulations and Modeling	-	-	-	3	-	3	50	50	100	Р	
3	FS17 B7.3E	Disaster Management in FSP	-	3	-	-	-	3	50	50	100	W	Open

Semester - VII

Semester - VIII

S. No.	Course Code	Course Title	Pre	F	Period	s per We	eek	edits		Marks	End Exam	marks	
			ney	L	S/F	P/T/0	Total	ū	Int.	Ext.	Total	W/J/P	Rei
1	FS17 B8.1E	Energy Simulation and Modeling	FS17 B7.2E	-	-	3	3	3	50	50	100	Р	
2	FS17 B8.2E	Project Finance	FS17 B7.5C	3	-	-	3	3	50	50	100	W	

SEMESTER – I

FS17B1.1C BUILDING SERVICES STUDIO – I

CORE/S : 10/wk Int mks: 100 Ext mks : 100 Total mks: 200 End exam: Viva-Voce Cr: 10

Objectives of the Course:

To impart an understanding of principles of composition, and to appreciate design and design elements. Exercises complement the lectures and ensure that the students learn to develop a series of compositions in two and three dimensions.

UNIT I

Introduction to Buildings:

Introduction to building typologies- reading building drawings like plans, sections, elevations. Understanding how building works, various components and systems in building-like structural systems, spatial systems, services and networks.

Components in structural systems and how components work together – footings, columns, beams, slabs and their diagrammatic representation in a small building.

Components in spatial systems – various types of spaces designed for different functions; small spaces like toilets, lobbies, corridors etc., Different types of rooms/ spaces and their spatial organization. Diagrammatic representation of various spaces; circulation diagrams, connectivity diagrams and the understanding of the functional requirements of the spaces. Introduction to building services as an enhancement of quality of spaces.

Brief introduction to Specific requirements-ventilation, lighting, thermal comfort for different spaces. Brief introduction to safety requirements- fire safety, security systems etc., for different spaces.

UNIT II

Plumbing Services and Layout:

Introduction to plumbing services- Water Supply, Waste Water, Storm Water.

Identifying various components and representation of these components by symbols in Water supply, waste water and storm water. Understanding and representing the plumbing services for a building in the form of diagrams.

Case study of residential building; Preparation of plumbing layout for the building; Technical terms and symbols for plumbing installations and accessories for a residence.

UNIT III

Electrical Services and Layout:

Introduction to electrical services. Identifying various components and representation of these components by symbols. Understanding and representing the electrical services for a building in the form of diagrams.

Case study of residential building; Preparation of electrical layout of the building; Technical terms and symbols for electrical installations and accessories of wiring, electrical layout for residence.

UNIT IV

Mechanical Services and Layout:

Introduction to mechanical services in a building- mechanical circulation systems and HVAC.

Mechanical circulation systems like lift, elevators, conveyors and escalators-Various components in each of these systems, diagrammatic representation and location of these systems.

Case study of small commercial complex/ mall. Identification of mechanical circulation systems in relation to the building and its diagrammatic representation.

Brief introduction to concept of HVAC, types of HVAC systems, various components and diagrammatic representation of HVAC systems.

Case study of small commercial complex/ mall. Identification of HVAC systems in relation to the building and its diagrammatic representation.

Expected Output & Assignment:

Suggested outcome in the form of documentation of site visits and case studies, Assignments based on the units topics. Preparing charts displaying various kinds of building services. Preparing schematic diagram for various types of services.

REFERENCE BOOKS:

- 1. Graphic Thinking for Architects and Designers, Third Edition by Paul Laseau: John Wiley & Sons
- 2. How buildings work, The Natural Order of Architecture, Third Edition by Edward Allen: Oxford University Press

FS17B1.2C GRAPHICS AND PRESENTATION TECHNIQUES

CORE/S : 4/wk nt mks: 50 Ext mks : 50 Total mks:100 End exam: 5hrs Cr: 4

Objectives of the Course:

To introduce architectural drawing techniques to facilitate effective visual communication.

UNIT I

Fundamentals of drawing and its practice

Introduction to drawing equipment, familiarization, use and handling simple exercises in drafting, points, types of lines, line thickness and intensities.

UNIT II

Concepts of scale and proportions

Graphic and numerical scales, dimensioning of lines and planes, enlargement and reduction of drawings, anthropometrics and the scale of man to function, lettering for titles and annotations, freehand lettering, measuring and drawing to scale different objects, rooms etc.

UNIT III

Isometric, Orthographic, Perspective projections

Isometric scale-Isometric views of lines, views of plane figures, simple and compound solids. Orthographic projections of point, lines, planes and solids, section of solids, study of Parallel and Angular perspective of simple objects.

UNIT IV

Freehand drawing and rendering techniques

Graphical representations of trees, hedges, foliage, vehicles, human figures etc in pen and ink, sketching exercises.

UNIT V

Symbolic representation of building elements

Representation of building elements, openings, materials, accessories etc., terminology and abbreviations used in architectural presentation.

UNIT VI

Measured drawings

Scales and construction of scales. Measured drawings of simple objects, furniture, rooms, doors and windows, room plans etc., in plan, elevation and section. Enlargement and Reduction.

UNIT VII

Basic Mechanical, Electrical and Plumbing drawings

Interpretation of existing mechanical, electrical and plumbing drawings and introduction to drafting of MEP drawings.

UNIT VIII

Workshop

Interpretation of mechanical, electrical and plumbing drawings in three-dimensional models.

Expected Output & Assignment:

Scale drawing of simple objects to minimum one room building plan, elevation, and section.

This is a studio subject and students should be made to prepare drawings as studio exercises.

REFERENCE BOOKS:

- 1. Geometrical Drawing for Art Students by Thoms, E. French: New York,MC Graw Hill
- 2. Engineering Drawing: Plane and Solid Geometry, 42nd ed.by Bhatt, N.D. and Panchal V.M: Charotar Pub: Anand, 2000
- 3. T.B. of Geometrical Drawing, 3rd ed, by Gill, P.S: DewanSuhil Kumar Kataria, Ludhiana, 1986
- 4. Building Drawing: with an integrated approach to built environment, 7th ed. by Shah, M.G., Kale, C.M. and Patki, S.Y: Tata McGraw Hill Pub., Delhi, 2000
- 5. Architectural Drafting: Structure and Environment, by Bies, D. John: Bobbs Merrill Educational Pub., Indianapolis
- 6. H.B. of Architectural and Civil Drafting, by Nelson, A. John: Van Nostrand Reinhold, New York, 1983

FS17B1.3C ENGINEERING MATHEMATICS

CORE /TH: 4/wk Int mks: 50 Ext mks: 50 Total mks: 100 End exam: 3 hrs Cr: 4

Objectives of the Course:

To equip students with adequate knowledge of mathematics that will enable them in formulating problems and solving problems analytically.

UNIT I

Differential equations of first order and first degree - exact, linear and Bernoulli.

UNIT II

Non-homogeneous linear differential equations of second and higher order with constant coefficients with RHS term of the type e, Sin ax, cos ax, polynomials in x, e V(x), xV(x), method of variation of parameters.

UNIT III

Rolle's Theorem - Lagrange's Mean Value Theorem - Cauchy's mean value Theorem - (all theorems without proof).

UNIT IV

Radius, Centre and Circle of Curvature – Evolutes.

UNIT V

Applications of integration to lengths, volumes and surface areas in Cartesian and polar coordinates

UNIT VI

Vector Calculus: Gradient- Divergence- Curl and their related properties of sumsproducts- Laplacian and second order operators.

UNIT VII

Vector Integration - Line integral - work done - Potential function - area- surface and volume integrals.

UNIT VIII

Laplace transform of standard functions - Inverse transform - first shifting Theorem, Transforms of derivatives and integrals - Unit step function - second shifting theorem.

Expected Output & Assignment:

Assignments on given topics and periodic internal tests.

REFERENCE BOOKS:

- 1. A Text Book of Engineering Mathematics, Vol-1 ,by T. K. V. Iyengar, B. Krishna Gandhi and Others: S. Chand & Company
- 2. A Text Book of Engineering Mathematics, by C. Sankaraiah:V. G. S. Book Links
- 3. A Text Book of Engineering Mathematics, by Shahnaz Bathul: Right Publishers
- 4. A Text Book of Engineering Mathematics, by P. Nageshwara Rao, Y. Narasimhulu & N. Prabhakar Rao:Deepthi Publications
- 5. A Text Book of Engineering Mathematics, by B. V. Raman: Tata Mc Graw Hill
- 6. Advanced Engineering Mathematics, by Irvin Kreyszig: Wiley India Pvt. Ltd

FS17B1.4C ENGINEERING PHYSICS

CORE/TH : 3/wk Int mks: 50 Ext mks : 50 Total mks:100 End exam:3 hrs Cr: 3

Objectives of the Course:

The objective of the Engineering physics is to acquaint the students with the basic phenomenon/concepts of physics, the student face during course of their study in the industry and Engineering field. The student with the knowledge of the basic physics will understand and explain scientifically the various physics related problems in the industry/engineering field and structures related subjects. The student will be able to understand the new developments and breakthroughs efficiently in engineering and technology.

UNIT I

Ultrasonic:

Introduction; Production of ultrasonic waves; Magnetostriction method; Piezo electric method; Detection of ultrasonic waves; Properties of ultrasonic waves; Use of ultrasonic for nondestructive testing; Applications of ultrasonic.

UNIT II

Acoustics of Buildings:

Basic requirement of acoustically good hall; Reverberation and time of reverberation; Sabine's formula for reverberation time; Measurement of absorption coefficient of a material; Factors affecting the architectural acoustics and their remedy.

UNIT III

Optics:

Interference; Interference in thin films by reflection; Coherence; Diffraction; Fressnel and Fraunhofer diffractions; Fraunhofer diffraction at a Single slit; Double slit; Polarization; Types of Polarization; refraction.

UNIT IV

Magnetic Properties:

Permeability; Magnetization; Origin of magnetic moment; Classification of magnetic materials; Dia, para and ferro magnetism; Hysteresis curve; Soft and hard magnetic materials.

UNIT V

Lasers:

Introduction; Characteristics of lasers; Spontaneous and stimulated emission of radiation; Einstein's coefficients; Population inversion; Ruby laser; Helium; Neon laser; CO2 laser; Semiconductor laser; Applications of lasers in industry, scientific and medical fields.

UNIT VI

Thermal Properties:

Introduction; Specific Heat of Solids; Einstein Model; Debye Model; Lattice Vibrations; Phonons; Thermal Conductivity.

UNIT VII

Science & Technology of Nano-material:

Introduction to Nanomaterials; Basic principles of Nanoscience & Technology; Fabrication of nanomaterials; Physical & chemical properties of nanomaterials; Carbon nanotubes; Applications of nanotechnology.

UNIT VIII

Introduction to modern physics:

Quantum mechanics-solutions to Schrödinger equation, applications of quantum mechanics- Approximation Methods for Bound States, ScatteringTheory, Time-Dependent Perturbation Theory, Electromagnetic Radiation and Quantum Electrodynamics, relativistic quantum mechanics theory,

Expected Output & Assignment:

Suggested outcome in the form of documentation assignments based on the units topics. Preparing charts displaying various kinds of units based on optics, lasers, thermal properties etc. Preparing schematic diagram for various physics related topics.

REFERENCE BOOKS:

- 1. Physics Volume 2 by Halliday, Resnick and Krane: John Wiley & Son
- 2. Applied Physics by Dr. M. Chandra Shekar & Dr. P. Appala Naidu: V.G.S. Book links
- 3. Engineering Physics by R.K.Gaur & S.L. Gupta: Dhanpat Rai and Sons
- 4. Nanotechnology by Mark Ratner and Daniel Ratner: Pearson Education
- 5. Introduction to modern physics by Paolo Amore: John Dirk Walecka
- 6. Materials Science and Engineering by V. Raghavan: Prentice-Hall India
- 7. Engineering Physics by Dr. M. Arumugam: Anuradha Agencies
- 8. Nanomaterials by A.K. Bandyopadhyay: New Age International Publishers
- 9. Engineering Physics by M.N. Avadhanulu & P.G. Kshirasagar: S. Chand & Company Ltd.

FS17B1.5C ENGINEERING CHEMISTRY

CORE/TH : 3/wk Int mks:50 Ext mks: 50 Total mks:100 End exam:3 hrs Cr: 3

Objectives of the Course:

To acquire knowledge about desalination of brackish water and treatment of municipal water.

To gain the knowledge of conducting polymers, bio-degradable polymers and fiber reinforced plastics.

To learn significance of green chemistry and green synthesis and the synthesis of nano materials.

To understand mechanism of corrosion and preventive methods.

UNIT I

Water Technology-I:

Introduction, effect of water on rocks and minerals, types of impurities in water, hardness of water – temporary and permanent hardness. Units and inter conversions of units. Estimation of hardness by EDTA methods. Problems on temporary and permanent hardness. Analysis of water - alkalinity; chlorides and dissolved oxygen. Disadvantages of hard water. Methods of treatment of water for domestic purposes-sedimentation, coagulation, filtration, disinfection - sterilization, chlorination, break – point chlorination, ozonization.

UNIT II

Water Technology-II:

Water for industrial purposes; water for steam making; boiler troubles; carry over; priming and foaming, boiler corrosion, scales and sludges, caustic embrittlement. Water treatment: internal treatment; colloidal, phosphate, calgon, carbonate, sodium aluminate conditioning of water. External treatment; lime-soda process, zeolite process, ion-exchange process; numerical problems.

UNIT III

Science of Corrosion:

Definition, examples; types of corrosion: theories of corrosion and mechanism; dry corrosion, (direct chemical attack), wet corrosion, (electro chemical theory) principles of corrosion, galvanic series, galvanic corrosion, concentration cell corrosion, mechanism of wet corrosion; hydrogen evolution type, oxygen absorption type. Factors influencing corrosion, control of corrosion; proper design, use of pure metal and metal alloys, passivity, cathodic protection – sacrificial anode and impressed current. Modifying the environment, use of inhibitors.

UNIT IV

Protective Coatings and their applications:

Surface preparation: (1)solvent cleaning (2)alkali cleaning (3)pickling and etching (4)sand blasting (5)mechanical cleaning. Types of protective coatings: metallic coatings – anodic coatings, galvanization; cathodic coatings – tinning, metal cladding, electroplating ex: chromium plating, metal spraying, cementation – sheradizing, colourizing, chromizing, chemical conversion coatings: (1) phosphate (2) chromate (3) anodized coatings; organic coatings: paints – constituents and their functions

UNIT V

Polymer Science and Technology:

Polymerization reactions: basic concepts. Types of polymerization: addition and condensation polymerizations. Plastics: thermosetting and thermoplastics and differences. Compounding and moulding of plastics: compression, injection, transfer, and extrusion moulding methods. Preparation, properties and engineering uses of
the following: polyethylene, PVC, Teflon, Bakelite, nylon, polyester, polyurethanes and silicone resins. Rubber: processing of natural rubber, vulcanization and compounding. Elastomers: Buna S, Buna N, Thiokol.

Expected Output & Assignment:

Assignment on given topics, periodic internal tests, report on field visit (water, sewage treatment plant)

REFERENCE BOOKS:

- 1. A text book of Engineering Chemistry by Jain & Jain: Dhanpat Rai Publishing Company, New Delhi(15 Edition) (2006)
- Chemistry of Engineering Materials by C.P. Murthy: C.V. Agarwal and A. Naidu BS Publication Hyd. 2007
- 3. A Text book of Engineering Chemistry by S.S. Dara: S.Chand & Co, New Delhi (2004)
- 4. Engineering Chemistry by J C Kuriacose and J. Rajaram: Tata McGraw-Hill Co, New Delhi (2004)
- 5. Text book of Engineering Chemistry by Shashi Chawala: Dhanpat Rai Publishing Company, 15th edition New Delhi (2004)
- 6. Laboratory Manual on Engineering Chemistry by S.K. Bhasin and Sudha Rani: Dhanpat Rai Publishing Company, New Delhi (2004)
- 7. Engineering Chemistry by R. Gopalan, D. Venkappaya and S.Nagarajan: Vikas Publishing House, New Delhi (2004)
- 8. Engineering Chemistry by R.V. Gadag A.N. Tyanand Shortly IK: International Publishing house Pvt. Ltd. New Delhi

FS17B1.6C SURVERYING & LEVELLING

CORE/TH/L : 2/wk Int mks: 50 Ext mks : 50 Total mks:100 End exam: 3 hrs Cr: 2

Objectives of the Course:

To explain the techniques and instruments used in survey of land tracts.

UNIT I

Introduction – Definitions – Basic Principles of Surveying; Classification of Survey; Uses of Survey - Scales and Symbols-Sources of errors in Survey – Linear Measurement: accurate and approximate methods, duties of Surveyor.

UNIT II

Chain Surveying – Introduction – Types of chains and tapes. Instruments for chaining and taping – ranging-cross staffs – offsets – obstacles in chain surveying – errors and corrections (standardization, temperature and pull), composition of Areas (Trapezoidal rule – Average ordinate-Simpson rule).

UNIT III

Compass Surveying: Introduction on compass surveying –Types of Bearings-Designation of bearings – Fore bearing and back bearing – Types of Traverse – Temporary adjustments of compass, local attraction, Corrections, precautions, errors.

UNIT IV

Plane Table Survey: Introduction on Plane Table and their Accessories – Setting up the plane table – Methods of Plane Table (traversing Method – Radiation Method – Intersection Method) – Resection Method (two point problem). Three point problem

UNIT V

Leveling – Introduction –Definitions of terms used in leveling – Principle of leveling – Classifications temporary adjustments of dumpy level, RL's by height of Instrument and rise and fall method, Contouring and their characteristics, uses, – errors in leveling.

UNIT VI

Automated Surveying – Introduction to use of Digital Surveying – Instruments such as Total station, Electronic Theodolite, G.P.S, DGPS.

UNIT VII

Site Studies – Plot, site, land and regions, size and shape of site, Analysis of accessibility, Topography, Climate, land forms, Surface Drainage, Soil, Water, Vegetation, Ecology and Visual aspects.

UNIT VIII

Topographical Surveying: Concepts and Techniques: Definition, Procedure in topographic surveying, uses of topographical maps, Applications of surveying instruments.

Expected Output & Assignment:

Students are expected to use surveying equipment, prepare Longitudinal Section and Cross Section, contour maps and carry out field survey. Assignments and periodic tests to be conducted.

Note : One practical exam is compulsory as a internal assessment.

REFERENCE BOOKS:

- 1. K.R. Surveying Vol. I, 6th ed. by Arora: Standard Book House, Delhi, 2000
- 2. Surveying Vol. 1, 13th ed. by Punmia B.C: Laxmi Publications Pvt. Ltd., New Delhi, 1996
- 3. Surveying and Levelling, Volume 1, by S. S. Bhavikatti: I. K. International Pvt Ltd,
- 4. Surveying Volume 1, by Duggal: Tata McGraw-Hill Education, 2004.

FS17B1.7C COMPUTER APPLICATIONS IN FSP

CORE/L :2/wk Int mks: 50 Ext mks :50 Total mks:100 End exam: Practical & Viva-Voce Cr: 2

Objectives of the Course:

To enable the student to make audio-visual presentations, word processing, and other basic Programming Language.

UNIT I

Introduction

Introduction and history of computer, software & hardware concepts - bits, bytes - types of languages – Operating systems (windows, DOS, Linux).

UNIT II

Introduction to Word Processing Package (like MS office), toolbar, creating a new document, formatting text, inserting tables, pictures, page numbers and date/time, spelling and grammar checking, taking print outs.

UNIT III

Spread Sheets:

Introduction to spread sheets (like MS Excel), creating formulae, order of operations, borders and shading, inserting chart, taking print outs.

UNIT IV

Multi-media Presentations:

Introduction to multi-media presentation (like MS Power Point), creating a presentation, opening an existing presentation, creating a blank presentation, different Power Point views, slide manipulation, slide animation, slide transitions, view slide show, navigating while in slideshow, hyper linking to various other media/ application outputs, scanning of different media in different formats, setting of options, resolution settings, management of file size, integrating partial scans of large documents, pack up a presentation for use on another computer, taking print outs.

UNIT V

Exploring Microsoft Access:

Introduction, creating new and opening existing databases, creating a database using a wizard, creating a database without using a wizard, tables - what they are and how they work, create a table from scratch in design view, primary keys, switching views, entering data, manipulating data, advanced table feature examples.

Relationships - how to link multiple tables together, forms - what they are and how they work, creating a form using a wizard, reports - what they are & how they work, creating report & mail merge labels using a wizard.

UNIT VI

Internet concepts: Introduction to Internet, use of internet, various search engines, hyper text markup Language, e-mails.

UNIT VII

Programming languages:

C language, flow charts; Introduction, What is C? Structure of C program, Variables, I/O statements, Branching and Looping, Arrays, Strings, Functions, Pointers, Structures, files.

UNIT VIII

Database management systems

Introduction: SQL (structured query language), creating and inserting data into tables, updating values, modifying tables, working with quires Basic Structure of SQL, Variables and Types, Simple SQL Programs.

Expected Output & Assignment:

The internal assessment to be carried out through practical's and periodic tests on the above mentioned topics.

REFERENCE BOOKS:

- 1. Microsoft Office 2000,by Leon Hard Woody :Prentice hall of India. New Delhi
- 2. Microsoft Office for Windows, by Steve Sagman: India Addison Wesley, 1999
- 3. SQL/PL/SQL The Programming Language Of Oracle, by Ivanbayross: Bpb Publications
- 4. LET US C, Fifth Edition, by Yashwath Kanitkar: Bpb Publications
- 5. Programming In ANSIC, by Balaguruswamy: Tata McGraw-Hill Education, 2008
- 6. The C Programming Language, by Karningh and others: Addison-Wesley
- 7. HTML Black Book, by Steven Holzner: Dreamtech Press.

GN17B1.2A ENVIRONMENTAL STUDIES

AECC-I/TH: 2/wk Int mks: 50 Ext mks : 50 Total mks:100 End exam: 3hrs Cr: 2

Course Overview: A compulsory subject for all the undergraduate students of various discipline highlights significance of maintaining balance and sustainability of various components of the environment.

Objectives of the Course : To sensitize the students towards sustainable environment.

Course Contents:

UNIT – I

Environmental studies – Introduction: - Definition, scope and importance, Measuring and defining environmental development indicators.

UNIT – II

Environmental and Natural Resources: Renewable and non-renewable resources - Natural resources and associated problems - Forest resources - Use and over - exploitation, deforestation, case studies - Timber extraction - Mining, dams and other effects on forest and tribal people - Water resources - Use and over utilization of surface and ground water - Floods, drought, conflicts over water, damsbenefits and problems - Mineral resources: Use and 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, renewable and non-renewable energy sources use of alternate energy sources. Case studies. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

UNIT - III

Basic Principles of Ecosystems Functioning: Concept of an ecosystem. - Structure and function of an ecosystem. - Producers, consumers and decomposers.-Energy flow in the ecosystem Ecological succession. - Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem:

- a. Forest ecosystem
- b. Grassland ecosystem
- c. Desert ecosystem
- d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

UNIT - IV

Biodiversity and its conservation: Introduction - Definition: genetic, species and ecosystem diversity. Bio-geographical classification of India - Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values - Biodiversity at global, National and local levels. - India as a mega-diversity nation - Hot-sports 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 Ex-situ conservation of biodiversity.

UNIT - V

Environmental Pollution: Definition, Cause, effects and control measures of:

a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear hazards

Solid waste Management: Causes, effects and control measures of urban and industrial wastes. - Role of an individual in prevention of pollution. - Pollution case studies. - Disaster management: floods, earthquake, cyclone and landslides.

UNIT - VI

Social Issues and the Environment: From unsustainable to sustainable development -Urban problems related to energy -Water conservation, rain water harvesting, and watershed management -Resettlement and rehabilitation of people; its problems and concerns. Case Studies -Environmental ethics: Issues and possible solutions. -Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies. -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. -Public awareness.

UNIT - VII

Human Population and the Environment: Population growth, variation among nations. Population explosion - Family Welfare Programme. -Environment and human health. -Human Rights. -Value Education. -HIV/AIDS. -Women and Child Welfare. -Role of information Technology in Environment and human health. -Case Studies.

UNIT - VIII

Field work: Visit to a local area to document environmental assets River /forest grassland/hill/mountain -Visit to a local polluted site-Urban/Rural/industrial/ Agricultural Study of common plants, insects, birds. -Study of simple ecosystems - pond, river, hill slopes, etc.

TEXT BOOK:

ErachBharucha, A Text Book of Environmental Studies for Undergraduate Courses, University Grants Commission.

SEMESTER – II

FS17B2.1C BUILDING SERVICES STUDIO II

CORE/S : 10/wk Int mks: 100 Ext mks :100 Total mks:200 End exam: Viva-Voce Cr: 10

Objectives of the Course:

To impart knowledge related to design process and introduce various problem solving approaches. To develop abilities in design in the context of user requirements.

UNIT I:

Basic anthropometrics – average measurements of human body in different postures – its proportion and graphic representation, application in the design of simple household furniture. Basic human functions and their implications for spatial planning. Minimum and optimum areas for various functions in a residence. Reference to building norms and standards.

UNIT II

Introduction to design methodology. Detailed study of functional spaces such as living, dining, bedrooms, kitchen, toilet etc. including the furniture layout, circulation, clearances, lighting and ventilation, etc. Case study of existing house and analysis of the spaces.

UNIT III

Desk study and analysis of designed spaces noted for comfort and spatial quality; spatial design and integration of MEP services in the design.

UNIT IV

Design of a two-bed room house within a given site. Preparation of furniture layouts and MEP service layouts.

Expected Output & Assignment:

One major portfolio dealing with residential unit, with attention to circulation, ventilation, space planning and MEP service diagrams.

Note: In the end exam, which is a viva-voce, the students have to present the entire semester's work for assessment.

REFERENCE BOOKS:

- 1. Space planning Basics, by Karlen Mark: Van Nostrand Reinhold, New York, 1992
- 2. Time Saver standards for Interior, by Joseph D Chiara, Julius Panero, & Martin Zelnick: McGraw-Hill Education 2001
- 3. Interior Design Illustrared, 2nd edition,by Francis.D. Ching & Corky Bingelli:Wiley publishers, 2004.

- 4. Human Dimension & Interior Space : A source book of Design Reference standards,by Julius Panero & Martin Zelnick: Watson Guptill, 1979.
- 5. Space Planning Basics, by Karlen Mark, Kate Ruggeri & Peter Hahn: Wiley publishers, 2003.

FS17B2.2C STRUCTURAL MECHANICS

CORE/TH : 3/wk Int mks: 50 Ext mks : 50 Total mks:100 End exam: 3 hrs Cr: 3

Objectives of the Course:

To provide the basic knowledge of the engineering mechanics by deriving different forces, force systems, beams type sectional properties behavior of different members due to applied forces and basics of steel.

UNIT I

Introduction: Forces, system of forces, resultant, equilibrant Parallelogram law, Triangle law, Lamis Theorem, polygon law, resultant of coplanar, concurrent force system, couple, characteristics of couple, moment, Equilibrium,

UNIT II

Analysis of trusses, types of stresses, Loads on trusses, 2-D truss analysis using method of joint (Cantilever & Simply Supported)

UNIT III

Stress, Strain, type of stresses, stress-strain cure for ductile Material, Hooke's law, Modulus of Elasticity, Bars of Varying Section, Bars of Composite Section.

UNIT IV

Shear stress, types of Strain, poissons Ratio, Shear modulus Bulk Modulus Relation between the three Elastic Constants members subjected to 3 mutually perpendicular forces

UNIT V

Types of Beams, types of loads, calculation of reactions for simply supported beam (Using Point loads & Udl's) definition shear force & Bending Moment SFD& BMD for Cantilever beams.

UNIT VI

Shear force (SF)& Bending Moment (BM) diagrams for simply supported & over hanging beams for point loads & UDL, point contra flexure & its location, Relation between loading, SF & BM

UNIT VII

Definition of centroid, line of symmetry ,centroid for some standard shapes, calculation of centroid for shapes like L,T,C,I Sections etc., moment of inertia, Derivation of M.I formula for Rectangle, circle, Triangle, calculation of M.I for L,T,C,I Sections etc.,

UNIT VIII

Types of joints, lap joint & butt joint, failure of riveted joints, strength of the joint, efficiency of joint, Unwins formula, chain riveting & Diamond Riveting. Welded joints: Introduction, Advantages and disadvantages of welded joints, types, strength of fillet weld, design of welded joint for plates and unsymmetrical sections for axial loading.

Expected Output & Assignment

Students to make documentation of different built elements and their aspects mentioned above. Structural/ study models of different structures such as force system, bending moment, welded joints etc., shall be made along with short notes on the same. Assignments and periodic tests to be conducted.

REFERENCE BOOKS:

- 1. Engineering Mechanics, by Khurmi. R.S: S. Chand and Co. Ltd., New Delhi, 1999
- 2. Engineering Mechanics, 7th ed. by Ramamrutham. S.: Dhanpat Rai Pub. Co. Ltd., Delhi, 2004
- 3. Engineering Mechanics, by Timoshenko. S. and Young, D.H: McGraw-Hill International Editions

FS17B2.3C FLUID MECHANICS AND HYDRAULICS

CORE/TH: 3/wk Int mks: 50 Ext mks: 50 Total mks: 100 End exam: 3 hrs Cr: 3

Objectives of the Course:

The study of fluid mechanics involves statics, kinematics and dynamics aspects of fluid. Some of the notable applications are in design of dams, flow of water in pipes, measurement and analysis of various parameters like pressure velocity. The course tries to cover the important aspects of Fluid mechanics and its application.

UNIT I

Fluid statics:

Dimensions and units: physical properties of fluids- specific gravity, viscosity surface tension- vapor pressure and their influence on fluid motion- atmospheric gauge and vacuum pressure – measurement of pressure- Piezometer, U-tube and differential manometers.

UNIT II

Fluid kinematics:

Stream line, path line and streak lines and stream tube, classification of flowssteady & unsteady, uniform, non uniform, laminar, turbulent, rotational, and irrotational flows-equation of continuity for one dimensional flow.

Fluid dynamics:

Surface and body forces –Euler's and Bernoulli's equations for flow along a stream line, momentum equation and its application on force on pipe bend.

UNIT III

Closed conduit flow:

Reynold's experiment- Darcy Weisbach equation- Minor losses in pipes- pipes in series and pipes in parallel- total energy line-hydraulic gradient line.

Measurement of flow:

Pilot tube, venturimeter, and orifice meter, Flow nozzle, Turbine flow meter

UNIT IV

Basics of turbo machinery:

Hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work don and efficiency, flow over radial vanes.

UNIT V

Hydroelectric power stations:

Elements of hydro electric power station-types-concept of pumped storage plants-storage requirements, mass curve (explanation only) estimation of power developed from a given catchment area; heads and efficiencies.

UNIT VI

Hydraulic Turbines:

Classification of turbines, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies, hydraulic design –draft tube theory-functions and efficiency.

UNIT VII

Performance of hydraulic turbines:

Geometric similarity, Unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbine, cavitations, surge tank, water hammer.

UNIT VIII

Centrifugal pumps:

Classification, working, work done – manometer head- losses and efficiencies specific speed- pumps in series and parallel-performance characteristic curves, NPSH.

Reciprocating pumps:

Working, Discharge, slip, indicator diagrams.

Expected Output & Assignment:

Assignments on given topics and periodic internal tests.

REFERENCE BOOKS:

- 1. Hydraulics, fluid mechanics and Hydraulic machinery, by Dr P.N.Modi and Dr S.M.Seth :RK Bansal
- 2. Fluid Mechanics and Hydraulic Machines, by Rajput :Chand (S.) & Co Ltd ,India,
- 3. Fluid Mechanics and Fluid Power Engineering, by D.S. Kumar: Kotaria& Sons.
- 4. Fluid Mechanics and Machinery by D. Rama Durgaiah: New Age International.
- 5. Hydraulic Machines by Banga& Sharma: Khanna Publishers.

FS17B2.4C BUILDING MATERIALS

CORE/TH : 3/wk Int mks: 50 Ext mks : 50 Total mks:100 End exam: 3hrs Cr: 3

Objectives of the Course:

To understand the elementary and simple construction methods, explaining basic principles and consideration in the construction.

To impart knowledge on the various building materials,

To highlight the current trends and innovations in the usage of building materials.

UNIT I

Stones: Introduction, requirements of good building stones, uses and classifications, stone cladding, modern use of stone tiles in architectural works, artificial or cast stones.

Bricks and Clay Products:

Bricks, Composition of bricks, requirements of first class (good bricks), classification of bricks as per BIS, properties of burnt clay bricks, tests for bricks, special bricks.

Building Tiles:

Introduction to fire bricks and ceramic tiles.

UNIT II

Lime: Introduction, lime as one of the cementing materials, classification of lime,

storage and uses of lime. Aggregates: Introduction, types, classification, standard specification as per BIS.

Mortar: Function and utility of mortar, types of mortars.

UNIT III

Cement: Definition, brief description of manufacturing Portland cement, physical properties, tests for cement, standard specifications for Portland cement, uses of different types of cement, storage of cement.

UNIT-IV

Timber: Introduction, properties of good timber, identification of timber, preservation of timber, some common timbers and their uses in Civil Engineering Works.

Wood based Products: Veneers, plywood, plywood grades and sizes (IS-303-1975), hard board, particle board, block board, battle board, laminated board.

UNIT V

Metals: Glossary of terms, introduction, properties and uses of cast iron, wrought iron, steel, mild steel, high tensile steel, commercial forms of steel and aluminum.

Asphalt, tar and bitumen: Description and uses of asphalt, tar and bitumen.

Asbestos: Introduction, specifications, uses of asbestos in civil engineering works.

Plastic: Introduction and definition, uses of plastic in construction, plastic building products produced in India, modern developments in plastics.

Glass: Function and utility of glass, types of glasses and their uses, selection of glass.

Insulating Materials: Introduction, heat and sound insulating materials, types of insulating materials.

Admixtures: Definition, function and utility of admixtures, types of admixtures.

UNIT VI

Introduction to Advance Building Materials: Advance building materials plastic, PVC, metals, synthetic boards, fire resistant board/tiles, acoustic materials, glass, composite panels and their application, non load bearing gypsum board.

UNIT VII

Building Construction: Masonry Work: Technical terms, header, stretcher, bond, course, bed, facing, face, backing, hearting, joint, bat, closers, perpends, frog, quoin, plinth, plinth course, sill, jamb, reveal, string course, cornice, corbel.

Bond: Definition and purpose of bond, common types of bond.

UNIT VIII

Damp Proofing: Sources of dampness, methods of its prevention, material used in Damp proof Course.

Expected Output & Assignment:

Students should be exposed to on site and laboratory tests for above materials. Students should conduct market survey on above contents. Assignments and periodic tests to be conducted.

REFERENCE BOOKS:

- 1. Engineering Materials, by S.C. Rangwalla: Ahmedabad Book Depot, 1964
- 2. Engineering Materials, by G.J.Kulkarni: Ahmedabad Book Depot, 1964
- Building Materials Practice, by Ragsdale & Raynham : London E. Arnold 1972
- 4. Building Materials, by Deshapande: United Book Corporation, 1962

FS17B2.5C BASICS OF ELECTRICAL ENGINEERING

CORE/TH: 3/wk Int mks: 50 Ext mks: 50 Total mks: 100 End exam: 3hrs Cr: 3

Objectives of the Course:

An ability to apply knowledge of mathematics, science, and engineering

An ability to identify, formulate, and solve engineering problems

To understand the basic concepts of magnetic, AC & DC circuits

To explain the working principle, construction, applications of DC machines, AC machines & measuring instruments

To Gain knowledge about the fundamentals of wiring and earthling.

UNIT I

Introduction to Electrical Engineering:

Essence of electricity, Conductors, semiconductors and insulators (elementary treatment only); Electric field; electric current, potential and potential difference, electromotive force (EMF), electric power, ohm's law, basic circuit components, electromagnetism related laws, Magnetic field due to electric current flow, force on a current carrying conductor placed in a magnetic field, Faradays laws of electromagnetic induction. Types of induced EMF's, Kirchhoff's laws, Simple problems.

UNIT II

Network Analysis:

Basic definitions, types of elements, types of sources, resistive networks, inductive networks, capacitive networks, series parallel circuits, star delta and delta star transformation, Network theorems- Superposition, Thevenins's, Maximum power transfer theorems and simple problems.

UNIT III

Magnetic Circuits:

Basic definitions, analogy between electric and magnetic circuits, magnetization characteristics of Ferro magnetic materials, self inductance and mutual inductance, energy in linear magnetic systems, coils connected in series, attracting force of electromagnets.

UNIT IV

Electronic circuits:

Terminal characteristics, operation of diodes, Zener diode, diodes models, Diode applications for Rectifier, invertors circuits. Operation and principle of Transistors and their applications.

UNIT V

Alternating Currents:

Principle of ac voltages, waveforms and basic definitions, relationship between frequency, speed and number of poles, root mean square and average values of alternating currents and voltage, form factor and peak factor, phasor representation of alternating quantities, the J operator and phasor algebra, analysis of ac circuits with single basic network element, single phase series circuits, single phase parallel circuits, power in ac circuits.

UNIT VI

Transformers:

Principles of operation, Constructional Details, Ideal Transformer and Practical Transformer, Losses, Transformer Test, Efficiency and Regulation Calculations (All the above topics are only elementary treatment and simple problems).

UNIT VII

Introduction to Electrical Machines, Instruments and Power generation

Three phase induction motor: principle of operation, slip and rotor frequency, torque (simple problems).

Synchronous Machines: Principle of operation, EMF equation (Simple problems on EMF). Synchronous motor principle and operation (Elementary treatment only)

Basic Instruments: MC, MI instruments, dynamometer wattmeter, digital energy meter.

Power generation: Elements of power system, layout of thermal, hydro and nuclear power plants. Introduction to renewable energy sources and recent trends in generation.

UNIT VIII

Fundamental Principles of Electricity:

Voltage, Amperage, wattage and transmission of power, distribution in cities, HT

and LT consumers, Transformers and load calculations, Single and three phase connections, Indian Electricity rules.

Expected Output & Assignment:

Assignments and periodic tests to be conducted.

REFERENCE BOOKS:

- 1. Basic Electrical Engineering,by M.S.Naidu and S. Kamakshiah : Tata McGraw-Hill Education, 1995.
- 2. Basic Electrical Engineering, by T.K.Nagasarkar and M.S. Sukhija: Oxford University Press.
- 3. Theory and Problems of Basic Electrical Engineering by D.P.Kothari& I.J. Nagrath: PHI Learning Pvt. Ltd.1998
- 4. Principles of Electrical Engineering by V.K Mehta: S.Chand Publications.
- 5. Essentials of Electrical and Computer Engineering by David V. Kerns, JR. J. David Irwin Pearson: Pearson; 2nd edition ,2004
- 6. Electronic Devices & Circuit Theory,by R. L. Boylestad& Louis Nashlesky : Pearson Education
- 7. Basic Electronics- Devices, Circuits and IT Fundamentals,by SantiramKal : Prentice Hall, India
- 8. Electronic Devices and Circuits, by David A. Bell : Oxford University Press 2008

BT17B2.1C MATHEMATICAL METHODS

CORE/TH: 4/wk Int mks: 50 Ext mks : 50 Total mks:100 End exam: 3 hrs Cr: 4

Objectives of the Course:

The main objective of this course is to familiarize students with a range of mathematical methods that are essential for solving advanced problems in theoretical physics.

UNIT I

Matrices and Linear systems of equations: Elementary row transformations-Rank-Echelon form, Normal form – Solution of Linear Systems – Direct Methods- LU Decomposition- LU Decomposition from Gauss Elimination –Solution of Tridiagonal Systems-Solution of Linear Systems.

UNIT II

Eigen values, eigen vectors – properties – Cayley-Hamilton Theorem - Inverse and powers of a matrix by Cayley-Hamilton theorem – Diagonolization of matrix. Calculation of powers of matrix – Modal and spectral matrices.

UNIT III

Real matrices – Symmetric, skew - symmetric, orthogonal, Linear Transformation – Orthogonal Transformation. Complex matrices: Hermitian, Skew-Hermitian and Unitary – Eigen values and eigen vectors of complex matrices and their properties. Quadratic forms- Reduction of quadratic form to canonical form – Rank - Positive, negative definite - semi definite - index - signature - Sylvester law.

UNIT IV

Solution of Algebraic and Transcendental Equations: Introduction – The Bisection Method – The Method of False Position – The Iteration Method – Newton-Raphson Method.

UNIT V

Interpolation: Introduction- Errors in Polynomial Interpolation – Finite differences-Forward Differences- Backward differences –Central differences – Symbolic relations and separation of symbols-Differences of a polynomial-Newton's formulae for interpolation – Central difference interpolation Formulae – Gauss Central Difference Formulae –Interpolation with unevenly spaced points-Lagrange's Interpolation formula.

UNIT VI

Curve fitting: Fitting a straight line –Second degree curve-exponential curve-power curve by method of least squares. Numerical Differentiation and Integration–Trapezoidal rule – Simpson's 1/3 Rule –Simpson's 3/8 Rule.

UNIT VII

Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Euler's Method, Runge-Kutta Methods, Predictor-Corrector Methods, Adams- Moulton Method, Milne's Method.

UNIT VIII

Fourier Series: Determination of Fourier coefficients – Fourier series – even and odd functions – Fourier series in an arbitrary interval – even and odd periodic continuation – Half-range Fourier sine and cosine expansions. Fourier integral theorem (only statement) – Fourier sine and cosine integrals. Fourier transforms – Fourier sine and cosine transforms – properties – inverse transforms – Finite Fourier transforms.

Expected Output & Assignment:

Assignments on given topics and periodic internal tests.

REFERENCE BOOKS:

- 1. Mathematical Methods, by T. K. V. Iyengar, B. Krishna Gandhi and Others: S. Chand & Company
- 2. Mathematical Methods, by C. Sankaraiah: V. G. S. Book Links

- 3. A Text Book of Engineering Mathematics, by B. V. Raman: Tata Mc Graw Hill.
- 4. Numerical Methods for Scientific and Engineering Computation, by M. K. Jain, S. R. K. Iyengar & R. K. Jain: New Age International Publishers

GN17B2.1A COMMUNICATION SKILLS

AECC-II/L: 2/wk Int mks: 50 Ext mks : 50 Total mks:100 End exam: Viva-Voce Cr: 2

Course Overview: To prepare students to acquire understanding and fluency in English for professional work

Objectives of the Course: To provide an adequate mastery of technical and communicative English Language training primarily, reading and writing skills, and also listening and speaking skills.

Expected Skills / Knowledge Transferred: To prepare students for participation in seminars, group discussions, paper presentation and general personal interaction at the professional level.

UNIT I

Communication: Importance of Communication; Elements of good individual communication; organizing oneself; different types of communication; Barriers in the path of Communication

UNIT II

Listening skills: Listening to conversation and speeches (Formal and Informal)

Reading: Techniques of reading, skimming, Scanning, SQ3R technique

UNIT III

Creative Writing: Scope of creative writing; Writing skills Signposting, Outlines, Rephrasing

Writing a report/ format of the report; Paragraph, Letter Writing, Essay writing, Memo, Circular, Notice, Cover Letter, Resume, Writing with a thesis, Summary, Précis, Product description – Description of projects and features

Oral Report; Periodical Report; Progress Report; Field Report

Preparation of minutes; Video conference; Tele conference / Virtual meeting

UNIT IV

Speaking: How to converse with people, How to communicate effectively; Language and grammar skills; Pronunciation drills, Phonetics, vowels, Diphthongs, consonants, Stress, Rhythm and intonation, Conversational skills

Features of effective speech- practice in speaking fluently –role play – telephone skills – etiquette.

Short Extempore speeches – facing audience – paper presentation – getting over nervousness – Interview techniques – preparing for interviews – Mock Interview – Body Language.

UNIT V

Impact of internet on communication; communication through computers;

voice mail; broadcast messages; e-mail auto response; etc.

Reference books:

- 1. Krishna Mohan & Meera Banerji: Developing Communication Skills Macmillan India
- 2. C S Rayudu: Principles of Public Relations, Himalaya Publishing House
- 3. K. Ashwathappa: Organizational Behavior, Himalaya PublishingHouse
- 4. Daniel Colman: Emotional Intelligence

GN17B2.2A VALUE EDUCATION

AECC-III: 2/wk Int mks: 50 Ext mks : 0 Total mks:50 End exam: Nil Cr: 2

Course Overview: To provide guiding principles and tools for the development of the whole person, recognizing that the individual is comprised of Physical, Intellectual, Emotional and Spiritual dimensions.

Knowledge Transfer /Expected Skills:

To help individuals think about and reflect on different values.

To deepen understanding, motivation and responsibility with regard to making personal and social choices and the practical implications in relation to themselves and others, the community and the world at large to inspire individuals to choose their own personal, social, moral and spiritual values and be aware of practical methods for developing and deepening them.

UNIT I

Value Education—Introduction – Definition of values – Why values? – Need for Inculcation of values – Object of Value Education – Sources of Values – Types of Values: i) Personal values ii) Social values iii) Professional values iv) Moral and spiritual value Behavioral (common) values

UNIT II

Personal values – Definition of person – Self confidence – Relative and absolute confidence, being self-determined, swatantrata (loosely equivalent to freedom).

Self discipline – Self Assessment – Self restraint –Self motivation – Determination – Ambition – Contentment Self-respectand respect to others; expression of respect

UNIT III

Social values – Units of Society - Individual, family, different groups – Community – Social consciousness – Equality and Brotherhood – Dialogue – Tolerance – Sharing – Honesty-Responsibility – Cooperation; Freedom – Repentance and Magnanimity.

Peer Pressure - Ragging - examples - making one's own choices

UNIT IV

Professional values-Definition-Competence-Confidence-Devotion to duty-Efficiency-Accountability.

 Respect for learning /learned – Willingness to learn-Open and balanced mind – Team spirit – Professional

Ethics – Willingness for Discussion; Difference between understanding and assuming.

Time Management: Issues of planning, as well as concentration (and aligning with self goals) Expectations from yourself. Excellence and competition, coping with stress, Identifying one's interests as well as strengths.

UNIT V

Behavioural values – Individual values and group values. Anger: Investigation of reasons, watching one's own anger; Understanding anger as: a sign of power or helplessness, distinction between response and reaction.

Right utilization of physical facilities. Determining one's needs, needs of the self and of the body, cycle of nature.

Relationship with teachers. Inside the class, and outside the class, interacting with teachers.

UNIT VI

Complimentary nature of skills and values. Distinction between information & knowledge

Goals: Short term goals and long term goals; How to set goals; How to handle responsibilities which have to be fulfilled while working for goals.

Reference Books

- 1. Ramancharla Pradeep Kumar. Compiled Reading Material IIIT Hyderabad
- Dr. S. Ignacimuthu S. J., Values for life, Better yourself Books, Bandra Mumbai- 600 050 (1999).
- 3. Values (Collection of Essays)., Published by : Sri Ramakrishna Math., Chennai—(1996)
- 4. Prof. R.P.Dhokalia., Eternal Human ValuesNCRT –Campus Sri Aurobindo Marg., New Delhi
- 5. Swami Vivekananda., Education., Sri Ramakrishna Math., Chennai-4(1957)

SEMESTER - III

FS17B3.1C BUILDING SERVICE STUDIO - III

CORE/S: 10/wk Int mks: 100 Ext mks : 100 Total mks :200 End exam: Viva-Voce Cr: 10

Objectives of the Course:

To develop a conceptual understanding of landscape design and site planning principles.

To develop skills in integrating landscape design with built environments.

Course Contents: Understanding Site, Site Analysis and Infrastructure Analysis.

Study and Analysis: Selection, development and utilization studies are to be objectively performed and communicated or established through case studies and analyzing constraints, and interventions in site planning.

Design Proposal: Graphic representation of all the aspects mentioned below on maps and drawings, Documentation and Design of Site Planning incorporating, Site Appraisal. Site Analysis, Site Zoning, Built form Analysis, User Analysis w.r.t Amenities provided along with bye laws and regulation, Site Grading, Integration of Services i.e. Plumbing & Electrical.

General Site Context and Characteristics

- Geographic location, adjacent land use patterns, access systems, nearby destinations and facilities.
- Nature of the area or projects nearby and their effects on the site (micro & macro climates on built form)

Site Topography

- Geology, Soil and Hydrology
- Understanding Contours
- Cut and fill Techniques
- Site Leveling
- Pattern of landforms typology, slopes, circulation possibilities, access point, barrier and visibility
- Unique features

Water

- Existing water bodies
- Natural and man-made drainage channels
- Surface drainage pattern
- Water supply location

Vegetation

- Dominant plant
- General pattern of plant cover

Climate

- Local pattern of wind direction, wind rose, speed and sun angles
- Local microclimates
- Ambient air qualities, sound levels

Sensory qualities

- Character and relationship of visual spaces
- Quality and variation of light

Site and zoning

- Zoning classification i.e, land use zoning
- Set-backs,
- Height restrictions,
- FSI and FAR
- Incentive zoning
- Open spaces
- Open space ratio
- Pedestrian and Vehicular circulation
- On Off street parking requirements
- Water front access plan
- Water front area, bulkhead line, shoreline
- Waterfront Public Access Area

Man Made Structures.

- Existing buildings and Siting
- Co-relation between Site form and Infrastructure
- Neighborhood context
- Location,outline,type,circulation pattern, streets, roads, alleys, sidewalks, and plazas

Infrastructure Analysis

Electrical

- DG Set Types
- Transformers Types

- Over Head Transmission lines
- Underground Transmission lines
- Earthing systems & Lighting arrester
- Server rooms
- Control room
- Street lights & Solar plates
- Outdoor Lighting

Plumbing

Indoor

- Indoor water supply network
- Drainage network

Outdoor

- Irrigation Systems
- External Drainage System
- Storm Water Management
- Roof Water Harvesting
- Grey Water Systems
- Sewage Treatment Plant
- On Site Sewage Disposal

Mechanical

Location of Pump rooms

*Economic footprint has to be considered and evaluated for all.

Site Appraisal and Analysis of the site are to be prepared and assessed based on UDA guidelines and National Building Codes.

Expected Outputs & Assignment:

One main/major design problem dealing with documentation of site planning and infrastructure analysis for medium sized sites (upto 5 Ha) of Institutional campus, Gated Communities, Hospitals and Corporate Offices. At least one minor/time problem of a small scale residential dwelling or Commercial Complex (less than 5 acres) has to be taken up as a site planning/ infrastructure planning exercise.

A brief report of about 1000 words explaining the concept and design proposals must be submitted along with the main design portfolio. Also, an site model along with building services must be submitted for one major design exercise.

Note: Focus will be on the site and context and their relationship to the built environment. Activities, services and construction methods, phenomena of social utilizations, growth and change shall also be studied and analyzed.

REFERENCE BOOKS:

- 1. R Gene Brook: Site planning, environment, process and development TSS, NBC
- 2. Kevin Lynch: Site Planning Premier on Problem Seeking
- 3. Michael Laurie: An introduction to landscape architecture
- 4. Tom Turner: Landscape Planning
- 5. S. K. Bhattarcharjee: Landscape Gardening & Design with Plants

FS17B3.2C ELECTRICAL SYSTEMS

CORE/TH: 3/wk Int mks:50 End mks:50 Total mks:100 End exam: 3hrs Cr:3

Objectives of the Course:

To understand electrical aspect of transmission and distribution procedures of Electricity.

UNIT I

Fundamental principles of Electricity:

Electricity - Definition, Units, & Symbols, Basics & Importance of Electricity, Electrical codes and standards, Indian Electricity Acts, Generation, Transmission and distribution system, Introduction to electric motor, drives, starters, UPS etc.

UNIT II

Utilization of Electricity, Electrical Switchgear (High Voltage and Low Voltage), Distribution Transformers:

Types of transmission and Distribution lines and their application, Types of transformer, on load Tap changers for Transformers, Power Factor Correction Capacitors. Generation of Electric Power, Standby DG Sets and their hookup to the Mains Distribution, Multiple DG Sets Synchronization.

UNIT III

Substation layouts:

Transformers, Switch gear Panels and capacitor Bank. Distribution of electricity. Cabling- mains and sub mains. Electrical Installation in large Buildings. Service Ducts. Internal Electrical wiring and controls. Maintenance of electrical installations. Safety Precautions in Handling Electrical Systems.

UNIT IV

Electric layouts:

Conversion of 3-Phase to 1- Phase connection, preparation of layouts for residences, offices etc., Domestic appliances: Types of electric motors and electro

mechanical devices. Construction and working of at least six domestic appliances and location in buildings.

UNIT V

Lighting Calculation:

NBC standards, nominal illumination levels in building interiors, lux, lumen, intensity, lighting schemes.

Building Wiring and Cable System

Wiring Rules and regulations. Types of Conductors, wiring methods and types of cables, Applications and Selection of wires and cables for general building. Applications and Selection of switches and sockets, boards service wires, metering distribution circuits, Lighting, and Power circuit wiring diagrams. Conduit Layout Design, Load schedule and Load balancing.

UNIT VI

Safety aspects in Electrical Systems:

Types of Fire fighting systems for Electrical Equipment- Fuses, MCB's, MCCB's and C.B's and theirs cut outs, Standard heights of mounting accessories. Lightning Protection, Grounding - system grounding and equipment grounding, Earthing Methods, and Standards, ELCB, pipe earthing, plate earthing, Factors that affect the Earth Resistance, Earth Resistivity Measurements, and Earthfault detection and sensing.

UNIT VII

Electrical load for small buildings:

Definition of lighting load and power load, Lamps and Lamp circuits: Types of lamps - construction of different types of lamps for small building, lamp circuit incorporating energy meter, cut out and distribution box. Electrical design for small scale building.

UNIT VIII

Electrical Load for high rise building:

Lighting load, power load, wiring layout for large building, Design of size of transformer, pump installation, cable size, and DG set Load sharing, Optimization of DG Set operation with respect to load. Electrical design for large scale building

Expected Outcome & Assignment

Assignments on given topics and periodic internal tests.

REFERENCE BOOKS

- 1. Electrical Wiring, Estimating & costing by S.L.Uppal Electrical wiring,
- 2. Estimating & costing by J.B.Gupta
- 3. Electrical Drawing by Balbir Singh Electrical wiring by Arora

- 4. Maintenance and Operation of Electrical Equipment by BVS Rao, Vol- I
- 5. Testing, Commissioning Operation & Maintenance of Electrical equipment by S.Rao
- 6. Electrical Installation Estimation and Costing by M.Rajalingam.
- 7. Sally Hunt, "Making Competition Work in Electricity", 2002, John Wiley Inc.

FS17B3.3C FUNDAMENTALS OF STRUCTURAL SYSTEMS

CORE/TH: 4/wk Int mks: 50 Ext mks: 50 Total mks: 100 End exam: 3 hrs Cr: 4

Objectives of the Course:

To elaborate the knowledge on structural mechanics to apply the concepts and theories to built a desirable structures with respect to the behavior of beams, columns and stress behavior due to applied forces.

UNIT I

Fundamentals of Structures

Construction and form, Structure and Form. Geometry of form and structural function. Introduction to basic structural systems, elements of structure, their functions &behavior, beams, slabs, columns, walls, foundations, bearing wall systems, trusses, rigid frames, linear and curved elements; simply supported, cantilever and overhanging beams for various loads; effect of simple geometric forms on the overall structural behavior.

UNIT II

Fundamentals of Forces

Primary and secondary forces acting on structures dead loads, live load, wind, seismic forces, distribution of loads through the elements of the system.

Structural Systems:

Single and double layer grids; braced domes, ribbed domes, plate type domes, Network domes, Lamella domes, Geodesic domes, Grid domes. Braced and folded structures.

UNIT III

Mechanical properties:

Concept of direct and shear stresses and strains, stress-strain relationship, Biaxial and triaxial loading. Elastic constants and their relationship, stress-strain diagrams and their characteristics for mild steel other metal and concrete. Factors of safety.

Uniaxial problems: Stresses and strains in compound bars in uniaxial tension and compression, temperature stresses in simple restrained bars and compound bars of two types only.

UNIT IV

Axial force, shear force & Bending Moment Diagrams.

Beams, Loading and support conditions, Bending moment, Shear force and axial load diagrams for all types of loadings for simply supported beams, cantilevers and beams with overhangs, Relation between shear force, bending moment and loading intensity.

UNIT V

Stresses in beams (Bending, Shear)

- i. Bending; Theory of simple bending, Determination of moment of inertia of cross sections of various shapes, section modulus, Moment of resistance, bending stresses in solid, hollow and built up section.
- ii. Shear: Distribution of shear stresses on beam cross sections,
- iii. Strain energy under uniaxial tension and compression shear bending and torsion impact loads and instantaneous stresses.

UNIT VI

Slope & Deflection of beams:

Theory of long columns, Euler, Rankine formula, slope & deflection in statically determinate beams subjected to point loads, u. d. loads, Moments by a) Macauley's Method b) Moment Area Method c) Conjugate Beam method.

UNIT VII

Thin cylinders:

Design, changes in volume and dia of thin cyinders. Thin spherical shells

Thick cylinders:

Derivation of lame's theory. Design of thick cylinders. Thick spherical shell.

Torsion Of Circular Shafts – Theory of pure torsion – Derivation of Torsion equations : T/J = q/r = Ne/I - Assumptions made in the theory Theory of pure torsion – Torsional moment of resistance – Polar section modulus – Power transmitted by shafts – Combined beinding and torsion and end thrust – Design of shafts according to theories of failure

UNIT VIII

Springs: Introduction – Types of springs – deflection of close and open coiled helical springs under axial pull and axial couple –springs in series and parallel – Carriage or leaf springs

Columns And Struts: Introduction – Types of columns – Short, medium and long columns – Axially loaded compression members – Crushing load – Euler's theorem for long columns – assumptions

Expected Output & Assignment

Students should prepare charts based on bending moments and different structural figures. Assignments and periodic tests to be conducted.

REFERENCE BOOKS:

- 1. Development of Structural Form, by Rowland J. Mainstone: Taylor & Francis Group, 2001.
- 2. Engineering Materials, by Rangwala: Anand, 1993.
- 3. Building Construction, by S. P. Bindra, S. P. Arora: Dhanpat Rai Publications
- 4. Strength of Materials vol I, by B.C. Punmia: Laxmi Publications pvt. Itd
- 5. Mechanics of Materials, by E.P.Popov: Prentice Hall of India, New Delhi

FS17B3.4C THERMO DYNAMICS

CORE /TH: 4/wk Int mks :50 Ext mks :50 Total mks:100 End exam: 3hrs Cr:4

Objectives of the Course:

To understand the treatment of classical Thermodynamics and to apply the First and Second laws of Thermodynamics to engineering applications.

UNIT I

Fundamental Concepts & Definitions:

Thermodynamics: Terminology; definition and scope, microscopic and macroscopic approaches. Engineering Thermodynamics: Definition, some practical applications of engineering thermodynamics. System (closed system) and Control Volume (open system); Characteristics of system boundary and control surface; surroundings; fixed, moving and imaginary boundaries, examples. Thermodynamic state, state point, identification of a state through properties; definition and units, intensive and extensive various property diagrams, path and process, quasi-static process, cyclic and non-cyclic processes; Restrained and unrestrained processes; Thermodynamic equilibrium; definition, mechanical equilibrium; dia-thermic wall, thermal equilibrium, chemical equilibrium. Zeroth law of thermodynamics. Temperature as an important property.

UNIT II

Work and Heat:

Mechanics - definition of work and its limitations. Thermodynamic - definition of work and heat, examples, sign convention. Displacement works at part of a system boundary and at whole of a system boundary, expressions for displacement works in various processes through p-v diagrams. Shaft work and Electrical work. Other types of work. Examples and practical applications.

UNIT III

First Law of Thermodynamics:

Statement of the First law of thermodynamics for a cycle, derivation of the First law of processes, energy, internal energy as a property, components of energy, thermodynamic distinction between energy and work; concept of enthalpy, definitions of specific heats at constant volume and at constant pressure. Extension of the First law to control volume; steady state-steady flow energy equation, important applications such as flow in a nozzle, throttling, adiabatic mixing etc., analysis of unsteady processes, case studies.

UNIT IV

Pure Substances & Steam Tables and Ideal & Real Gases:

Ideal and perfect gases: Differences between perfect, ideal and real gases, equation of state, evaluation of properties of perfect and ideal gases. Real Gases: Introduction. Vander Waal's Equation of state, Vander Waal's constants in terms of critical properties, law of corresponding states, compressibility factor; compressibility chart, and other equations of state (cubic and higher orders). Pure Substances: Definition of a pure substance, phase of a substance, triple point and critical points, sub-cooled liquid, saturated liquid, vapor pressure, two-phase mixture of liquid and vapor, saturated vapor and superheated vapor state of a pure substance with water as example. Representation of pure substance properties on p-T and p-V diagrams, detailed treatment of properties of steam for industrial and scientific use (IAPWS-97, 95)

UNIT V

Basics of Energy conversion cycles:

Devices converting heat to work and vice versa in a thermodynamic cycle Thermal reservoirs. Heat engine and a heat pump; schematic representation and efficiency and coefficient of performance. Carnot cycle.

UNIT VI

Second Law of Thermodynamics:

Identifications of directions of occurrences of natural processes, Offshoot of II law from the I. Kelvin-Planck statement of the Second law of Thermodynamic; Clasius's statement of Second law of Thermodynamic; Equivalence of the two statements; Definition of Reversibility, examples of reversible and irreversible processes; factors that make a process irreversible, reversible heat engines; Evolution of Thermodynamic temperature scale.

UNIT VII

Entropy:

Clasius inequality; statement, proof, application to a reversible cycle. ∞ (δ QR/T) as independent of the path. Entropy; definition, a property, principle of increase of entropy, entropy as a quantitative test for irreversibility, calculation of entropy, role

of T-s diagrams, representation of heat, Tds relations, Available and unavailable energy.

UNIT VIII

Availability and Irreversibility:

Maximum useful work for a system and a control volume, availability of a system and a steadily flowing stream, irreversibility. Second law of efficiency.

Expected Outputs & Assignment:

Assignments and periodic tests to be conducted.

REFERENCE BOOKS:

- 1. Heat Engineering, by DrVasandani and Dr Kumar: Metropolitan Book Co. Pvt. Ltd., Delhi.
- 2. Thermal Engineering, by PL Ballaney: Khanna Publishers, Delhi.
- 3. Engineering Thermodynamics: Work and Hest Transfer, by Rogers and Mayhew; ELBS Publications.
- 4. Thermodynamics and Heat Engines Vol. I and II, by R Yadav: Central Publishers, Allahabad.
- 5. Steam Turbine Theory and Pratice, by WAJ Keartan: ELBS Series
- Applied Thermodynamics by TD Eastop& A McConkey: ELBS Publications 2003

FS17B3.5C WATER SUPPLY SYSTEMS

CORE/TH: 3/wk Int mks: 50 Ext mks: 50 Total mks: 100 End exam: 3hr Cr: 3

Objectives of the Course:

To provide a sound understanding of design principles in water supply systems and treatment processes. Students will be able to acquire sufficient knowledge on basic design of conventional and advanced water treatment processes.

Introduction:

Importance and Necessity for planned water supplies, wholesome water, Status of protected water supply in India, Planning and Execution of Modern water supply schemes.

UNIT I

Water Demands

Various types of water Demands, Domestic Demand, Industrial Demand, Institutional and commercial water demand, Demand for Public uses, Fire demand, Losses and wastes, Per capita demand, Factors affecting per capita demand, Variations in demand, Seasonal variations, Daily variations, Hourly variations, Design Period, Total requirement of water for a town or a city, Population forecasting methods and problems, Arithmetical increase method, Geometrical increase method, Incremental increase method, etc.

UNIT II

Sources of water supply

Hydrological concepts, Definition, Precipitation, Infiltration, Run off, Evaporation, Transpiration, Surface sources, Natural ponds and lakes, Streams and rivers, Impounding reservoirs, Sub surface sources, Infiltration galleries, Infiltration wells, Springs, Wells, Intakes for collecting surface water, definitions and general introduction.

UNIT III

Quality of water

General Introduction

Characteristics of Water, Physical Characteristics, Turbidity, Colour and Temperature, Taste and Odour, Chemical Characteristics, Total Solids and suspended solids, PH value of water, Hardness of water, Chloride content, Nitrogen content, Metals and other Chemical substances, Dissolved Gases, Bio-chemical Oxygen Demand, Bacterial and Microscopical characteristics, Water Borne Diseases, Drinking water standards.

UNIT IV

Treatment of Water

General Introduction, Treatment unit flow diagram, Screening, Sedimentation, Plain Sedimentation, Sedimentation aided with Coagulation, Filtration, Theory of filtration, Slow sand filters construction and operation, Rapid sand filters, Pressure filters, Disinfection, Methods of Disinfection, Chlorination, pre, post, Break-point Chlorination and Dechlorination, Defluoridation - by Nalgonda technique.

UNIT V

Distribution System

General Introduction, Requirements of a good distribution system, Layouts of Distribution Networks, Dead end system, Grid iron system, Ring system, Radial system, Systems of Distribution, Gravitational system Pumping system, Combined system, Types of pumps and their suitability, Centrifugal pumps – Components, Selection of pump horse power, Operation and maintenance, Trouble Shooting, Requirement of pipe materials, Different types of pipes, Laying and Testing,Maintenance,Pipe Corrosion - Causes and Prevention.

UNIT VI

Appurtenances in the distribution system

Understand the various appurtenances in a distribution system, Use of, Sluice

valves,Check valves or reflux valves ,Air valves, Drain valves or Blow off valves, Scour valve,Water meter, Fire Hydrants etc,

UNIT VII

Water supply plumbing systems in buildings

Plumbing System in Water Supplies, The House Water Connection, Stop Cocks, Water taps and Bib cocks, Pipe fittings, Storage of water in buildings, Estimating Storage Capacity, Overhead Storage, Underground Storage tanks, Types of tanks, RCC, GI and HDPE tanks, General requirements of domestic water storage, Water piping systems in building, Piping system using direct supply, Piping system using over head tanks, Piping system using underground - overhead tank supply, Pumped systems

UNIT VIII

Water Efficient Design

Rain Water Harvesting, Rain water Harvesting structures, Rain water directed to Service wells, Rain water harvesting by percolation pit method, Low water fixtures-Gravity-Fed Low Flow, Pressure-Assisted Low Flow.

Expected Output & Assignment:

The internal assessment to be carried out through practical's and periodic tests on the above mentioned topics.

REFERENCE BOOKS:

- 1. Water and Wastewater Engineering, Vol-I and II, by Fair, and Geyer: John Wiley and sons, New York
- 2. Water Supply and Sewerage, by Steel and McGhee: Mcgraw-Hill 1991
- 3. Environmental Engineering, by Peavy, Rowe and Tchobanoglous: McGraw-Hill 1984
- 4. Water and Wastewater Technology, by Hammer and Hammer, Jr.: Prentice Hall of India
- 5. Water Supply Engineering Environmental Engineering Vol.-I, by Garg, SK: Khanna Publishers, New Delhi, 2005
- 6. Water Supply and Wastewater Engineering, by Raju: Tata McGraw hill, New Delhi
- 7. Water Supply and Treatment, by Kshirsagar : Roorkee Publishing House, Roorkee
- 8. Water Supply and Wastewater Engineering ,by Punmia: Laxmi Publishers, New Delhi
- 9. Water Supply and Sanitary Engineering, by Birdie: Dhanpat Rai Publishing

FS17B3.6C WASTE WATER SYSTEMS

CORE/TH: 3/wk Int mks: 50 Ext mks: 50 Total mks: 100 End exam: 3hrs Cr: 3

Objectives of the Course:

This course is designed to explain the concepts behind water demand & supply and treatment of sewage.

UNIT I

Introduction

Definition of terms - Sullage, Sewage, sewer and sewerage, Classification of sewage, Systems of sewage disposal, Types of sewerage systems and their suitability separate, combined and partially separate systems. Natural Wastewater Treatment Systems - Ponds and Lagoons, Wetlands and Root-zone systems, Surface and Ground Water Treatment for Potable Water Supply.

UNIT II

Quantity of Sewage

Quantity of discharge in sewers, dry weather flow, variability flow, Determination of storm water flow, Surface drainage - requirements, shapes, laying and construction. Sewerage systems - Different shapes of cross section for sewers, circular and noncircular, merits and demerits, Brief description and choice of types of sewers - stoneware, cast Iron, cement concrete and A.C. pipes, Laying of Sewers - setting out alignment of a sewer, excavation, checking the gradient, preparation of bedding, handling, lowering, laying and jointing, testing and back filling. Sewer Appurtenances - Brief description, location, function and construction of, Manholes, Drop Manholes, Street inlets, Catch basins, Flushing tanks, Regulators, Inverted siphon, Necessity of pumping sewage - location and component parts of pumping station.

UNIT III

Sewage Characteristics

Strength of sewage, sampling of sewage, characteristics of sewage, physical, chemical and biological, Analysis of Sewage - significance of the following tests. 1. Solids, 2. C.O.D, 3. B.O.D, 4. PH- value, 5. Chlorides (No details of tests) Characteristics of industrial waste water - principles of treatment, reduction of volume, and strength of waste water.

UNIT IV

Sewage treatment and disposal

Preliminary treatment - Brief description and functions of the following units 1. Screens, 2. Skimming tanks and 3. Grit chambers, Primary treatment - Brief description and functions of plain sedimentation, Secondary treatment - Brief description of 1. Trickling filters, 2. Activated sludge process., Septic tank, Sewage disposal - dilution, disposal on to lands, groundwater recharge, reuse etc,

UNIT V

Water Treatment

Water Treatment Plant Characteristics, Plant layout; Operations and maintenance of Treatment plants, Trouble Shooting, Filtration, Softening of Water, Defluoridation, Removal of Odors, Treated Municipal Wastewater Discharge Systems, Post treatment techniques, recycled water for green belts, Groundwater Quality Protection

UNIT VI

Drainage and sanitation in Buildings

Aims of building drainage and its requirements - General layout of Sanitary fittings to a house, drainage arrangements for a single and multi storied buildings as per IS code of practice

Sanitary fittings - traps, water closets, flushing cisterns, urinals, inspection chambers, antisiphonage inspection, testing and maintenance of sanitary fittings

UNIT VII

Waste Water Treatment & Recycling

Water Recycling, Course filter and surge tank, Sand filters with reeds, UV disinfection, Grey Water and Rainwater Sources and End Uses, Potential End Use After Treatment, Grey Water Collection, Grey Water Collection Tank, Grey Water Treatment, Grey Water Collection and Sand water Pipe work, Use of Treated Grey Water and Rainwater, Typical Influent Characteristics of Grey Water.

UNIT VII

Solid Waste

Sources, Engineering classification, Characterization, Generation and Quantification. Transport - collection systems, collection equipment, transfer stations, collection route optimization. Treatment methods: Methods of refuse processing, recovery, recycle and reuse, composting – aerobic and anaerobic, incineration, pyrolysis and energy recovery. Disposal methods: Impacts of open dumping, site selection, sanitary land filling – design criteria and design examples,leachate and gas collection systems, leachate treatment), Biomedical Waste management: Biomedical (Handling and Management) Rules 2008 ,sources, treatment and disposal.

Expected Output & Assignment:

Simple exercise on residential units, along with site study on waste water treatment plant, reports on the above contents.

REFERENCE BOOKS:

1. Water and Wastewater Engineering, Vol-I and II, by Fair, and Geyer: John Wiley and sons, New York

- 2. Water Supply and Sewerage, by Steel and McGhee: Mcgraw-Hill 1991
- 3. Environmental Engineering, by Peavy, Rowe and Tchobanoglous: McGraw-Hill 1984
- 4. Water and Wastewater Technology, by Hammer and Hammer, Jr.: Prentice Hall of India
- 5. Water Supply Engineering Environmental Engineering Vol.-I, by Garg, SK: Khanna Publishers, New Delhi, 2005
- 6. Water Supply and Wastewater Engineering, by Raju: Tata McGraw hill, New Delhi
- 7. Water Supply and Treatment,by Kshirsagar : Roorkee Publishing House, Roorkee
- 8. Water Supply and Wastewater Engineering ,by Punmia: Laxmi Publishers, New Delhi
- 9. Water Supply and Sanitary Engineering, by Birdie: Dhanpat Rai Publishing

ELECTIVE-1

DT17B1.4C COMPUTER PROGRAMMING AND DATA STRUCTURES

DSE-1/P/T/O : 3/wk Int mks: 50 Ext mks : 50 Total mks:100 End exam: Practical & Viva-Voce Cr: 3

Objectives of the Course:

To impart the basic concepts of data structures and algorithms

To understand concepts about searching and sorting techniques

To understanding about writing algorithms and step by step approach in solving problems with the help of fundamental data structures.

UNIT I

Introduction to Computers – Computer Systems, Computing Environments, Computer Languages, rating and running programs, Software Development Method, Algorithms, Pseudo code, flow charts, applying the software development method.

UNIT II

Introduction to C Language – Background, Simple C Programme, Identifiers, Basic data types, Variables, Constants, Input / Output, Operators. Expressions, Precedence and associativity, Expression Evaluation, Type conversions, Bit wise operators, Statements, Simple C Programming examples. Selection Statements – if and switch statements, Repetition statements – while, for, do-while statements, Loop examples, other statements related to looping – break, continue, goto, Simple C Programming examples.

UNIT III

Designing Structured Programs, Functions, basics, user defined functions, inter function communication, Standard functions, Scope, Storage classes-auto, register, static, extern, scope rules, type qualifiers, recursion- recursive functions, Preprocessor commands, example C-programsArrays – Concepts, using arrays in C, inter function communication, array applications, two – dimensional arrays, multi-dimensional arrays, C-programme examples.

UNIT IV

Pointers – Introduction (Basic Concepts), Pointers for inter function communication, pointers to pointers, compatibility, memory allocation functions, array of pointers, programming applications, pointers to void, pointers to functions, command –line arguments. Strings – Concepts, C Strings, String Input / Output functions, arrays of strings, string manipulation functions, string / data conversion, C-programme examples.

UNIT V

Derived types – Structures – Declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typeset, bit fields, enumerated types, C programming examples.

UNIT VI

Input and Output – Concept of a file, streams, standard input / output functions, formatted input / output functions, text files and binary files, file input / output operations, file status functions (error handling),C-programme examples.

UNIT VII

Searching and Sorting – Sorting- selection sort, bubble sort, insertion sort, quick sort, merge sort, Searching-linear and binary search methods.

UNIT VIII

Data Structures – Introduction to Data Structures, abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks-Operations, array and linked representations of stacks, stack application-infix to postfix conversion, postfix expression evaluation, recursion implementation, Queues-operations, array and linked representations.

Expected Output & Assignment:

The internal assessment to be carried out through practical's and periodic tests on the above mentioned topics.

REFERENCE BOOKS:

- 1. C Programming & Data Structures ,Third Edition, by B.A.Forouzan and R.F. Gilberg:Cengage Learning.
- 2. Problem Solving and Program Design, Fifth Edition, in C,by J.R. Hanly and E.B Koffman: Pearson education.

FS17B3.3E CONSTRUCTION WORKSHOP

DSE-1/P/T/O: 3/wk Int mks: 50 Ext mks : 50 Total mks:100 End exam: Practical & Viva-Voce Cr: 3

Objectives of the Course:

To introduce various fabrication skills and techniques necessary to produce scale – models and to encourage preparation of models as an essential phase in design development and evaluation

UNIT I

Introduction:

Introduction to the use of different type of tools and methods relating to masonry, carpentry, tile laying for floors and pavements, painting and welding

UNIT II

Brick Bonds:

Using instrument. Brick laying for English Bond: Lay straight wall in English Bond, Lay corner wall in English Bond, Lay Tee joint in English Bond, Lay cross wall in English Bond. Brick laying for Flemish Bond: Lay straight wall in Flemish Bond Brick footing: Lay straight wall with footing; Lay corner joint wall with footing; Lay Tee joint wall with footing; Lay cross wall with footing.

UNIT III

Masonry:

Building walls with plinth projections and corbelling in straight length and at corners. Building wall with cornices in straight length and at corners. Building wall with attached piers and post footings in straight length and at corners. Brick wall with different kind of jambs and fixing of door chowkets. Brick wall with different kind of jambs and fixing of window chowkets. Construction of arches over door opening. Construction of arches over window opening. Practice of plastering and pointing. Construction of squint quoins.

UNIT IV

Carpentry and Joinery:

Using instruments, Halving joints: Tee joint; Cross Joint; Dove tail joint. Wood working for doors, windows and chowket: Door and Window; Chowket according to given specifications. Joint with keys: Make table using joint with key according to specifications; Make shafts using joint with key according to specifications. Construction of rafter and beam joints.Elementary roof framing to half scale models. Stair framing of half scale models.
UNIT V

Flooring:

Introduction to the laying of tile flooring, different types of stone flooring, different types of wooden flooring for floors, pavements, combination of different materials, integration of lighting services and communication network, plumbing services etc.

UNIT VI

Welding:

Welding (Gas): safety, introduction to the tools and equipment, exercises involving autogenously, butt and fillet welds. Welding (Electrical): safety, introduction to the tools and equipment, exercises involving, butt, fillet and pipe welds.

Machining: safety, facing and rough turning to size \pm 1.0 mm using rule and calipers, finish turning to size \pm 0.05 mm using micrometer, tapping and screw cutting using taps and dies.

Sheet metal: safety, introduction to the tools and equipment, exercises involving the production of rivet joints, safe edge (lap and wire), groove joint and hinge piece

Expected Output & Assignment:

The students are expected to make scale models, gain hands-on experience. Visit to construction yards and building sites. Assignments to be given on the above topics.

REFERENCES BOOKS:

- 1. Workshop Technology I,II,III, by S K Hajra, Choudhary and A K Chaoudhary: Media Promoters and Publishers Pvt. Ltd., Bombay
- 2. Workshop Technology by Manchanda Vol. I,II,III: India Publishing House, Jalandhar
- Manual on Workshop Practice by K Venkata Reddy, KL Narayana et al: MacMillan India Ltd. New Delhi
- 4. Basic Workshop Practice Manual by T Jeyapoovan: Vikas Publishing House (P) Ltd., New Delhi
- 5. Workshop Technology by B.S. Raghuwansh: Dhanpat Rai and Co., New Delh
- 6. Workshop Technology by HS Bawa:Tata McGraw Hill Publishers, New Delhi

FS17B3.3E RENEWABLE ENERGY SYSTEMS

DSE-1/TH: 3/wk Int mks: 50 Ext mks :50 Total mks:100 End exam: 3hrs Cr:3

Objectives of the Course:

To understand the various forms of conventional energy resources.

To learn the present energy scenario and the need for energy conservation.

To explain the concept of various forms of renewable energy.

To outline division aspects and utilization of renewable energy sources for both domestics and industrial application.

To analyze the environmental aspects of renewable energy resources.

UNIT I

Introduction

World Energy Use – Reserves of Energy Resources – Environmental Aspects of Energy Utilization – Renewable Energy Scenario in India and around the World – Potentials – Achievements / Applications – Economics of renewable energy systems in small and large scale buildings.

UNIT II

Solar Energy:

The Sun – Production and transfer of solar energy – Sun-Earth angles – Availability and limitations of solar energy– Measuring techniques and estimation of solar radiation – Solar thermal collectors – General description and characteristics – Flat plate collectors – Heat transfer processes – Short term and long term collector performance – Solar concentrators – Design, analysis and performance evaluation of solar energy technologies.

UNIT III

Wind Energy:

Wind speed and power relation, power extracted from wind, wind distribution and wind speed predictions. Wind power systems: System components, Types of Turbine, Turbine rating Choice of generators, turbine rating, electrical load matching, Variable speed operation, maximum power operation, control systems, system design features, stand alone and grid connected operation.

UNIT IV

Hydro energy:

Feasibility of small, mini and micro hydal plants scheme layout economics. Tidal and wave energy, Geothermal and Ocean-thermal energy conversion, (OTEC) systems schemes, feasibility and viability.

UNIT V

Biomass:

Various resources, energy contents, technological advancements, Conversion of biomass in other form of energy - solid, liquid and gases. Gasifies, Biomass fired boilers, Co firing, Generation from municipal solid waste, Issues in harnessing these sources.

UNIT VI

Energy Storage and hybrid system configurations:

Energy storage: Battery - types, equivalent circuit, performance characteristics, battery design, charging and charge regulators. Battery management. Fly-wheel

energy relations, components, benefits over battery. Fuel Cell energy storage systems. Ultra Capacitors.

UNIT VII

Grid Integration:

Stand alone systems, Hybrid systems - hybrid with diesel, with fuel cell, solar wind, wind-hydro systems, mode controller, load sharing, system sizing. Hybrid system economics. Grid integration with the system: Interface requirements, Stable operation, Transient-safety, Operating limits of voltage, frequency, stability margin, energy storage, and load scheduling. Effect on power quality - harmonic distortion, voltage transients and sags, voltage flickers. Dynamic reactive power support. Systems stiffness.

UNIT VIII

Case Studies:

Applications, Economic and Environmental Analyses for above Renewable Energy Systems adopted for small and large scale buildings.

Expected Outputs & Assignment

The students will be able to identify the new methodologies / technologies for effective utilization of renewable energy sources in building.

Assignments on given topics and periodic internal tests and case studies.

- 1. Non Conventional Energy Sources, by Rai. G.D., Khanna Publishers, New Delhi, 2011.
- Renewable Energy Sources, by Twidell, J.W. & Weir, A. EFN Spon Ltd., UK, 2006.
- 3. Solar Energy, by Sukhatme. S.P., Tata McGraw Hill Publishing Company Ltd., New Delhi, 1997.
- 4. Renewable Energy, Power for a Sustainable Future, by Godfrey Boyle, Oxford University Press, U.K., 1996.
- 5. Solar Energy "Fundamentals Design, Modelling & Applications", by Tiwari. G.N., Narosa Publishing House, New Delhi, 2002.
- 6. Wind Energy Conversion Systems, by . Freris. L.L., Prentice Hall, UK, 1990.
- 7. Wind Energy Systems, by Johnson Gary, L. Prentice Hall, New York, 1985
- Introduction to Biofuels, by David M. Mousdale CRC Press, Taylor & Francis Group, USA 2010
- 9. Solar Photovoltaics, "Fundamentals, Technologies and Applications", by Chetan Singh, Solanki PHI Learning Private Limited, New Delhi, 2009.
- 10. Non-Conventional Energy Resources, second Edition by B.H. Khan,TMH -2009
- 11. Wind and Solar Systems by Mukund Patel, CRC Press, 2011.
- 12. Grid Integration, from: IEEE Journals (Transaction)

SEMESTER - IV

FS17B4.1C BUILDING SERVICES STUDIO -IV

CORE/S: 10/wk Int marks: 100 Ext marks :100 Total mks:200 End exam: Viva-Voce Cr: 10

Objectives of the Course:

Acquainting with the various ways of designing a plumbing system in building in urban context i.e. low/medium rise, high density, high rise etc.

Study and Analysis- Through literature studies and case studies analyze the constraints, typologies and interventions in water supply and sanitation services.

Design Proposal- Design of a building project incorporating varied formats of grouping on an actual site with specific bye-laws and regulations, calculating – demand of water supply.

Integration of Plumbing Services

Water supply:

- Calculating water demand
- Capacity of sump, Overhead tank
- Pipe Network: Type and specifications, Diameter, Valves, Connections, Fire hydrants
- Pumps: Type, Power calculations, Head calculations, etc.,
- Distribution Network: Specific network for Hot water, Cold water, Treated water, Drinking water, bore water and Recycled grey water
- Fixtures: Types of fixtures, specifications and cataloguing, market survey
- Pressure calculations and Diameter of Piping
- Fountains and cascades, swimming pools, Sprinkler system, Irrigation system for gardening
- Treatment of water: Water softeners, RO plants, filters beds

Preparation of water supply layout at site level and building level, report containing calculations and specifications, catalogue reference for a gated community, resorts, hotels, hospitals, manufacturing unit, complex or office building.

Sewage system:

- Calculating STP water demand
- Location of STP, segregation and design of STP chambers
- Creating internal layout of Sanitary system
- Load calculations for Pipe sizes, Manholes, etc.,
- Pipe Network: Type and specifications, Diameter, Connections and slopes

Strom water systems:

- Calculating storm water demand
- Location of Rainwater harvesting pit
- Calculating run off coefficient for different materials
- Load calculations for: Pipe sizes, Trenches, etc.,
- Pipe Network: Type and specifications, Diameter, Connections and slopes

Preparation of sanitary and storm water layout at site level and building level, report containing calculations and specifications, catalogue reference for a gated community, resorts, hotels, hospitals, manufacturing unit, complex or office building.

Expected Output & Assignment:

Major design problem: Literature review, Data collection, Case study and proposal for a hospital, manufacturing unit, resorts and hotels. Any two minor design problems like commercial complex or office building.

REFERENCE BOOKS:

- 1. TSS (Time Sever Stranded)
- 2. UPC2005 (Uniform Plumbing Code)
- 3. NBC 2005 (National Building Code)
- 4. Water Supply and sanitation by Rangwala
- 5. Hand book of Building Services by Hafiz contractor

FS17B4.2C BUILDING TECHNOLOGIES-I

Core/TH: 3/wk Int mks: 50 Ext mks : 50 Total mks:100 End exam: 3hrs Cr: 3

Objectives of the Course:

To study about the basic building materials, properties and their applications.

To know the smart building materials, external paints and their uses.

To understand different types of masonries and their applications.

UNIT I

Functional Planning Of Building

Introduction

Man made environment, general principles for site selection, site plan, planning regulation and by-laws, principles of planning, orientation of buildings, basic components and their basic requirements of a building.

UNIT II

Soils, their investigation and testing: general discussions on soils, soil investigations, testing on soils for bearing capacity

Carpentry and Joinery:

Terms defined; mitring, grooving, rebating, veneering. Various forms of joints in wood work, such as lengthening joints, bearing joints, halving, dovetailing, housing, notching, tusk and tenon etc.

UNIT III

Foundations:

Types of foundations and general procedure in foundation design

Masonry Construction:

Masonry classifications- stone, brick, hollow concrete, reinforced, composite masonry.

Framed Structures and Partitions:

Advantages of tall buildings, problems of tall buildings, concept of framed structure its advantages, partition walls.

UNIT IV

Arches and Lintels:

Arches and their stability considerations, technical terms in arch work, types of arches, method of construction of arches, types of lintels

Ground and upper floors: selection of flooring for ground floors, construction of ground floors, choice of construction for upper floors.

UNIT V

Vertical Transportation:

Stair case, elevators of lifts, ramps, escalators, dumdwaiter, vertical conveyors.

Doors and Windows:

Definitions of technical terms, installation of door and window frames and their specifications, types of doors, windows and their classification-fixtures and fastening for doors and windows

UNIT VI

Roofs and Roof Coverings:

Sloping roof and roof trusses, pitched roof or sloping roofs, flat roofs or terrace roofs, shell roofs, domes.

Partition Walls:

Brick partition, reinforced brick partition, brick nogged partition, lath and plaster partition, pre-cast concrete partition, glass block and glass Crete partition, common wooden partition, trussed partition.

UNIT VII

Building Finishes:

Plastering, pointing, white-washing, color washing.

Distempering Finishes:

Paints, varnishes, distempers

UNIT VIII

Miscellaneous Structures:

Structures-shell, folded plate, tension, skeletal frame, pneumatic, prefabricated structures, fireplaces and flues, earthquake resistant structures.

Materials for Special Treatments: Fire resistant, waterproofing, thermal insulation, acoustical treatment and anti-termite treatment.

Expected Outputs & Assignment

Students to make documentation of different built elements and their aspects mentioned above. Construction of building/ study models of different structures such roads, bridges; dams etc. shall be made along with short notes on the same. It would be more appropriate if the student go and visit the site practically.

REFERENCE BOOKS:

- 1. Building construction by S.P.Arora, S.P.Bindra, 19th edition, Dhanpat rai publications. New Delhi 2000.
- 2. Building construction by Rangwala S.C, 22nd edition charoter publication house, Anand 2004.
- 3. Elementry building construction, by Moxley, R.Mitchell's, Technical press ltd.

FS17B4.3C REFRIGERATION SYSTEMS

CORE/TH: 4/wk Int mks :50 Ext mks :50 Total mks:100 End exam: 3hrs Cr:4

Objectives of the Course:

To understand the basic cycles of various refrigerating systems, their performance evaluation along with details of system components and refrigerant properties. The course is also aimed at imparting knowledge of psychometric properties, processes which are used in air-conditioning systems for comfort and industrial applications.

UNIT I

Introduction: Application of air-conditional and refrigeration energy usage in airconditioning/ buildings introduction of Refrigeration and Heat Pump: Carnot cycle, modification in reversed Carnot cycle, vapour compression cycle, actual vapor compression cycle,

UNIT II

Basic Refrigeration and Advanced Cycle: Single and multi- compressor and multi-evaporator system, system with flash chamber and intercooler, PH and TS diagram, thermodynamics analysis, effect of inter-cooling and super heating, cascade refrigeration.

UNIT III

Refrigerants and Environmental Issues : Designation of refrigerants, selection of refrigerants, Ozone depletion (ODP) and Global warming (GW), Montreal and Kyoto protocols total equivalent warming index (TEWI), Azeotropic and zeotropic mixtures, alternative to existing CFC and HCFC refrigerants.

UNIT IV

Components of Vapour Compression Systems: Types of compressors, condensers, evaporators, expansion devices –Comparison between air-cooled and water-cooled condenser based air-conditioning plants.

Other refrigeration system: Introduction to Vortex tube, steam jet and thermoelectric refrigeration system, vapor absorption, vapor adsorption system, reversed Brayton cycle- air based refrigeration.

UNIT V

Air-condition: Introduction to thermal comfort and parameters of indoor environment quality; psychometrics properties, psychometric chart; Basic process in air-conditioning; Humidification and dehumidification process; introduction to evaporative cooling towers- Thermodynamic analysis.

Heating and cooling load Estimate: Components of cooling/'heat load, room sensible heat factor (RSHF), Grand sensible heat factor(GSHF), heating and load estimation of atypical office/ domestic building, concept of diversity.

UNIT VI

Air conditioning system types and selection criteria: Major system types in airconditioning : unitary, package, central chilled water based system: components of chilled water system, concept of primary- secondary chilled water pumping; concept of variable flow system, components of non-chilled water based system , types and role for energy efficiency, comparison of variable refrigerant flow and constant flow systems.

UNIT VII

Air distribution: Fundamentals of duct design, pressure loss and AHU calculations, types of terminal units, VAV, UFAD systems; concept of heat recovery system.

UNIT VIII

Controls in RAC system: Introduction of building management system, major components and use of BMS; instrumentation requirements, concepts of direct digital control.

Low temperature application: Importance of cold chain, equipment types, introduction to design approach and equipment sizing, concept of cryogenics.

Miscellaneous topics: Installation, commissioning, noise, vibration electrical connection and safety in RAC system

Expected outcome/ Assignments:

Report on visit to industries /Case studies, assignments on given topics and periodic internal tests.

REFERENCE BOOKS:

- 1. Refrigeration & Air Conditioning,byC.P.Arora:Tata McGraw-Hill Education, 2000.
- 2. Refrigeration & Air Conditioning, by Arora & Domkundwar: Dhanpat Rai & Co
- 3. Refrigeration & Air Conditioning, by R C Arora: PHI 2012
- 4. Hand Book of Air Conditioning System Design / Carrier 5. Refrigeration & Air Conditioning by S.C. Jain : Chand and Co

FS17B4.4C ILLUMINATION ENGINEERING

CORE/TH: 3/wk Int mks: 50 Ext mks: 50 Total mks:100 End exam: 3hrs Cr: 3

Objectives of the Course:

To introduce the fundamentals of illumination engineering and architectural lighting design.

To impart lighting fundamentals, measurement, and technology and their application in the analysis and design of architectural lighting systems.

UNIT-1

Light and vision, basic units, photometry and measurement, quality and quantity of light of different sources of light. Daylight, incandescent lamps, halogen lamps, electric gas discharge lamps, fluorescent lamps, high discharge lamps. A market survey of lamps with cost and technical specifications.

UNIT-II

Design of lighting; lumen method, point by print method, design tools, design documentation, simple numerical.

UNIT – III

Specific lighting design requirement of different buildings such as homes, offices, industrial, hospital, art galleries, museums and exhibitions, case study of at least one type of the building by each student.

UNIT – IV

Outdoor lighting: road lighting, high-mast lighting, tunnel lighting, landscape lighting, decorative lighting, facade lighting, spot lighting.

Unit – V

Daylighting, advantages of daylighting; design tools in daylighting. Case studies and various examples, behavior of daylighting in interior spaces. Potentials of daylighting as an energy resource.

UNIT – VI

Integration of daylighting with artificial lighting; lighting controls, intelligent building systems for lighting.

UNIT – VII

Conservation of energy in lighting use of daylight, optical fiber lighting, LED in lighting and the emerging trends in lighting.

Unit – VIII

Estimation of Lighting

Definition of lighting loads, Lamps and Lamp circuits: Types of lamps - construction of different types of lamps for small buildings, lamp circuit incorporating energy meter, cut out and distribution box.

Expected Outcome& Assignment:

The expected outcome from this course is related to lighting design and lighting load calculations. The internal assessment to be carried out through periodic tests on the mentioned topics along with quiz.

- 1. Concepts and practice of Architectural Day Lighting, by Moore, Fuller: Van Nostrand Reinhold co., New York, 1985.
- 2. Designing with light: A Lighting H.B. International Lightning Academy, by Valia, Anil:Mumbai, 2002
- 3. Concepts in Architectural Lighting, by David Egan. M:Mc Grew Hill Book company, New York, 1983
- 4. Architectural Lighting Design, by Gary Steffy, LC, IES, and field: Wiley; 2008

FS17B4.5C CLIMATOLOGY & BUILT ENVIRONMENT

CORE/TH: 4/wk Int mks:50 Ext mks :50 Total mks:100 End exam: 3hrs Cr:4

Objectives of the Course:

To equip the students with the basic understanding of climatic types in India, and the impact of requirements of building design and site planning: to introduce them to the basic science if building design and site planning for thermal comfort, day lighting and natural ventilation: familiarize them with the data; methods, principles, standards and tools for planning and designing for climatic comfort.

UNIT I

Climate concepts

Climate and built form interaction. Global climatic factors, elements of climate, micro and macro climate, classification of tropical climates, different zones, design consideration for warm humid, hot dry, composite and upland climate wind conditions & external noise, challenge of rapid extreme environmental change. Graphic representation of climatic data, Mahoney's tables.

UNIT II

Natural Ventilation

Air movement around & through buildings, orientation for wind and stack effect, air hygiene, fresh air supply and heat discharge, ventilation rates and air speeds, dimensioning ventilation openings, concepts for control and regulation in atria, glass halls, high-rise buildings, double-shell facades, roofed sports arenas and industrial manufactories.

UNIT III

Thermal Comfort

Thermal comfort factors, physiological aspects, body heat balance, comfort range, comfort charts.

UNIT IV

Sun and the design process

Solar geometry, solar charts, sun angles and shadow angles, Orientation for sun, sun control. Design of shading system (external/internal, screen/blinds, coloring, etc.) Intensity of window ventilation rate (type, height, width, position and number of opening vents, etc.)

UNIT V

Heat flow through buildings.

Basic principles of heat transfer through buildings, size, position and number of windows (proportion of window area), type of glazing (heat insulating glazing or sun protection glazing), Thermal load calculations, static load, dynamic load, insulation properties, U values for materials.

UNIT VI

Passive cooling

Passive methods of cooling, roof pond, desiccant cooling, evaporative cooling earth sheltered buildings, site planning (including landscape) and building design consideration to climatic factors.

Detailed appraisal/analysis climatologically performance of an existing residence and or a workplace; followed by the redesigning or same to improve the climatologically performance.

Expected Outcome & Assignments:

Assignments on given topics and periodic internal tests.

REFERENCE BOOKS:

- 1. Manual of Tropical Climate and Housing and Building, by Koenigsberger, O.H. and others: Orient Longman, Chennai-2003
- 2. Tropical Architecture, by Kukreja, C.P: Tata McGraw-Hill pub.co.Ltd., New Delhi-1978.
- 3. Chartered Institution of Building Services Engineers (CIBSE), AM10 Natural Ventilation in Non Domestic Buildings, 2005.
- 4. Sun, Wind & Light: Architectural Design Strategies (3rd edition), by G. Z. Brown and Mark DeKay: John Wiley & Sons, 2014.
- 5. Architecture of the well-tempered environment (2nd edition), by Roger Benham: The University of Chicago Press, Chicago, 1984.
- 6. Heating, Cooling, Lighting: Design Methods for Architects (2nd edition), by Norbert Lechner: John Wiley & Sons2001.
- 7. Building Performance Simulation for Design and Operation, byJ L M Hensen and R Lamberts (Editors): Taylor & Francis, 2011 K Voss.

FS17B4.6C CAD & ADVANCE 3D MODELING

SEC-III/P/T/O: 4/wk Int mks:50 Ext mks :- 50 Total mks:100 End exam: Practical & Viva-Voce Cr:4

Objectives of the Course:

To explore computer modeling techniques using CAD

UNIT I

Starting AutoCAD:

Introduction to the menu, starting drawings from scratch, Creating and using templates-starting drawings with setup wizards. Saving and closing a file.

UNIT II

Using co-ordinate system:

The UCS, Working with Cartesian and polar co-ordinate systems, using displays with key shortcuts.

Setting up the drawing environment:

Setting the paper size, Setting units, setting grid limits, drawing limits, Snap controls, Use of paper space and model space.

UNIT III

Basic commands dealing with drawing properties:

Layer control, change properties, line weight control, etc.

Inquiry methods:

Using database information for objects, calculating distance and angle, areas etc.

UNIT IV

Dimensioning commands and Blocks:

Dimensioning the objects in linear, angular fashions along with quick time dimensioning etc. Creating and working with blocks, creating symbols, use of blocks in creating a layout of a residential area- one exercise to be done as lab assignment.

UNIT V

3d – Modeling:

Parameters, Modifiers, Viewport Navigation Control, Objects and Sub-objects Modeling, Parametric object creation, Polygon tools and techniques for modeling, spline tools and techniques for modeling, modeling organic / inorganic objects.

UNIT VI

Texturing:

UV space, Applying 2D images onto 3D geometry Materials, Using the Material Editor, Materials and Maps Lighting, Lighting tools and techniques, Shadows: Depth-Map and Ray traced Animation, The Graph Editor, and Controllers.

UNIT VII

Rendering - Output considerations:

Modules and advanced specialist areas, Advanced UV mapping for complex models. Applying UV coordinates to organic objects; Applying UV coordinates to inorganic objects. Advanced Materials for complex models, Multi / Sub-Object, Composite Matte / Shadow, Photorealism' with mental ray Materials and Lighting, Ready-made libraries, Secondary diffuse lighting techniques, Caustics

UNIT VIII

Particles:

Particle Flow - The sophisticated, event-driven particle toolset that lets the user design the behavior of a particle based on a series of defined events. Rigid-body dynamics – Reactor, Realistic, high-speed simulations of multiple rigid objects. Character animation – biped, Character animation toolset. Skin and Physique modifiers.

Expected outcome/Assignments:

Software skill development. Assignments and periodic tests to be conducted.

- 1. Engineering Drawing with Auto CAD 2000, by Teyapoovan, T:Vikas Pub. House Pvt. Ltd., New Delhi, 2000.
- 2. Inside Auto CA, by Daniel:New Riders Pub1987.
- 3. Auto CAD Release 2000, by Georgeomura:Sybex Inc 1993
- 4. Commercial using AutoCad 2013, by Daniel Hohn Stine CSI,CDT, Schroff Development Corporation.

SEMESTER - V

FS17B5.1C BUILDING SERVICE STUDIO – V

CORE/S: 10/wk Int mks: 100 Ext mks : 100 Total mks:200 End exam: Viva-Voce Cr: 10

Objectives of the Course:

To familiarize the various ways of designing an electrical system in building in urban context i.e. low/medium rise, high density, high rise etc.

Study and Analysis- Through literature studies and case studies analyze the constraints, typologies and interventions in Lighting and power system.

Design Proposal- Design of a building project incorporating varied formats of grouping on an actual site with specific bye-laws and regulations, calculating – demand of Lighting and power load.

ELECTRICAL DESIGN CALCULATIONS

- Lighting load calculation: The average illuminance (lumen, zonal cavity), point-to-point, flux transfer.
- Design of Transformer size and DG set size.
- LT Panel Board Design: MDB, SMDB, DB
- Load schedule & Load balancing: R, Y, B phase balancing.
- Standard heights of mounting accessories.
- Electrical wiring system: Lighting, power circuit wiring diagrams.
- Calculating the Total power requirements
- Types & selection of Circuit Breakers, fuses and cables
- Estimation of the quantities of electrical services.

EARTHING & LIGTINING PROTECTION SYSTEM

- Earthing Systems (Types Method and Installation)
- Earth pit calculation and strip calculation
- Lightning Protection Systems

ELECTRICAL SYSTEM DESIGN

- Site Level : Transformer, DG set, Panel board, Server (UPS) and Communication & Earthing Layout
- Building Level: Conduit Layout, MDB, SMDB, DB, Switch Board and Protective Devices (MCB, MCCB), Preparation of general installations and sections.
- Individual Level : Electrical Loads (Power Load & Lighting Load)

Preparation of conduit, power, lighting and cable tray layout at site level and building level, report containing calculations and specifications, catalogue reference for a gated community, resorts, hotels, hospitals, manufacturing unit, complex or office building.

Expected Outcome & Assignments:

Major design problem: Literature review, Data collection, Case study and proposal for a hospital, manufacturing unit, resorts and hotels. Any two minor design problems like commercial complex or office building. In the form of reports and drawings.

REFERENCE BOOKS:

- 1. Electrical Wiring, Estimating and Costing E-Book by S.L. Uppal & G.C. Garg
- 2. Electrical Design Estimating and Costing 1st addition by new age international (p) limited. Publishers-2004 By K.B.Raina & S.K.Battacharya
- Surjit Singh by of Electrical estimating & costing 2nd addition By Khanna Publishers-1997.NBC 2005
- 4. Building Services hand book by Fred hall and RoserGreeno. Sixth Edition
- 5. Design of Electrical Services for Buildings by Barrie Rigby fourth edition.
- 6. Electrical design for building construction, by John E. TraisterMcGraw-Hill Book Company, 1985 - Technology & Engineering
- 7. Building Services Engineering By David V.Chadderton

FS17B5.2C HVAC SYSTEMS

CORE/TH: 4/wk Int mks: 50 Ext mks : 50 Total mks:100 End exam: 3hrs Cr: 4

Objectives of the Course:

To analyze air-conditioning processes using the principles of psychometric.

To evaluate cooling and heating loads in an air-conditioning system.

To analyze the losses in air duct system.

To analyze thermal insulation air condition system.

To analyze the COP of air condition system and air distribution system.

UNIT I

Building survey-

location of equipment. Heat gain through glass-calculation of solar heat gain through ordinary glass tables-shading devices-effect of shading devices. Thermal resistance of various building materials.

Heat Transfer through Building Structures:

Periodic heat transfer through walls and roofs. Empirical methods to calculate

heat transfer through walls and roofs using decrement factor and time lag method. Equivalent temperature difference method.

Heating Load Calculations:

Winter heating load calculation-heat losses through structure-heat losses due to infiltration. Effects of solar radiation and internal heat sources on heating loads. Methods for estimating energy requirements for heating.

UNIT-II

Air Conditioning Systems:

All water, all air, air water system. Unitary System, window air conditioner, split and central air conditioning system, Non-Central AC, Package AC System, VRV/VRF System, Chilled Water System.

Equipments selection

Selection of cooling tower, Selection of Chillers, AHU and FCU classification and selection, Package unit selection DX unit selection, Selection of De-humidifier

UNIT III

Air Distribution:

Types of Ducts, Duct fittings, Dampers, Flexible ducts, Classification of Duct(Low, Medium & High pressure), Duct gauge selection, Comparison between different shapes of duct, Duct Fabrication, Insulation & Installation procedure, Vanes location & number of vanes required, Type of Duct Materials, Calculation of total sheet required for Duct Fabrication& estimating duct weight in kg, Selection of Duct Gauges & thickness, Hanger Spacing, Hanger Rod Diameter and Angle support Size, Types of Air Terminal Device, Selection and Sizing of Air Terminal Device (Manually)

Duct Designing methods (Manual calculations):

Equal friction method, Velocity reduction method, Static regain method

UNIT-IV:

Air Conditioning Apparatus:

Fans and blowers - types of fans- fan characteristic centrifugal fans, axial fans -- fan arrangements, filters, sources of noise and control, static pressure calculation for selection of motor and fan. Water supply pipe sizing calculations - piping network for supply and return water line - pipe fittings - lining and insulation - piping system as per ASHRAE standards.

UINT V:

Piping:

Refrigerant Pipe sizing, Chilled water pipe sizing, Study on Chilled Water Systems, Types & Application of Chillers, AHU's, FCU's & FAHU's, Chilled Water Pipe Sizing by ASHRAE standards, Types of Valves & Its Connection, Valve Authority, Open loop & Closed loop system, Primary and Secondary pump system, Common Header Pipe Sizing, Hydraulic Calculation for Pump Selection, Expansion Tank Sizing, Air Separator, Pump Cavitations, Pump Curves, NPSH Calculation for Pumps, Advance Psychometric Analysis, Determine Mix Air Temperature, Calculate the Flow of Air, ESHF, Ton of Refrigeration, Design of CAV & VAV System

UNIT VI:

Exhaust Systems:

General exhaust systems. Local exhaust system, Removal of pollutants and contaminated air. Air cleaning devices, Fans.

Ventilation in Kitchen:

Characteristics of Smoke emitted from Cooking, Exhaust flow, IMC (International Mechanical Code) Calculation of appliances area, contaminated air, and free foot area. Total air flow volume with example. Types of hood, Design of hood. Design factors, integrated air curtains, Combination hood.

UNIT VII

Thermal Insulation for A/C System:

Method of heat transfer - desired properties of ideal insulating materials - types of insulating materials. Heat transfer through insulation - economic thickness of insulation. Insulation of heated buildings - Insulation for cooling building and cold storage - pipe insulation

UNIT VIII

Specifications for equipments and installation

Painting and identification , noise control, fan and blowers, piping, sheet metal works and ducts ,air terminals, insulation, electrical work and cabling

Expected Outcome Assignments:

Report on field visits, Market survey, assignments on given topics and periodic internal tests.

- 1. Refrigeration & Air Conditioning, byC.P.Arora:3rd Edition, Tata McGrew Hill publication
- 2. Refrigeration & Air Conditioning,by Arora &Domkundwar:Dhanpat Rai & Co 2002
- 3. Refrigeration & Air Conditioning, by R C Arora: PHI 2012
- 4. Hand Book of Air Conditioning System Design / Carrier 5. Refrigeration & Air Conditioning, by S.C. Jain: Chand and Co.
- 5. Electrical and Mechanical Services in High Rise Building, by A.K Mittal: CBS Publisher

FS17B5.3C BUILDING TECHNOLOGY II

CORE/TH: 3/wk Int mks: 50 Ext mks :50 Total mks:100 End exam: 3hrs Cr: 3

Objectives of the Course:

To analyse the structural elements like RCC beam, slab, column, and footings

To analyse two way slab & one way continuous slabs

To analyse columns & footings for eccentric loads.

To analyse RCC Retaining walls & design of water tanks

UNIT I

Introduction to RCC: Understanding the properties and characteristics of RCC. Its advantages and disadvantages. Cast-in-situ and pre-cast constructional methods in RCC. Understanding the structural components of a typical RCC frame structure with reference to their location, junctions, load transfer and design. Introduction to prestressed concrete structures.

UNIT II

Super Structure Construction For Building

RCC columns – different shapes, different combinations and loading conditions (axial, bending, non axial), slenderness factor. RCC beams - Single and doubly reinforced beams, T and L beams, continuous beams, lintels and brackets. RCC slabs – One way and two way slabs.

UNIT III

Construction Of Foundation Of Special Structures

Erection of lattice towers, rigging and foundation of transmission line structures – construction sequence in cooling towers, silos, chimney, sky scrapers, bow string bridges, cable stayed bridges – Advanced construction techniques for offshore structures – construction sequence and methods in domes and prestress domes – foundation structure for heavy equipment and conveyor and machinery in heavy industries, foundation for transformers, lift foundation and foundation for steel frames and steel structures Advanced concepts: Flat slab, coffered slab, diaphragms, retaining walls and water tanks. Miscellaneous: RCC staircases and ramp – Waist slab and folded plate staircases. RCC Balconies, chajjas etc.

UNIT IV

Failures:

Introduction to building failures: causes of decay and damage in old buildings, issues of maintenance and repair. Preliminary inspection and general observation, decayed elements difference between decay and damage. types of Structural Distress and Deterioration, Factors Causing distress

UNIT V

Sub Structure Construction

Box jacking pipe jacking – under pinning, trenchless technology, innovative road Construction techniques; immerse tube tunneling. Smart tunnels: application and construction

UNIT VI

R.C. Concrete:

Mixing methods at site, structural design for repairs, construction stage defectsinternal settlement of concrete, setting shrinkage of concrete, post-construction stage defects- temperature stresses, corrosion of reinforcement bars, weathering action ,causes of failure in concrete structures for the given topics, pressuregrouting.

UNIT VII

Methodical approach to Repairs:

Cracks over openings, sinking and sagging balconies, repairs to decayed floors and floor joints, example: Jack arch., madras roof terrace, foundation sinking, repairs to walls. Propping, strutting

UNIT VIII

Unusual problems:

Bulging in walls due to inadequate restrain, tensile cracking in brick walls, Repairs to large span rooms, water proofing the roof terraces, leakages from toilets, case studies and site visits.

Expected Outputs & Assignment

Students to make documentation of different built elements and their aspects mentioned above. Construction of advanced building technologies/ study models of different advanced models and simultaneously visiting site helps to understand the concepts. The students should go and visit the failure occurred region to understand the subject properly. It would be more appropriate if the student go and visit the site practically as each unit of the course thought.

- 1. Advanced Construction Techniques by Jerry Irvine, CA Rocketr, 1984.
- Barry, R The construction of buildings vol.2 5th ed. East-West press.New Delhi, 1999
- 3. Hailey and hancork, D.W. Brick work and associated studies vol.2. Macmillan London, 1979.
- 4. The technology of building defects John Hinks, geoff cook, 1997.

FS17B5.4C FIRE ENGINEERING AND SCIENCE

CORE/TH: 3/wk Int mks: 50 Ext mks : 50 Total mks:100 End exam: 3hrs Cr: 3

Objectives of the Course:

This course in Fire Safety Engineering will provide the fundamental concepts of the subject and some workplace or practical context to the science. It is concerned with the study of fire prevention, fire development and containment, fire dynamics, fire decay and suppression, hazards and risk management, and the means by which fire consequence may be minimized in human, environmental.

UNIT I

Chemistry of Fire, Oxidation, Slow – rapid – spontaneous combustions, chain reaction, Flash point & Fire point ignition temperature, Classification of Fire, Methods of extinguishment, First aid firefighting arrangement Types of fire extinguishers

UNIT II

Basic science of water-based / gas / dry power fire systems; Pedestal fire hydrant system, sprinkler system, water spray/deluge system, drencher system, fixed foam system, dry pipe foam system; Halogen gas system, CO2system and dry powder system; Computer programs for system design; Smoke control systems; Fire safety control in HVAC systems

UNIT III

Fixed Installation: External hydrant, Ring mains, Hose reels, wet and dry riser, Automatic sprinkler system Deluging system, Drencher system, Premixed foams solutions, and Flooding system.

UNIT IV

Pumps and classification, Discharge and suction head, Pressure and power requirements, Starting and troubleshooting, Pump testing and relay operation. Water hammer, Parallel and series connections, Branching lines, local losses and Friction losses in pipe, Discharge pressure at sprinkler head and nozzles.

UNIT V

Fire alarm systems: purpose, general requirements, basic components, types of detectors, hazards of smoke, heat, toxicity and flame. Their detection and monitoring, testing and monitoring of alarm systems

UNIT VI

Protection against fires: Fire rating of building materials and components, Insulation and Coatings, Fire and smoking barriers, Fire Zones, door and window locking systems. Storage of flammable and hazardous materials, Fire risk Assessment

Fire Escape route: Exit signage, Fire evacuation plan and layouts, Fire drill.

UNIT VII

Advance technologies in fire fighting system, water mist systems, fire escaping chutes, passive fire protection systems. Backpack and trolley fire extinguishers.

UNIT-VIII

Designing the fire fighting layouts – Schemes and schematics for Sprinkler systems, public address system.

Expected Outputs & Assignment

Exercise on firefighting and Fire alarm layouts with schematics, Assignments on given topics and periodic internal tests.

REFERENCE BOOK:

- 1. Fire Protection design manual, 6th edition by Department of Veterans Affairs
- 2. National Building Code NBC (Part-4)
- 3. Fire Safety, Science and Engineering: A Symposium (Astm Special Technical Publication) by T. Z. Harmathy

FS17B5.5C BUILDING INFORMATION MODELING

CORE/TH: 3/wk Int mks: 50 Ext mks : 50 Total mks:100 End exam: Practical & Viva-Voice Cr: 3

Objectives of the Course:

To understand BIM Basics & the Benefits.

To describe how BIM can be used as a communication and collaboration tool, and its contributions to Scheduling, Estimating, and Facility Management.

To explain the process of implementing BIM and how BIM-based designs for Structural, Mechanical, Electrical, Plumbing, Communications, Security, Fire Protection fit into the overall Construction Document fabric.

UNIT I

Building Information Modeling, background and history, need for BIM. Revit Architecture Basics, Exploring the User Interface, Working with Revit on Elements and Families, Starting a Project.

UNIT II

Starting a Design, Creating a Basic Floor Plan, Creating and Modifying Levels, working with Grids, The Basics of the Building Model, Adding and Modifying Walls, Working with Compound and Vertically Compound Walls, Using Editing commands, Working with Doors, Adding and Modifying Windows, Loading Additional Building Components, Adding and Modifying Component Families.

UNIT III

Viewing the Building Model, Managing Views, Controlling Object Visibility, Working with Section and Elevation views, Creating and Modifying 3D Views.

Using Dimensions and constraints, working with Dimensions, Applying and Removing Constraints.

UNIT IV

Developing the Building Model, Creating and Modifying Floors, Adding and Modifying Ceilings, Adding and Modifying Roofs, Creating curtain walls, Adding Stairs and Railings.

Detailing and Drafting, Creating Callout views, working with Text and Tags, Working with Detail Views, Working with Drafting Views.

UNIT V

Construction Documentation, Creating and Modifying Schedules, Creating Rooms and Room Schedules, Creating Legends and Keynotes.

Presenting the Building Model, Creating and Printing Drawing Sheets, Working with Title Blocks, Managing Revisions.

UNIT VI

Creating Renderings, Using Walkthroughs, Using Sun and Shadow Settings.

Expected Outcomes & Assignments

The internal assessment to be carried out through practicals and periodic tests on the mentioned topics.

REFERENCE BOOKS:

- 1. BIM Handbook; A guide to building information modeling for owners Managers, Designers,Engineers and contractors,byCharles M. Eastman, Kathleen Liston, Paul Teicholz, and Rafael Sacks., Wiley2008
- 2. Building Information Modeling by Willem Kymmell., McGraw-Hill Education 2008

FS17B5.6C BUILDING AUTOMATION AND CONTROLS

CORE/TH: 4/wk Int mks: 50 Ext mks : 50 Total mks:100 End exam: 3hrs Cr: 4

Objectives of the Course:

The course objective is to make students familiar with goals and purpose of nonindustrial automation, automation components, and with automation system design.

UNIT I

Introduction:

Concept of intelligent building and implementation strategies; Building management system (BMS); Communication in BMS; Communication system in buildings; vertical transportation; Power quality issues Building performance – Building management systems. Measuring Building Performance.

UNIT II

Components:

Sensors, Actuators, Controllers. Need for building controls, defining building automation, BMS function and control optimization; Direct Digital Control; Introduction of various concepts like Automation in acoustical design, illumination, water supply, fire-fighting, HVAC, emergency systems, etc. Effect on indoor environment and the global environment, Energy conservation benefits, Advantage of a BMS.

UNIT III

Smart technologies, sensor technologies, building control and automation systems, and human-systems relationships are explored. Case studies constitute an integral part of the module.

UNIT IV

Protocols used in building automation:

ZigBee, BACnet, LonTalk, Modbus, DALI, C Bus, oBIX, DSI

UNIT V

Electronic Systems in Buildings: Telephone and communication, EPABX networks, transmission. Security systems, Burglar alarms, video surveillance, access control. Computer labs, access flooring, server rooms.

UNIT VI

Control theory:

Simple proportional control, Proportional and differential controller (PD), Proportional Integral and Differential controller (PID).

UNIT VII

Integration of BMS:

BMS in Light control, Transportation, Lifts and elevators, Air conditioning, Assess controlling, Fire systems.

UNIT VIII

Introduction to BMS Network Infrastructure for building connectivity-Benefits of advanced building cabling, Definitions, basic principles, building network infrastructure & design considerations.

Expected Outputs & Assignment

Assignments on given topics and periodic internal tests.

REFERENCE BOOKS:

- 1. Intelligent Buildings and Building Automation by Shengwei Wang: Spon Press, London, 2009
- Understanding Building Automation Systems by Reinhold A. Carlson , Robert A. Di Giandomenico: R.S. Means Company, Inc. 1991
- 3. A guide for building and facility automation systems by John P. Cilia;Fairmont Press
- 4. Instrumentation & mech. Measurements by A. K. Tayal: Galgotia Publications

FS17B5.xE. ELECTIVE-II

FS17B5.1E ELECTRICAL ENERGY SYSTEMS AND MANAGEMENT

DSE-II /L: 3/wk Int mks: 50 Ext mks : 50 Total mks: 100 End exam: 3hrs Cr: 3

Objectives of the Course:

To understand the electrical energy needs of various consumer areas and the relative mathematical analysis of it.

To describe and use from technical point of view the various methods of electrical energy production and to classify and use them from economic and operational point of view.

To understand the relationship between the electrical loads and the respective power production installations on the base of economic and technological criteria.

UNIT-I

Overall Structure of Electrical Systems:

Supply and demand of electricity, Economic operation, Input-output curves, Load sharing, Industrial Distribution, Load profiling, Electricity tariff types and calculation, Reactive Power, Power factor, Capacitor sizing, Capacitor losses, location, placement and maintenance.

UNIT-II

Energy Efficiency:

Energy accounting, monitoring and control, Electricity audit instruments, Energy consumption models, Specific Energy Consumption, ECO assessment and Evaluation methods, Transformer loading, efficiency analysis, Feeder loss evaluation, Lighting, Energy efficient light sources Domestic, commercial, industrial lighting, Lighting Controls, Luminaries, energy conservation.

UNIT-III

Energy and Power Policies:

Tariffs and subsidies, Energy utility interface, Private sector participation in power generation, State role and fiscal policy, Energy and development, Role of modeling in energy policy analysis, Energy data base, Data Collection-filtration and analysis, Energy balances, Flow diagrams, Energy demand analysis, Trend analysis, Optimization techniques, Energy supply analysis, Costs of exploration and economics of utilization of dep

letable and renewable resources, Scarcity rent, International energy supply, Energy demand supply balancing, Energy - economy interaction, Energy investment planning, Energy environment interaction, Energy Pricing mechanisms.

UNIT-IV

Electric Loads of Air Conditioning and Refrigeration:

Power consumption in compressors, Electrolytic process, Electric heating, Furnace operation and scheduling, Cogeneration schemes, optimal operation.

Expected Outputs & Assignment

Assignments on given topics and periodic internal tests.

REFERENCE BOOKS:

- 1. Plant Engineers and Managers Guide to Energy conservation, byA.P.W. Thumann: The Fairmont Press 2011
- 2. Energy management, by W.R. Murphy and G. McKay: Butterworth & Co Publishers, Oxford, UK, 2001.
- 3. Art and Science of Utilization of Electrical Energy, by H. Partab: Pritam, 1985
- 4. Electric Energy Utilization and Conservation, byS.C. Tripathy: Tata McGraw Hill, 1991.
- 5. Energy Management Handbook, 2edition, by W.C. Turner: Fairmont press, 1993.
- 6. UNESCAP- Guide Book on Promotion of Sustainable Energy Consumption

FS17B5.2E ENERGY AUDITING

DSE-II /L: 3/wk Int mks : 50 Ext mks :50 Total mks:100 End exam: 3hrs Cr: 4

Objectives of the Course:

To understand the importance of energy management

To understand the procedure for energy audit

To understand the energy conservation methods

To assess the energy efficiency & cost reduction measures

UNIT I

Energy Management & Audit:

Definition need and types of energy audit. Energy management (audit) approachunderstanding energy costs, bench marking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirements, fuel & energy substitution, energy audit instruments.

UNIT II

Electrical system:

Electricity billing, electrical load management and maximum demand control, power factor improvement and its benefit, selection and location of capacitors, performance assessment of PF capacitors, distribution and transformer losses

UNIT III

Electrical Lighting Load:

Light source, choice of lighting, luminance requirements, and energy conservation avenues.

Electrical Power Load:

Types, losses in induction motors, motor efficiency, factors affecting motor performance, rewinding and motor replacement issues, energy saving opportunities with energy efficient motors.

UNIT IV

Energy Efficient Technologies in Electrical Systems:

Maximum demand controllers, automatic power factor controllers, energy efficient motors, soft starters with energy saver, variable speed drives, energy efficient transformers, electronic ballast, occupancy sensors, energy efficient lighting controls, energy saving potential of each technology.

UNIT V

Compressed Air System:

Types of air compressors, compressor efficiency, efficient compressor operation, Compressed air system components, capacity assessment, leakage test, factors affecting the performance and saving opportunities

HVAC and Refrigeration System:

Vapor compression refrigeration cycle, refrigerants, coefficient of performance, capacity, and factors affecting Refrigeration and Air conditioning system performance and saving opportunities.

UNIT VI

Vapor absorption refrigeration system:

Working principle, types and comparison with vapor compression system, saving potential.

Fans and blowers:

Types, performance evaluation, efficient system operation, flow control strategies and energy conservation opportunities.

UNIT VII

Pumps and Pumping System:

Types, performance evaluation, efficient system operation, flow control strategies and energy conservation opportunities.

Cooling Tower:

Types and performance evaluation, efficient system operation, flow control strategies and energy saving opportunities assessment of cooling towers.

UNIT VIII

Energy conservation in buildings and energy conservation building codes (ECBC):

Energy conservation buildings codes (ECBC) norms, building envelope, insulation, lighting, heating, ventilation, air conditional(HVAC), fenestrations, water supply, and energy storage/ captive generation, elevators and escalator, star labeling for existing buildings, energy service companies based case studies.

Expected Outcomes & Assignments

Assignments on given topics and periodical internal tests.

*Note: Comprehensive exercises from above units

- 1. Energy Management Hand Book, Sixth edition, by W.C. Turner & Steve Doty:Fairmont Press, Inc.
- 2. Energy Management Principles, by CB Smith: Pergamon Press
- 3. Energy Management, by W.R.Murthy and G.Mc.Kay : BS Publication

SEMESTER - VI

FS17B6.1C BUILDING SERVICES STUDIO -VI

CORE/S: 10/wk Int marks: 100 Ext Marks :100 Total:200 End exam: VIVA-VOCE Cr:10

Objectives of the Course:

To familiarize with the various ways of designing an air conditioning system in building in urban context i.e. low/medium rise, high density, high rise etc.

Study and Analysis- Through literature studies and case studies analyze the constraints, typologies and interventions in Heat load calculation, types of air conditioning system, air distribution and pipe line system

Design Proposal- Design of a building project incorporating varied formats of grouping on an actual site with specific bye-laws and regulations, calculating – demand of Heat load, Selection of types of air conditioning system for a building, Duct and pipe calculations, Selection of fans, blowers, etc.,

Fundamental of HVAC

Basics of Heat Transfer: Standards and codes used in HVAC Study on Psychometric Charts (Manual and ASHRAE Analysis software). Properties of Air (Altitude, DBT, WBT, %RH, DPT, Humidity Ratio & Enthalpy).

Types

Heat load calculation

- Cooling & Heating Load Calculation
- General& E-20 manual calculation
- Chiller load calculation,
- Fresh Air Handling Unit Designing as per ASHRAE 62.1.
- Winter load calculation Ventilation System Designing
- Ventilation and Infiltration Load Calculation

Selection of air condition systems

- All air systems
- All water systems
- Air- water systems

Air distribution systems

- Duct design consideration,
- Duct sizing methods,
- Duct sizing as per aspect ratio,
- Bill of materials for duct network,

- Gauge selection for sheet metal
- Calculation of number of sheets for duct
- Finding duct size using duct calculator
- · Legends and symbols used in the HVAC industry,
- Selection of diffusers and grilles,
- Preparation of layouts (Double line diagram-DLD) as per SMACNA rules,
- Duct routing- preparation of single line diagram(SLD),
- Sectional drawing @Duct supports, Opening for ducts passing through wall

Chiller piping design

- Piping calculation
- Piping design
- Selection of appropriate valves for the piping system
- Piping networking auto cad drawing

Case study

- Residential building
- Hospitals building
- Commercial building

Preparation of conduit, power, lighting and cable tray layouts at site level and building level, report containing calculations and specifications, catalogue reference for a gated community/resorts/hotels.

Expected Outputs & Assignment

Major design problem: Literature review, Data collection, Case study and proposal for a hospital, manufacturing unit, resorts and hotels, commercial complex or office building. Any two minor design problems like gated community and residential building.

- 1. Refrigeration and air conditioning, C.P.Aroura
- 2. ISHRAE/ASHRAE Handbooks
- 3. Refer CED online web site
- 4. Refrigeration and air conditioning, Anathnarayan

FS17B6.2C GREEN BUILDING

CORE/TH: 3/wk Int mks: 50 Ext mks :50 Total mks:100 End exam: 3hrs Cr: 3

Objectives of the Course:

Develop skills to promote environmental friendly characteristics in the area of architecture and buildings and identify crucial technologies, facilities and application that help in the present context of green building construction.

UNIT I

Concept of Green Buildings

Green Building and initiatives, its origin, characteristics of a green building, Green buildings in India, certification of green buildings rating systems (BREEAM, USGBC, LEED, IGBC, TERI-GRIHA) criteria for rating, sustainability.

UNIT II

Desktop studies of few green buildings of different typologies.

UNIT III

Site Selection and Planning

Site selection, local building regulation, preserving and protection of natural landscape during construction, Soil conservation, Design to include existing site features.

UNIT IV

Water Efficiency

Efficient water use during construction, Rainwater harvesting- Roof and non-roof, Waste water reuse, water efficient plumbing fixtures, water metering.

UNIT V

Energy Efficiency

Optimizing building design to reduce conventional energy demand, On-site renewable energy, Solar water heating systems, ECBC codes for energy efficiency, Energy metering.

UNIT VI

Materials and Resources

Efficient Segregation of waste, Handling of construction waste. Reuse of salvaged materials, use of Recycled construction materials, Alternative building materials, local materials, rapidly renewable building materials and wood.

UNIT VII

Indoor Environmental Quality

Enhanced fresh air ventilation, Exhaust systems, Low VOC materials, paint & adhesives, Enhanced day lighting, Tobacco control.

UNIT - VIII

Innovation and Design

Innovation and design process

Expected Outcome& Assignment:

Desktop study report on Green Buildings, two assignment/case studies, Report on rating system for Green building.

REFERENCE BOOKS:

- 1. Indian Green Building Council (IGBC) Abridged Manuals.
- 2. Green Rating & Integrated Habitat Assessment (GRIHA) Manuals.
- 3. Sustainable Building Rating Systems, by K.M.Fowler, E.M.Rauch , July 2006, Pacific Northwest National Laboratory, U.S Department of Energy.
- 4. Sustainable Construction by Kibert

FS17B6.3C O & M OF BUILDING SERVICES

CORE /TH: 4/wk Int mks 50 Ext mks :50 Total mks:100 End exam: 3hrs Cr: 4

Objectives of the Course:

The course deals with operation and maintenance management of equipment, machinery, production systems. Basic theory, maintenance strategies, relevant standards, as well as tools, methods and maintenance strategies are discussed.

UNIT I

Operation and Maintenance (O & M) Management, importance of maintaining buildings and services, Testing and evaluation of Buildings and services, Check lists for handing over and taking over, Importance of seasonal maintenance: premonsoon and post-monsoon activities, Effects of non-maintenance, Manpower and material planning for O&M, Budgeting for O&M.

UNIT II

Maintenance of Water supply systems, Relationship between water supplies and health, standards for water supplies, quality monitoring of drinking water supply, protection of sources of water supply, O & M of pumping stations, water treatment plants, chlorination practices, maintenance of groundlevel and elevatedtanks, leakage detection survey, O & M of swimming pools, O & M of Kitchen Services.

UNIT III

Maintenance of Sewerage Systems, Sewer cleaning equipment and devices, O & M of Sewage pumping stations, Sewage Treatment, Septic Tanks, Stabilization ponds, Activated Sludge Processes, Filters, Oxidation ditches, Effluent disposal and utilization

UNIT IV

Maintenance of Electrical installations, substation equipment inspection and preventive maintenance schedules, Earthling System Checks, O & M of DG Sets, Cables, UPS systems, Lifts & Escalators, Motors and Fire Detection systems, O & M of AC and Refrigeration systems, compressors, condensers, pumps, cooling towers, Air Handling Units, Electrical circuits and controls for AC plants, clean rooms, operation and monitoring, Low humidity rooms.

Expected Outputs & Assignments

Students have to prepare a report on a Case study about the O & M strategies and should be able to prepare and fill the O & M checklist for the building services.

REFERENCE BOOKS:

- 1. Facility Manager's Operation and Maintenance Handbook by Bernard Lewis: Mc Graw Hill
- 2. Facilities Maintenance Management by Gregory H. Magee:R.S. Means Company
- 3. Building Maintenance Management by Barrie Chanter and Peter Swallow

FS17B6.4C ESTIMATION, COSTING AND SPECIFICATION

CORE/L: 4/wk Int mks: 50 Ext mks :50 Total mks:100 End exam: 3hrs Cr: 4

Objectives of the Course:

To understand the techniques of estimation and costing and writing specification related to building construction.

UNIT I

Quantity Surveying: Introduction - Definitions and terms used, principles, units of measurements. Methods of preparing approximate estimates, basic differences and advantages, detailed estimation for Building Services: Method of obtaining detailed quantities of building items for MEP adopting PWD guideline.

UNIT II

Obtaining all items from selection of equipment to commissioning of the services at the site - Case study of construction site.

UNIT III

Rate analysis: Cost of materials and labor for various works, data sheet for different items of works, different methods of execution & installation and commissioning of services i.e. piece work, daily basis, lump sum, labor rates and percentage etc

UNIT IV

Specifications: definition, purpose and importance of specifications, factors on

which specifications depend, types of specifications, specification writing for MEP services.

UNIT V

Estimation, Costing and Specifications for Plumbing Services

Type of pipes used, Pipe fittings, Valves, Pumps and their fittings, Laying of water supply and sanitary pipes, construction of water harvesting pits, sump, and OHT etc., Sanitary fixtures, Traps, Gully and Inspection chambers construction quantity, Trenches & Harvesting pit and STP construction quantity.

UNIT VI

Estimation, Costing and Specifications for Electrical Services

Types of Lights, Electrical and Lighting fixtures, Switch and Switch boards, Electrical appliances, Wiring, Cables, Conduits, Cable trays and their fittings, MCB's, Energy Meters, Distribution Panels, Transformers, DG Sets, Lighting arresters and their fittings.

UNIT VII

Estimation, Costing and Specifications for HVAC Services

Indoor units, Outdoor unit, copper pipes and their fittings, Diffusers, grills, etc., AHU, FCU, Duct and their fittings, Insulation, Dampers, Chillers, Filters, Pumps andtheir fittings, Valves, Ducting.

UNIT VIII

Market Survey

Detailed market survey on overall cost of materials, Equipments, Fittings, etc.

Expected Outcome Assignments:

Report containing estimation, costing and specification to be done for Electrical, Plumbing services and HVAC system for a commercial or hospital building.

- 1. Estimating and Costing in Civil Engineering: Theory and Practice, by Datta,23rd edition, B.N.: UBS Pub. Distributors Ltd., New Delhi, 1993.
- 2. Estimating and Costing, by Bride, 2nd edition, G.S: Dhanpat Rai and Sons, Delhi, 1982.
- 3. Standard Specification and rates, Government of Andhra Pradesh, Government Press, Hyderabad Indian Standards Institution.
- 4. National Building Code ofIndia 2005: Indian Standards Institution, New Delhi, 1984.
- 5. Specification in Detail, by Macey,5th edition, W. Frank: Technical Press ltd, London, 1955.

FS17B6.5C SAFETY HEALTH & ENVIRONMENT

CORE/TH : 4/wk Int mks: 50 Ext mks : 50 Total mks: 100 End exam: 3hrs Cr: 4

Objectives of the Course:

The basic objective of field councils is to facilitate the exchange of ideas and information to assist agencies to reduce the incidence, severity and cost of occupational accidents, injuries, and illnesses.

UNIT I

Introduction to Safety Health and Environment, Occupational Health (hygiene and safety), recognition and evaluation of Occupational Hygiene (noise, illumination, Heat & climate, toxic substances, etc.), ergonomics & safety control, standard and regulation.

UNIT II

Material handling safety, Electrical Hazards and Safety, Construction Safety, Machine guarding, confined space entry, Acid area entry permit. Safety at construction site, hazards, handling and storage of compressed gas, excavation work, concreting and cementing work, transportation of men and material, waste control disposal.

UNIT III

Signage, Safe Condition, Prohibition, Warning, Fire Equipment, Fire Exit Signs, Risk Assessment (exposure, hazard & risk), Purpose of Risk Assessment, Prevention of risk ,Risk Assessments, Health risks, Safety task analysis risk reduction talk. Health & Safety Management implementation and operational Noise Slips, Trips, Leak Chemicals Manual Handling First Aid PPE Fire.

Health & Safety Culture

Safety aspects, planning, environmental aspects, legal and other requirement, Structure and Responsibility, Health Safety control, unsafe practice, Operational Good Practice. Emergency preparedness and response, Procedures for identifying potential accident and emergency situations, Accident and emergency response procedures, Site emergency plans.

UNIT IV

Appropriate fire fighting equipments, fire detection, smoke and heat detection alarms should be incorporated in the design, The fire-fighting equipment as per quality standards and norms should be used..Fire Water Hydrant System, Fire Extinguishers, Fire Protection System, Fire Detection System Equipments. Fire tetrahedron, Classification of fire type, Local equipment fire fighting equipments (fire hose box, fire man axe, fire beater, fire hook, fire bucket,) Type of extinguisher installation & maintenance. Fire safety rules NBC & TAC norms, Steps of fire management, Raise run rescue, Actions for minor fire, Evacuation, Extended evacuations ,sensory impaired (sight, hearing) ,specialty unit dialysis, operating rooms, icus, psychiatric care, hyperbaric oxygen chambers ,pediatrics facilities.

Expected Outputs & Assignments

Assignments on given topics and periodic internal test.

REFERENCE BOOKS:

- 1. Occupational safety and health management. by Anton.T, New York McGraw-Hill, 1989.
- 2. Occupational health and safety management : a practical approach by Reese, C, Boca Raton, Fla: Lewis, 2003
- 3. Hywel Murrell, K. Ergonomics: man in his working environment. London by Chapman and Hall, 1975.

FS17B6.6C. INTERNSHIP-1

CORE/PT: NIL Int mks: NIL Ext mks: PASS/FAIL Total mks: Nil End exam: Viva-Voce Cr:

Every student must work in an Office as a full-time trainee for a period of four weeks during summer vacation.

After completion of training, every student shall submit a detailed report with a set of drawings on at least two projects on which she/he has worked during the four weeks of practical training period. This report will be evaluated at a viva-voce by a jury consisting of one external, one internal and head of the department or his nominee. After submission of the report the department at its convenience will arrange for the conduct of the viva-voce examination for which the student will be awarded satisfactory/fail.

Expected Outputs & Assignments

The skills required for a student to undertake Project work in eighth semester.

FS17B6.xE ELECTIVE-III

FS17B6.1E COMPUTER APPLICATIONS IN MEP

DSE-III/P/T/O : 3/wk Int mks: 50 Ext mks : 50 Total mks:100 End exam: Practical & Viva-Voice Cr: 3

Objectives of the Course:

The programme is designed with the objective to provide knowledge and skills in the various aspects of computer applications in MEP and core programming.

UNIT I

Introduction to computer application programs in MEP, Basics of computers in MEP.
UNIT II

HVAC models for design

Process of analyzing HVACs designs. Process of creating room color fills. Process of exporting GBXML. Guidelines for exporting GBXML; process of using imported GBXML data. Guidelines for using imported GBXML data to color-fill rooms. Creating HVAC designs.

UNIT III

Creating HVAC designs

Process of adding mechanical parts. Guidelines for adding mechanical parts. Process of creating a supply system process of inspecting a system. Guidelines for inspecting a mechanical system, process of routing piping. Guidelines for routing piping process of creating duct routing in a return system.

UNIT IV

Creating electrical designs

process of creating electrical designs process of adding electrical devices to your design; guidelines for adding electrical devices; process of creating circuits; guidelines for creating circuits. Process of setting up an electrical distribution. Guidelines for setting up electrical distribution circuits. Process and guidelines of creating a lighting fixture family.

UNIT V

Creating Piping System:

Process of creating a piping system; guidelines for creating a piping system. Create a hydraulic supply piping system.

UNIT VI

Creating Plumbing Systems:

Process of creating a plumbing system; guidelines for creating a plumbing system; create a plumbing sanitary system.

UNIT VII

Creating Fire Protection Systems:

Process of creating a fire protection system; guidelines for creating a fire protection system; create a fire protection system.

UNIT VIII

Co-ordination of MEP services:

Integrating all the services- Electrical, HVAC, Plumbing and Fire fighting in a Building. Clash detection and rectifications.

Expected Outcome & Assignments

Creating service drawings, working on different layers, Clash detection, and Coordinated drawings.

REFERNCE BOOKS

- 1. User Guide Autodesk 2017
- 2. ASHRAE Handbook
- 3. ISHRAE HVAC Handbook

FS17B6.2E ADVANCED HVAC SYSTEMS

DSE-III/TH : 3/wk Int mks: 50 Ext mks : 50 Total mks: 100 End exam: 3hrs Cr: 3

Objectives of the Course:

To understand the new technologies in HVAC and their performance evolution and energy efficiency. The course is also aimed at imparting knowledge of psychometric properties, processes which are used in air-conditioning systems for comfort and industrial applications

UNIT I

Energy Conservation Measures (ECM): Under Floor Air Distribution System (UFAD); UFAD triminalogoy UFAD technology, energy saving methods in UFAD, heat load calculation in UFAD

Chilled Beam System; chilled beam technology, cost analysis, energy saving methods, problems in chilled beams

UNIT II

Radiant Cooling; technology, piping method, energy saving in radiant cooling, problems in radiant cooling

Geothermal Cooling; technology, energy saving, Thermal Energy Storage System (TES) or ICE on Pipe System; technology, tank design methods, energy saving.

UNIT III

Demand Control Ventilation (DCV); technology, energy savings, problems. EAT-Earth Air Tunnel System,

UNIT IV

Cooling without Air- Conditioning & Passive Cooling System Designing, Green in HVAC system Designing – Energy Modeling Concept.

Expected Outputs & Assignments

Assignments on given topics and periodic internal test.

REFERNCE BOOKS

- 1. ASHRAE Handbook
- 2. ISHRAE HVAC Handbook
- Handbook of Air Conditioning and Refrigeration second edition by Shan K. Wang Mcgraw-Hill New York

SEMESTER - VII

FS17B7.1C BUILDING SERVICES STUDIO - VII

CORE/S: 10/wk Int mks: 100 Ext mks : 100 Total mks:200 End exam: Vivo-Voce Cr: 10

Objectives of the Course:

To familiarize with various ways of designing green building, retrofitting of existing buildings and understanding different types of rating systems in green building.

Study and Analysis- Through literature studies and case studies analyze the rating systems for green buildings, energy, water efficient design strategy and design intent for green buildings.

Design Proposals: Design of buildings or retrofitting the existing building with green building features. Design to be represented in the form of schematic layouts, detailed estimates and report on working process. Design has to be evaluated against the base case of the appropriate category in green buildings.

Sustainable Design: Concept of sustainable design, site selection and planning: Building regulations (ECBC, GRIHA, and IGBC), Building materials and services in sustainable buildings.

Water Conservation: Rain water harvesting, calculating storm water quantity, pervious and impervious ground covers, estimation of capacity required for rain water harvesting and water efficient and waterless fixtures. Grey water recycling.

Energy Efficiency for Existing Buildings and New Buildings: Sources of energy - On-site and Off-site, calculation of energy from renewable sources, making alterations to the existing buildings (Retrofitting), base case for energy in different typologies of buildings. Energy efficient design for thermal comfort, mechanical equipment and electrical systems. Energy efficient equipments and fixtures. Building automation for energy efficient performance.

Building Material and Resource: Certified green building materials, Reduce reuse and recycling of materials, sustainable building materials, low embodied energy and low carbon materials, Life cycle assessment of building materials.

Indoor Environment: Importance of work environment and its relation to productivity, Indoor environmental quality, sick building syndrome, minimum fresh air ventilation, number of air cycles, odour, smoke and Co2 monitoring, detecting and control of chemicals (VOC,CFC) and bacteria in indoor environment.

Luminous environment, daylighting, artificial lighting, task lighting, suitability for functional spaces, Occupational Safety and Health Hazards ,Thermal comfort, indoor temperature and relative humidity ,Noise pollution and control measures ,Low emitting materials- Formal-dehyde, Volatile organic compounds, CFC, Lead and other chemical pollution causing materials.

Innovation and Development: Design process: Optimization of design in all the above aspects.

Expected Outputs & Assignment:

Students are required to undertake case studies of green buildings and do detailed critical study on all the above aspects. This shall be presented through drawings, photographs, reports etc. in the studio. The students will also prepare a report on the case study and design for the viva voce.

At least one major exercise (one problem should be pertinent to green buildings) and two minor problems should be given (at least one should be on interiors). The student has to prepare a comprehensive portfolio including details and their integration with the facilities.

Note: The topics not covered in case studies may be covered by the studio faculty members through lecture/slide shows. Informal talks by practicing developers, architects, contractors, lawyers, engineers and financiers on topics relating to facility management. In end exam which is a viva-voce the students have to present the entire semester work for assessment

Necessary theoretical inputs to be given highlighting the norms and design issues.

REFERENCE BOOKS:

- 1. Green Building Fundamentals by Mike Montoya
- 2. National Green Building Standard by International Code Council and National Association of Home Builders
- 3. Green Building through Integrated Design (Green Source Books) (Mcgraw-Hill's Green source) by Jerry Yudelson
- 4. MEGA STRUCTURES: THE LARGEST INDOOR PARKS AND MALLS (Easy Read Large Bold Edition) by Susan K. Mitchell
- 5. Designing the Exterior Wall: An Architectural Guide to the Vertical Envelope – Hardcoverby Linda Brock (Jun 20, 2005)
- 6. Sustainable Development by Kibert
- 7. Indian Green Building Codes (IGBC) Abridged versions
- 8. Energy Conservation Building Codes (ECBC) Norms
- 9. Green Integrated Habitat Assessment ((GRIHA) Manual.

FS17B7.2C MECHANICAL CIRCULATION SYSTEMS

CORE/TH : 4/wk Int mks : 50 Ext mks : 50 Total mks: 100 End exam: 3hrs Cr: 4

Objectives of the Course:

This course is to understand the entrances to buildings and the horizontal circulation within buildings with regard to universal design. Increase awareness of, and to encourage designers to identify, the needs of all those who require access to buildings and the horizontal circulation within buildings in order to undertake daily activities.

UNIT I

Movement systems; lifts, escalators, travolators, Lifts Terminology, Design Issues, Lifts motor design.

UNIT II

Vertical Circulation, Internal Stairs, Design and dimensions of internal stairs, Refuges, Tactile hazard warning surfaces for stairs, Handrails for internal stairs.

UNIT III

Internal Ramps, Design and dimensions of internal ramps, Ramp landings, Ramp handrails and kerbed up stands. Standards as given in TSS,TCPO,CPWD,ADA etc. for physically challenged and barrier free buildings.

UNIT IV

Passenger Lifts, Location of passenger lifts, Glass-walled lifts, Size and capacity of passenger lifts, Safety devices in passenger lifts, Signage for passenger lifts, Emergency systems for passenger lifts, Interior finishes in passenger lifts.

UNIT V

Evacuation Lifts Vertical Platform Lifts, Retro-fitted vertical platform lifts, Location and use of vertical platform lifts, recommended dimensions for vertical platform lifts, Short-rise vertical platform lifts, Enclosed and non-enclosed vertical platform lifts, Controls for vertical platform lifts

UNIT VI

Inclined Platform Stair lifts, recommended dimensions for inclined platform stair lifts, Stairlifts Escalators, Recommended dimensions for escalators, Escalator speeds, Travelators.

UNIT VII

Fans and blowers: Types, Performance evaluation, efficient system operation, Flow control strategies and energy conservation opportunities.

UNIT VIII

Hydraulic and pneumatic actuating systems, Fluid systems, Hydraulic and pneumatic systems, components, control valves, electro-pneumatic, hydropneumatic, electro-hydraulic servo systems: Mechanical actuating systems and electrical actuating systems

UNIT IX

Shutting down the lift, preparation, maintenance schedule, maintenance work, visual inspection, oil level, checking the spring resistance measurement "X", checking the clearance gap "S", checking the functionality of the limit switch, adjusting measurements "Y" at the limit switch, checking the electrical contacts, checking the tightening torque, checking the rope jump-off safety device, initial operation after maintance work

Expected Outputs & Assignments

Assignments on given topics and periodic internal test.

REFERENCE BOOKS:

- 1. Building Technology Mechanical and Electrical Systems by Benjamin Stein., Wiley, 1977.
- 2. Mechatronics Principles and Application by Godfrey C. Onwubolu., Elsevier Edition

FS17B7.3C CONTRACT, TENDERING AND PROCUREMENT MANAGEMENT

CORE/TH : 4/wk Int mks: 50 Ext mks : 50 Total mks: 100 End exam: 3hrs Cr: 4

Objectives of the Course:

To document the impact of each procurement phase on overall project goals.

To analyze significant issues related to qualifying and selecting suppliers/sellers or vendors for a project requirement.

To assess key factors, including risk factors that affect buyer and seller decisions concerning contract pricing and the selection of the proper contract type.

To compare e-procurement with other types of supplier bidding models

To summarize methods for soliciting a bid proposal, and evaluate technical, management, commercial, and ethical requirements.

UNIT I

Integrated Materials Management:

Definition, scope, need, corporate policies, procurement cycle, overview on source selection and vendor development and Buyer – Vendor Relationship (TKG), LifoFifo, C-Form,Introduction to VAT, Service Tax & GST

UNIT II

Purchasing Management

Price forecasting, Planning and Budgeting, Source Selection and Vendor Development, Negotiation, Supply confidence, Legalities in Procurement, Materials Handling, Transportation, Insurance and Stores Management, Inventory Management, Economic order quantity.

UNIT III

Contracts Introduction

Contracts; types of contracts such as item rate, lump-sum, cost plus percentage etc. General principles of Indian contract Act; Building contracts, conditions and forms of contract, Administration of contract. Principle of Arbitration, Indian Arbitration act 1940, Powers and duties of arbitrators, revoking authority; umpire, award cost fixed fee, cost with penalty, labour day work, piece work Daily Easement: definition; various types of easements; Dominant, and servient owners; essential conditions for enjoyment of easement; Fire insurance's definition, cover note; insurance for new work and additions; insurable value of property, claim for damage due to fire. Insurance of completed and pied building

UNIT IV

The Tender Process

Tender as a basis of contract, Preparing sound tendering documents, bid invitation: E-tendering, Bid/no bid analysis, preparation and submission of bids, Tender structure for different types of contracts, General conditions of contract and special conditions of contract.

UNIT V

Arbitration and conciliation act, Indian contract act 1872, case study by students on contract laws & claims,

UNIT VI

Breach of contract, alternate dispute resolution systems, risk management, use if FIDIC for conditions of contract – Red book, Interpretation of Contract, Rules of Interpretation

UNIT VII

Selection of consulting firms

Announcement and pre-qualification, Short listing, Request for Proposals, Preparation and submission of proposals, Receipt and opening of proposals, Evaluation of proposals, Selection of the consulting firmand negotiations, Agreement, Notification and Debriefing, Techno commercial evaluation.

Expected Outputs & Assignments

Assignments on given topics and periodic internal test.

REFERENCE BOOKS:

- 1. Contracting for Project Management by J. Rodney TurneR., Gower
- 2. Procurement Principles & Management by Peter Baily, David Farmer, Barry Crocker, and David Jessop., Trans-Atlantic
- 3. Project Procurement Management by Stephen Guth.
- 4. Contract Management by BS Pail
- 5. Procurement Management Grand by Baily & Farmer

FS17B7.4C Pre-Thesis Seminar

CORE/TH : 2/wk Int mks: 100 Ext mks : Nil Total mks: 100 End exam: Nil Cr: 2

Objectives of the Course:

To develop the theme and structure of the thesis by writing a preliminary thesis proposal

To acquire necessary resources for research and writing

To obtain appropriate bibliographic material

To develop a timetable for researching and writing the thesis

To provide support for the student's individual writing and assist in preparation of the thesis manuscript

To officially submit a final, complete thesis according to Department and University norms in partial fulfillment of the degree requirements

UNIT I

Introduction to project, difference between project and studio exercise literature and research papers, selection of topics for thesis, project thesis based on research / literature studies, preparation of synopsis, methodology of design thesis.

UNIT II

Emerging concepts in building technology and services, reviews of project related to building technology and services, review of project complexities involving theme, sub theme, technology etc.

UNIT III

Tools and methods to handle the project, field work, lab experiments, modeling techniques, Data analysis techniques, interpretation of data.

UNIT IV

Background / prior work

List the main relevant work by others and/or results you have achieved in your previous work investigations.

- i. Format for presentation of data, case study and analysis
- ii. Format for presentation seminar paper, drawing and simulation models.
- iii. Report writing: techniques in report writing, presentation of contextual information relevant to interpretation of data collected. Explain the relation of the thesis topic to the exiting knowledge in the form of coherently return thesis

Expected Outputs & Assignments

The inputs to the students on various thesis topics would be in the form of Expert / Guest Lectures. Each student in consultation with the faculty shall choose a thesis topic for project/dissertation to be continued in the subject Project of VIII semester, the student required to Collect necessary data, review literature on the chosen topic and present a written paper and seminar at the end of the semester.

FS17B7.5C PROJECT MANAGEMENT

CORE/TH: 4/wk Int mks: 50 Ext mks :50 Total mks:100 End exam: 3 hrs Cr: 4

Objectives of the Course:

To understand the characteristics of a project.

To apply project characteristics to your own project.

To identify skills necessary to manage a project.

UNIT I

Introduction to Project Management:

Definitions and meanings; importance of project management, Reasons or shortfall in its performance, scientific management, Different types of project, life cycle of project.

UNIT II

Project Management Frame Work, Project Scope management, Project Time Management-crashing and crunching, Tools and Techniques of Time Management, Project Cost Management. Procurement of Construction Services. The Construction Process. Project Control Using earned value techniques. Project Human Resource Management.

UNIT III

Project Communication Management. Project close-out acceptance and commissioning. Project Management Information System. Causes of Project Failure. Exercises, Tutorials and Case Studies.

UNIT IV

Project Management Strategies: Tools and Techniques for project management. Mission, Goals, Objectives, Policy, Strategy, Programmers, Value Chain Analysis, SWOT Analysis, Steps in Strategy Formulation and Implementation, Generic Strategy alternatives. Integrated reporting system, flow diagrams, bar, charts, milestone, charts, CPM and PERT, LOB. Techniques of monitoring of development works-standard oriented costs control, turnkey system, vertical production method, inventory cost control techniques, and unified status, index techniques.

UNIT V

The management of technology relating to development projects to meet regulatory requirements, and prevailing build-ability and quality standards. The topics include preliminary works, substructures, and structural systems, functional elements for reinforced concrete and structural steel buildings, and external works.

UNIT VI

Management of development technology for projects like Building Operations and Works of Engineering Construction. Regulations, Building Control Regulations, Buildable Design Appraisal System, Construction Quality Assessment System and other relevant codes of practice.

UNIT VII

Assessment of clients' requirements, selection of projects, formulation of project brief, the role of design as well as the designer in projects, design for value, integrated designs, and design evaluation.

UNIT VIII

Case study: Develop/Plan on project scheduling using MSP (Microsoft Project Management) or any other relevant software.

Expected Outputs & Assignments

Assignments on given topics and periodic internal test. Also the student are expected to integrate the planned Project schedule in BIM.

REFERENCE BOOKS:

- 1. Introduction to Management Science by Bernard W. Taylor
- 2. Project Management (Management Extra) by Elearn
- 3. Project Management in construction by Anthony Walker.
- 4. Projects by Prasanna Chandra
- 5. Urban construction project management publication: Mcgraw Hill

FS17B7.xE. ELECTIVE-IV

FS17B7.1E WORKSHOP MEP

OE-II/L: 3/wk Int mks : 50 Ext mks : 50 Total: 100 End exam: Practical & Viva-Voce Cr: 3

Objectives of the Course:

To understand MEP engineers involvement in the project with respect to his nature of work while the design execution after the conclusion of design.

UNIT I

Plumbing workshop:

Pipe cutting : Use of pipe cutters; Thread of pipes; Connection of fitting such as to pipes; Use of valves and unions; Function of pipes fitting: Use of hand tools; Pipe wrench; Chain wrench; Caulking tools; etc. Threading of PVC pipes. Connection of PVC pipes by connecting materials and by threaded pipes fitting. Bending of PVC pipes. Minor repairs in plumbing.

UNIT II

Electrical Workshop:

Study of symbol, specification and approximate cost of common electrical accessories, tools and worse & cables required for domestic installation. Study of a) Basic electricity rules for a domestic consumer b) Safety precaution & use of Fire fighting equipments.

Use of series of phase tester, series test lamp tong test and measure in testing of electrical installation. a) Prepare of potential divider and measure resistance of a filament lamp using voltmeter and meter. b) Measurement of power and energy consumption by and electric heater using wattmeter and energy meter.

Preparation of wiring diagram, wiring testing, fault finding& costing for a) Control of one lamp by one switch (using batten and tumbler switch b) Control the staircase wiring (using batten and tumbler switch) c) Control of one bell buzzer indenter by one switch (using conduit and flush type switch). Prepare one Switchboard as per institutional requirement (using flush type switches. Sockets, MCB, ELCB, etc.)

Study Connecting testing and fault finding of a) Fluorescent rube and its necessaries b) Ceiling fan with resistance type and electronic regulator

Study Connecting testing and fault finding of a) Automatic electric Iron. b) Air Cooler c) Electric water pump

Design Draw and estimate the material required for installation for A small residential Building/ Office/ hall

UNIT III

Mechanical workshop:

Air refrigeration systems, air craft air-conditioning systems and their performance. Vapour compression cycles - simple, multi-pressure and cascade systems. Vapour absorption systems - Aqua-ammonia, water-lithium bromide and Electrolux systems. Refrigerants and their uses, primary and secondary refrigerants, designation and properties, Ozone Depletion Potentiality (ODP) and Global Warming Potentiality (GWP) of refrigerants.

Refrigeration equipment. Air conditioning processes, cooling load calculations, air conditioning systems and equipment. Concept of effective temperature and effective sensible heat factor (ESHF), requirement of comfort air conditioning.

Solar refrigeration and air conditioning systems. Household refrigeration, water cooler, window air conditioner and desert coolers.

Mechanism of operation of lifts and escalators

Expected Outputs & Assignments

Assignments on given topics and periodic internal test.

REFERENCE BOOKS:

- 1. Principles of Electrical Engineering by V.K Mehta: S.Chand Publications.
- Essentials of Electrical and Computer Engineering by David V. Kerns, JR. J. David Irwin Pearson: Pearson; 2nd edition ,2004
- 3. Building Services hand book by Fred hall and RoserGreeno. Sixth Edition
- 4. Building Services Engineering By David V. Chadderton

FS17B7.2E BUILDING SIMULATION MODELING:

OE-II/P/T/O: 3/wk Int mks: 50 Ext mks :50 Total mks:100 End exam: Practical & Viva-Voce Cr: 3

Objectives of the Course:

To recognize the various building energy simulation tools, types and capabilities.

To learn underlying concepts, modeling inputs and analysis methods of building components such as envelope, lighting, occupants, equipment, process loads, HVAC and service hot water systems.

To model building performance using energy simulation software.

UNIT I

Rhinoceros 5 :

Modeling Tools for Designers and Architects

To create, edit, analyze, document, render, animate, and translate NURBS curves, surfaces, and solids with no limits on complexity, degree, or size. Rhino also supports polygon meshes and point clouds. Its accuracy and flexibility makes it possible to students to explore and build their ideas without having to spend much time learning.

UNIT II

Creating and Editing Geometry:

Drawing free-form curves, Grid Snap, Layers, Selecting objects, dedicated selection commands. Object types Surface, Poly-surface, Solid, Lightweight Extrusion Objects, Curve, Polygon, and Mesh.

UNIT III

Precision modeling:

Distance and angle constraint entry, Object Snaps, Additional modeling aids, Project constraint, Viewports and construction planes, Construction planes Analysis commands- Distance, Length, Radius, Point evaluation, Drawing with precision, circles, arcs, ellipses and polygons, rectangles, free from curves, helix and spiral.

UNIT IV

Editing Geometry:

Fillet, Blend, Chamfer, Move ,Copy, Undo and Redo, Rotate, Group Mirror, Join, Scale, Editing with the gumball actions: Gumball Controls, Trim, Split Extend, Offset Array.

UNIT V

Modeling and Editing:

Creating Deformable Shapes, Modeling with Solids, Creating surfaces- Simple surfaces, Planes, Surface from planar curves, Surface from edge curves, Extruding

curves, Lofted surfaces, Revolved surfaces, Rail Revolve, Sweeps and curve networks. Importing and exporting, Exporting Rhino File Information, Importing other file formats into Rhino.

UNIT VI

Annotating your model :

Dimensions ,Dimension types ,Dimension tools ,Linear Dimensions ,Leaders ,Making a 2-D drawing from a 3-D model, Transforming solids: Flow along surface, Surface direction.

Viewing the Building Model, Managing Views, Controlling Object Visibility, Working with Section and Elevation Views, Creating and Modifying 3D Views,

UNIT VII

Rendering:

Apply materials, Add lights, Add textures Use a ground plane, Creating Renderings, Using Walkthroughs, Using Sun and Shadow Settings.

UNIT VIII

Lumion 3D Software:

Importing the model in the software, applying material to the objects, choosing the visual styles, adjusting the backgrounds, adding objects, animate the objects, creating views, rendering the views, setting up camera angles, exporting the video.

Expected Outputs & Assignments

Students have to generate the reports for the simulation analysis to show the desired results and integrate the results in BIM.

REFERNCE BOOKS:

- 1. Inside Rhinoceros 5, 4th Edition by Ron K.C. Cheng Hong Kong Polytechnic University.
- 2. The Big Book of Simulation Modeling: Multimethod Modeling with AnyLogic 6 Kindle Edition by Andrei Borshchev

FS17B7.3E DISASTER MANAGEMENT IN FSP

OE-II/T: 3/wk Int mks: 50 Ext mks :50 Total mks: 100 End exam: 3hrs Cr:3

Objectives of the Course:

Imparting theoretical lectures with case discussion

Making students aware about the importance of this subject in the future prospects.

UNIT I

Introduction to Disaster Management

Contents Concepts of Hazard, Susceptibility to Vulnerability Reduction, The Nature of the Hazard, Rapid Onset vs. Slow Onset ,Controllable Events vs. Immutable Events, Frequency vs. Severity, Mitigation Measures to Withstand Impact vs. Mitigation Measures to Avoid Impact, The Nature of the Study Area, The Participants in the Event.

Hazard Management and Development Planning Hazard Management Activities, Disaster Mitigation, Natural Hazard Prediction, Emergency Preparedness, Disaster Rescue and Relief, Post-Disaster Rehabilitation and Reconstruction, Education and Training Activities

UNIT II

Identification and Prioritization Of Hazards

Natural Hazards in Perspective Historical Disasters and Agricultural Losses, Economy-wide Effects of Disasters, Natural Hazards and Development Issues, Potential Mitigation Strategies.

Potentially Hazardous Natural Phenomena Atmospheric, Seismic, Other Geologic, Hydrologic, Volcanic Wildfire.

Man-Made and Technological Types of Disasters, Hazardous materials, Power service Disruption & Blackout, Nuclear Power Plant and Nuclear Blast, Radiological Emergencies, Chemical and Weapons, Cyber, Explosion, Civil Unrest.

Assessing the Distastes and their Impact on Infrastructure and Building services might include:

- Building control systems.
- Energy distribution.
- Energy supply (gas, electricity and renewable sources such as solar, wind, geothermal and biomass).
- Escalators and lifts.
- Facade engineering (such as building shading requirements).
- Fire safety, detection and protection.
- Heating, ventilation and air conditioning (HVAC).
- Information and communications technology (ICT) networks.
- Lighting (natural and artificial).
- Lightning protection.
- Refrigeration.
- Security and alarm systems.
- Water, drainage and plumbing (including sustainable urban drainage systems (SUDS).

UNIT III

Critical Facilities Analysis

Public Safety And Security: Civil defense installations, Communications centers, Emergency management centers, Fire stations, Hospitals and other medical facilities, Mass emergency shelters, Police stations and other installations for public security

High-Density Occupancy: Auditoriums, theatres, stadiums, Churches, Educational facilities, Hotels, Office buildings, Penal institutions

Transportation: Airways-airports, ,Highways-bridges, tunnels, roadbeds Railways.

Utilities: Communications-lines, stations, printing presses, relay points, antenna complexes, Electric power-water impoundments, fuel storage, generators, transmission lines, substations, switchyards, Petrochemical installations-production, transmission, storage, terminals, Potable water-collection, transmission, siphons, flumes, treatment, storage, Waste water-collection, treatment, discharge

Agricultural: Food-storage, processing, transfer, Irrigation systems, Water containment-dams, reservoirs, levees, dikes, other impoundments Disaster Case Studies in above Scenarios.

UNIT IV

Disaster Management Strategy

Pre Disaster Phase: Preparedness in "No Disaster Situation", Formulation of District Disaster Management Plan, Risk Assessment and Vulnerability Analysis, Resource Inventory. Allocation of responsibilities to the individual actors/Groups/ Institutions/Organizations.

Impact Phase: Emergency Relief Measures, Rescue operation/Evacuation by teams (already identified) and providing basic infrastructure and movement to rescue centres, Management of Rescue Shelters, Administration of Relief.

Post Disaster Phase: Damage Assessment and Long term relief, Assessment & enumeration of damage, Developing a Reconstruction and Rehabilitation plan, Monitoring Relief Operation organized by outside agencies/ UN Agencies/ Red Cross/ NGOs/ PSUs/ other states etc, Restoration of Communication- Roads, Railways, Electronic Communication etc., Maintenance of Law & Order, Provision of Medical facilities, Minimum sanitation, drinking water, free kitchen etc, Removal of debris and disposal of carcasses.

UNIT V

Construction Industry Development For Disaster Prevention And Response

Enforcing Existing Codes and Laws, Preparedness for Disaster evacuation, Structural Mitigation Measures, Retrofitting. Earth Quake Resistant Construction. Long term response plan.

Expected Outputs & Assignments

Assignments on given topics and periodic internal test.

REFERENCE BOOKS:

- 1. Disaster Management Guidelines. GOI-UNDP Disaster Risk Reduction Programme 2009-2012.
- 2. Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, June 2003
- 3. Guerisse P. 2005 Basic Principles of Disaster Medical Management. Act Anaesth.Belg;56:395-401
- 4. Aim and Scope of Disaster Management. Study Guide prepared by Sharman and Hansen. UW-DMC, University of Washington.
- 5. Sphere Project (2011). Humanitarian Charter and Minimum Standards in Disaster Response.
- 6. Geneva: Sphere Project. http://www.sphereproject.org/ handbook/
- 7. Satapathy S. (2009) Psychosocial care in Disaster management, A training of trainers manual (ToT), NIDM publication.

SEMESTER - VIII

FS17B8.1C THESIS/PROJECT

CORE/P: 28/wk Int mks: 200 Ext mks :200 Total mks: 400 End exam: Viva-Voce Cr:12

Course Contents:

Each student of Bachelor of Building Technology and services is required to prepare a dissertation / project thesis on a subject concerning Facilities and services for a building under a guide/adviser as approved by the Head of the Department. The dissertation / project will provide opportunity to the student to synthesize the knowledge and skills acquired through the learning of various theories and practices during the course. Each student is expected to prepare a project thesis based on the preliminary work undertaken in the subject Pre Thesis Seminar of VII semester.

The project work should be mentored by the design consultant where they are undergoing practical training or any professional expert having specialized expertise in the topic chosen by the student. However incase the mentor is not available student can choose one from the university.

In case the student opts to work out of station he/she may be permitted to opt for internal faculty as guide up till the time they leave for internship. If any Reviews are scheduled in his period of internship the student can attend the review through a digital media.

At the end of the semester, each student is expected to submit the original investigation proposed design drawings prepared as per the department's specifications; three copies of the report in the specified format and in a soft copy and a physical or digital / virtual model should be submitted to the department after obtaining the approval of the respective guide/ adviser.

Note: The department shall schedule the final viva voce, at its convenience, only after the receipt of the project submission from the students.

FS17B8.2C INTERNSHIP-II**

PRACTICAL TRAINING

CORE/PT: 8wk Int mks: Nil Ext mks : 200 Total mks: 200 End exam: Viva-Voce Cr:8

Course Overview: Internship for a period of 8 weeks.

Course Contents:

Every student must work in an Office as a full-time trainee for a period of 8 calendar weeks (excluding Viva-voce) from the date of commencement of training. The Chief in the firm should have a minimum of five years of practical/professional experience as Building services consultant after her/his graduation. The student

should involve herself/himself in various aspects of work in an office like design of MEP services, working drawings for facilities and services, quantity estimation, site supervision, etc. Detailed instructions regarding the training, the frequency of reporting to the department, etc. will be issued at the end of the seventh Semester, which the student must strictly follow.

After completion of training, every student will have to submit a detailed report with a set of drawings on at least two projects on which she/he has worked during the eight weeks of the practical training period. This report will be evaluated at a viva-voce by a jury consisting of one external, one internal and Head of the Department or his nominee. After submission of the report the department at its convenience will arrange for the conduct of the viva-voce examination.

FS17B8.3C HUMAN BEHAVIOUR IN BUILDINGS

CORE/TH: 4/wk Int mks : 50 Ext mks :50 Total mks:100 End exam: 3hrs Cr:4

Objectives of the Course:

To integrate human behavior into the total investigation.

UNIT I

Introduction:

Human needs and influence of Facilities planning on human needs. Maslow's hierarchy of needs. Environmental behavior in facilities planning. Behavior of users in different settings. Study of proxemics, claustrophobia, crowding. Intimate, personal, social and public distances. Densities and their standards. Privacy, levels of privacy, audio and visual privacy. Concepts of barrier, territoriality, security. Life style, attitudes, values and tools to measure them.

UNIT II

Safety, security and control:

Energy control. Setting up and preparing for work. Closing Down. Effective Communication. Waste Management. Handling of Employee/ Associate Complaints. Caring For an associate / Employee. Importance of using employee related Language.

UNIT III

Hospitality management:

Learning objectives, Top ten Global Issues and challenges in the hospitality industry. Coping with Global Issues and trends. Hospitality Information Systems. Hotel and rooms Division Operation. Application of Facility planning in Hospitality Services.

UNIT IV

Personality development:

Listening. Voice and Language, Telephone Etiquette, Presentation skills, E-mail Writing, Attitude Speaking, Inter Personal Communication. Human resource

development – Leadership and Motivation. Team Work and team Building, Conflict Resolution, Decision Making.

UNIT V

Organizational Behavior:

The human behavior in organizational settings. The major elements of managerial and supervisory functions in business organizations and the dynamics of human behavior in organizational settings. Motivation, leadership, job and organizational design, creative communication, problem solving, and conflict resolution. Contemporary issues (cultural diversity, globalization, etc) to be discussed.

Expected Outputs & Assignments

Assignments on given topics and periodic internal test.

REFERENCE BOOKS:

1. Human Behavior in Design: Individuals, Teams, Tools by Udo Lindemann. Dimensions of Human Behavior: Person and Environment (Series in Social Work) by Elizabeth D. Hutchison

FS17B8.4C GRAND VIVA

CORE/P: - Int mks: - Ext mks: - Total mks: - End exam: Viva Voce Cr: nil

Objectives of the Course:

To evaluate overall technical knowledge and industry readiness.

To go under a virtual environment of technical interview.

To analyze various real life problem solving.

Course Overview:

Technical Expertise: Implement fundamental domain knowledge of core courses for developing effective logical reasoning.

Successful Career: Deliver professional services with updated technologies in Facilities and Services based career.

Soft Skills: Develop leadership skills and incorporate ethics, team work with effective communication & time management in the profession.

Life Long Learning: Conduct research among Facilities and Services profession as per market needs.

Course Outcomes:

To evaluate overall technical knowledge and industry readiness.

To go under a virtual environment of technical interview.

To analyze various application in Facilities and Services for real life problem solving

FS17B8.xE Elective-V

FS17B8.1E ENERGY SIMULATION MODELING

OE-III/P/T/O: 3/wk Int mks: 50 Ext mks : 50 Total mks: 100 End exam: Practical & Viva Voce Cr: 3

Objectives of the Course:

An understanding of the background of building performance simulation,

An understanding of requirements about thermal and visual comfort and indoor air quality, and of their relationship with energy usages in buildings,

An understanding of integrating passive strategies and renewable energy generation systems in a building model.

Unit-1

Course Introduction and Background

Brief history, need for simulation, and simulation as part of design process-various methods in simulation process, data collection, the variables which effect energy consumption in buildings.

UNIT II

Fundamentals of energy

Mass transfer and Thermal analysis of building components, Numerical methods, and Theoretical framework for energy simulation for buildings related to various aspects Energy simulation tools.

UNIT III

Software Analysis

Introduction to DOE2 (e-QUEST) software, building envelope analyses.

E-Quest model set-up-Thermal model of the building envelope. Modeling HVAC systems, Parametric Analyses,

E-Quest model use and interpretation. Code compliance exercise- Integrated modeling

E-Quest model calibration- Model calibration to actual energy use.

E-Quest ECM evaluation - Evaluating energy conservation measures.

UNIT IV

Introduction to Energy Plus

Introduction to Energy Plus interface tools. Linking energy models to other tools, BIM - Energy Plus, setting up from Revit or Sketch-up

Special emphasis shall be given to the open source code software-their applications and customization for the specific needs in the context of energy simulation.

Expected Outputs & Assignments

Evaluating Building performance in terms of thermal comfort and energy

conservation measures based on actual building operations and occupant behavior, adaptive responses by occupants to outdoor environment conditions.

REFERENCE BOOKS:

- 1. Software E-Quest, Energy Plus, Design Builder
- 2. Software tool application guides for above software
- 3. Building Performance Simulation for Design and Operation by J. Hensen and R. Lamberts (eds.). Publisher: Routledge (February 24, 2011).
- 4. ASHRAE Std 90.1-2007

FS17B8.2E PROJECT FINANCE

OE-III/TH: 3/wk Int mks:50 Ext mks :50 Total:100 End exam: 3 hrs Cr: 3

Objectives of the Course:

Understand the principles of project financing (PF)

To be able to evaluate the key components of the risk and the profitability of projects Know how to use simple financial software to model the net present value of a project

UNIT I

Project Finance Background

The process of developing a project from its inception to its commissioning, and the financing of projects. Evolution of Project Finance, Project Types, Critical Steps in a Project.

UNIT II

Market Analysis, Business Model, Competencies & Promoter Analysis

Background, Market Sizing, Consumer, Customer and Influencer, Market Insight Areas, Market Research Approaches, Business Model, Competencies, Promoter Analysis.

UNIT III

Estimating Cost of Project

Project Specifications, Estimating Fixed Capital Investment in Project, Estimating Working Capital Investment in the Project.

UNIT IV

Financial Projections

Background, Assumptions, Cost of Project & Means of Financing, Projected Profit & Loss Account, Projected Balance Sheet, Projected Funds Flow, Project IRR, Equity IRR, Loan Servicing Capability, Sensitivity Analysis, Building Scenarios.

UNIT V

Project Finance and Their Sources

Prudence in Mix of Long Term and Short Term Finance, Forms of Long Term Project Finance, Forms of Short Term Project Finance, Lease, and Role of Non-Banking Finance Companies.

UNIT VI

Public Private Partnerships

Background, PPP Models, Parties to a PPP Model, PPP Process, Model Concession Agreements.

UNIT VII

Taxation & Incentives

Taxation, Depreciation, Amortization of Preliminary Expenses, Interest on borrowed capital, Disallowances under the Act, Expenses in General and Incentives.

UNIT VIII

Project Risks & Their Mitigation

Background, Project Conceptualization Risk, Financial Closure Risk, Project Construction Risk, Political Risk, Market Risk, Supply Chain Risk, Policy Risk, Exchange Risk, Environmental Risk and Force Majeure.

Expected Outcomes & Assignment:

The internal assessment to be in the form of term papers and presentations on above mentioned aspects focusing on their applications.

REFERENCE BOOKS:

- 1. Project Financing by John D Finnerty
- 2. The Principles of Project Finance by Rod Morrison
- 3. Financial Management by Prasanna Chandra
- 4. Public Private Partnership and Project Finance by Prabuddha K. Das
- 5. Project Finance NSE (National Stock Exchange)