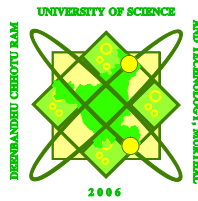


# **DEPARTMENT OF ARCHITECTURE**

**Deenbandhu Chhotu Ram University of Science and  
Technology, Murthal (Sonapat)**



**MASTER OF CONSTRUCTION & REAL ESTATE  
MANAGEMENT  
FULL TIME (2 YEARS)**

**ORDINANCE  
SCHEME OF EXAMINATION & SYLLABUS  
MAY 2013**

**Deenbandhu Chottu Ram University of Science & Technology Murthal, Sonapat**  
**DEPARTMENT OF ARCHITECTURE**  
**ORDINANCE FOR CREDIT BASED SYSTEM**  
**for**  
**MASTER OF CONSTRUCTION AND REAL ESTATE MANAGEMENT**  
**(w.e.f. academic session 2013-14)**

**1. Introduction**

**1.1** This ordinance shall apply to the Post Graduate programme, Master of Construction and Real Estate Management in the University under Innovative Programme – Teaching & Research in Interdisciplinary and Emerging Areas – the University Grants Commission.

Course	Duration of the Course		
		Normal duration	Extended duration
Master of Construction & Real Estate Management	Full time	Two years (04 semesters)	Four years (08 semesters)

**(a)** However, a student, who having passed the second semester examination discontinues her/his studies, for some justified reasons may be permitted to join the third semester within one year of her/his passing the second semester examination.

**(b)** An academic year shall consist of two semesters (odd & even) of approximately 20 weeks duration inclusive of the period of examination and semester break. The eligibility criteria for admission to the programme, fee structure, academic calendar, scheme of studies and examinations, examination schedule, sports calendar and cultural activity calendar etc. for the academic year shall be published in the University prospectus.

**2. Ordinance: Master of Construction and Real Estate Management**

Notwithstanding anything contained in any other ordinance with regard to the matter hereunder, the courses of study for the degree of Master of Construction and Real Estate Management the conditions for admission thereto shall be as under:

**2.1 Eligibility Criteria for Admission**

**(a)** Bachelor degree in Architecture or Civil Engg from any University/Institution in India or Abroad or its equivalent degree recognised by the Government of India with not less than 50% marks in the aggregate or equivalent grade of a recognized university or an examination recognized as equivalent thereto by this University. Relaxation up to 5% in the qualifying examination marks shall be provided to SC/ST candidates as per Haryana Government rules.

**(b)** Before accepting the admission, the candidate must also ensure that she/he fulfills the minimum eligibility conditions as laid down herein and by the University for admission to the programme.

**(c)** The admission would be made on the basis of the merit of the qualifying examination or as per the criteria decided by the University from time to time. The reservation would be according to the Haryana Government/University norms notified in the admission brochure.

**(d)** The reserved seats remaining vacant in the first counseling shall be carried forward to the second counseling and filled from respective categories of candidates. The above categories of

reserved seats still remaining vacant shall be converted into general category seats in the third counseling and filled out of the merit list of general category candidates in the third counseling.

(e) Fresh merit list will be prepared for each counseling.

(f) Only those candidates who present themselves personally on the specified date and time along with the originals of all the documents will be considered for admission.

(g) The admitted candidates will be required to deposit semester fees (non-refundable), securities (refundable) etc. of amount as decided by the University in cash/ D.D. on the spot at the time of admission.

**2.2** At the end of the each semester, there shall be an examination wherein candidates shall be examined in the courses studied by them in that semester. Each semester examination shall be designated as First Semester Examination, Second Semester Examination, and Third Semester Examination and Fourth Semester Examination.

**2.3** The Examination for all the semesters will normally be held in December/January and also in May/ June on such dates as may be fixed by the Controller of Examination as per the Schedule provided by the University. The date(s) of commencement of examination as well as the last date(s) for the receipt of examination forms and fees shall also be notified by the Controller of Examinations to the concerned University Teaching Departments.

**2.4** The courses of study and the subjects of examinations shall be as approved by the Academic Council from time to time. The medium of instruction and examination shall ordinarily be English except otherwise decided by the Academic Council. The question paper will be set in English, except otherwise decided by the Board of Post Graduate Studies and Research, Department of Architecture and approved by the Academic Council. Every candidate shall be examined in the subjects as laid down in the syllabus approved by the Academic Council from time to time. The credits for each subject as also the contact hours per week will be mentioned in the scheme of studies approved by the Academic Council.

**2.5** The Coordinator and the Deputy Coordinator of the Programme as appointed and approved by the UGC shall continue for the full term of the Programme or upto his/her superannuation. The Coordinator of the programme shall have the full administrative and academic responsibility. In his/her absence the Deputy coordinator of the programme shall assume the responsibility.

## **2.6 Evaluation Process**

### **2.6.1 Sesssionals:**

Sessional work shall be evaluated by the teachers of the various subjects based on the work done during semester on the basis of the following weightage:

<b>S. No.</b>	<b>Components of Minors</b>	<b>Weightage</b>
<b>A)</b>	<b>Theory Courses</b>	
1.	Minor Test – I	20 %
2.	Minor Test – II	20%
3.	Assignment / Mini Project / Term paper	30 %
4.	Quiz/Tutorial/Class Test	30 %

<b>B)</b>	<b>Project Studio Courses</b>	
1.	Seminar	20 %
2.	Problem formulation	20%
3.	Concept	20 %
4.	Preliminary Proposal	40%
<b>C)</b>	<b>Practical Training</b>	60%
<b>D)</b>	<b>Dissertation</b>	
1.	Synopsis	10%
2.	Mid term submission	50%
3.	Prefinal submission	40 %
<b>E)</b>	<b>Thesis</b>	
1.	Synopsis (Problem formulation)	10%
2.	Literature Review	30%
3.	Data collection and analysis	20%
4.	Proposals/Conclusions	40%

**(a) Theory courses:**

Every student has to appear in both the minor tests. If a student does not take a minor test, he/she shall be awarded zero marks in that test.

**(b) Project Studio Courses:**

The evaluation of Project Studio courses will be through presentation and digital and print submissions.

**(c) Dissertation:**

The evaluation of Dissertation will be through presentation and digital and print submissions.

**(d) Thesis:**

The evaluation of Thesis will be through presentation and digital and print submissions. It will be done by a jury constituted by the Coordinator of the Programme. The jury will comprise of coordinator/deputy coordinator, thesis guide and one external examiner.

The marks obtained in sessionals of theory/design studio/ dissertation/thesis courses are to be submitted to the Examination Branch duly signed by the Coordinator/Deputy coordinator and Chairperson of the department before the close of semester examination or a date fixed by the Controller of Examination. The examination branch shall convert the marks in to equivalent grades as per the grading procedure.

If a candidate, after attending the classes for the course of studies in the Department, but has failed in sessionals of one or more courses of studies, she or he can appear for such sessionals at subsequent semesters without attending a fresh course of studies for that semester. Such a candidate may, in the meantime, pursue her or his studies for the next semester(s) and appear in the examination(s) for the same along with the examination for the lower semester(s).

## **2.6.2 End semester Examinations**

### **(a) Theory examination:**

The theory papers shall be set by external/internal paper setters selected by the Vice-Chancellor from a panel of paper setters and examiners supplied by the Coordinator of the programme and duly approved by the Board of Post Graduate Studies and Research, the Department of Architecture. The evaluation of theory papers will be done by examiner(s) as per the University norm and notified by the Controller of Examinations. If there is more than one examiner in a course, the grading will be done through mutual consultation among the examiners to maintain uniformity of grades.

There shall be a different set of external examiners for each subject every year having Masters or Ph.D. or equivalent degree in Architecture, Civil Engineering or relevant disciplines. If a different set of external examiners for each subject every year is not available, alternate set of examiners may be selected by the Vice Chancellor from a panel of paper setters and examiners supplied by the Coordinator of the Programme and duly approved by Board of Post Graduate Studies and Research.

An external examiner for any subject of examination shall have a minimum of 5 years of teaching / professional experience in his / her specific field of study.

### **(b) Project Studio Examination:**

Portfolio evaluation in Project Studio shall be through viva-voce and digital and print submissions. It shall be conducted jointly by the external and internal examiners. If an external examiner is not available to come, alternate examiner (including those of the same University department) may be appointed by the Coordinator of the Programme with the intimation to the Controller of Examinations in the following preferential order:

i) From outside ii) From DCRUST Murthal.

### **(c) Practical Training Examination:**

Portfolio Evaluation of Practical Training will be through viva voce and digital and print submission; it shall be conducted by a jury comprising of the Coordinator of the Programme and an External examiner.

### **(d) Dissertation Examination:**

Portfolio evaluation of Dissertation will be through viva voce and digital and print submissions; it shall be conducted by a jury comprising of the Coordinator/Deputy coordinator of the Programme and external examiner. If an external examiner is unable to come, alternate examiner (including those of the same University department) may be appointed by the Coordinator of the Programme with the intimation to the Controller of Examinations in the following preferential order:

i) From outside ii) From DCRUST Murthal

### **(e) Thesis:**

Portfolio evaluation of thesis will be through viva voce and digital and print submissions. It shall be conducted by a jury comprising of two external examiners, thesis guide and Coordinator/Deputy coordinator of the Programme. Two external examiners shall be selected by

the Vice-Chancellor from a panel of examiners supplied by the Coordinator of the Programme and duly approved by the Board of Post Graduate Studies and Research, Department of Architecture. Both the examiners shall be called by the Department to conduct the thesis viva voce and in case of her/his refusal, the Vice-Chancellor, on the recommendation of the Coordinator of the Programme shall appoint, another set of external examiners from the panel.

## **2.7 Dissertation**

(a) The dissertation shall be based on empirical study, field work, and textual analysis in the field of construction and real estate management. It should demonstrate candidate's capacity for analysis and judgment as also her/his ability to carry out independent viewpoint in interpretation. A dissertation may be supplemented by published work, if any.

(b) The dissertation shall present an orderly & critical exposition of existing knowledge of the subject or shall embody results of original interpretation and analysis & demonstrate the capacity of the candidate to do independent research work. While writing the dissertation, the candidate shall lay out clearly the work done by her/him independently and the sources from which she/he has obtained other information.

(c) The dissertation shall be prepared as per guidelines given in the dissertation manual. Nevertheless, the typing shall be done on both sides of the paper, the font size should be 12 point Times New Roman in 1.5 (one and a half) space but the reference and bibliography should be typed in single space in Harvard style. The paper to be used should be A-4 size and orientation should be portrait.

## **2.8 Thesis**

(a) A candidate shall prepare her/his thesis under the supervision of a faculty of the Department. The guide shall be appointed by the Coordinator of the Programme in consultation with the faculty members. The Coordinator/Deputy coordinator may become guide for any student subject to the condition that an impartial jury member be appointed in the portfolio evaluation of the respective student. The topic of thesis wherever applicable, will be approved by a committee (Thesis Monitoring Committee) headed by the Coordinator of the Programme consisting of a Professor (Associate Professor, if professor is not available in the department) and guide(s) of the candidate.

(b) Any joint guide (Intra-departmental, Inter-departmental, External Institution or Industry), may also be associated in supervision, if desirable, but the reasons for recommendation of joint guide will be recorded in the Thesis Allotment proceedings. The inter-departmental or external guide can be appointed only as a joint guide and her/his prior written consent shall be submitted by the candidate to the Department.

(c) The Coordinator of Programme will coordinate all the internal stages.

(d) No part of the thesis or supplementary published work should have been submitted elsewhere for the award of any other degree.

(e) A candidate shall submit her/his thesis at the end of the IV semester. The result of Thesis shall be declared only after the candidate has passed all the courses. In case a candidate's Thesis is rejected or she or he is unable to complete it within the prescribed period for her/his category, she or he may be allowed extension by the Vice-Chancellor on the recommendation of the Coordinator of the Programme, up to the limits prescribed for completion of degree by a

candidate. However, she or he has to register each semester depositing continuation fee as decided by the University.

(f) The candidate shall be required to submit three soft bound copies of thesis as and when specified in the Scheme of Studies to the department. The candidate is required to submit the corrected copy of the thesis in hard bound within two weeks after the viva -voce.

(g) The thesis shall be prepared as per guidelines given in the thesis manual. Nevertheless, the typing shall be done on both sides of the paper, the font size should be 12 point Times New Roman in 1.5 (one and a half) space but the reference and bibliography should be typed in single space in Harvard style. The paper to be used should be A-4 size and orientation should be portrait.

(h) The student will present her/his thesis work before the jury and the jury will award the marks. A student scoring 'F' grade in the viva voce exam shall have to resubmit her/his thesis after making all corrections/improvements & this thesis shall be evaluated as above in subsequent semester.

## **2.9 Eligibility for appearing in end semester examination**

(a) A candidate has attended regularly the prescribed courses of studies for the relevant semester examination in the department recognized by the University for the degree of Master of Construction and Real Estate Management.

(b) A candidate has passed with 40% marks in the sessional of the prescribed courses of studies for the relevant semester examination in the department recognized by the University for the degree of Master of Construction and Real Estate Management.

(c) A candidate has his/her name submitted to the Controller of Examinations by the Coordinator of the Programme.

(d) A candidate has a good moral character (certificate be issued by the Chairperson of the department concern if required).

(e) A candidate has attended not less than 75% of the total classes held in each theory/studio/seminar/ dissertation/thesis etc. This requirement shall be fulfilled separately for each subject of study. A deficiency up to 10% may be condoned by the Chairperson of the Department on the recommendation of the Coordinator of the Programme. A further condonation of 5% in attendance may be allowed in severe/ compassionate circumstances by the Vice-Chancellor. However it may not be treated as a matter of right by the students. (In case a student fails to fulfill the necessary requirement of the attendance in any subject(s) in any semester, he/ she shall not be promoted to next semester and will have to repeat that academic semester in the next academic session along with regular students.)

(f) A candidate whose result declaration is delayed for no fault of her/his or has applied for revaluation may attend classes of the next higher semester provisionally at her/his own risk and responsibility subject to her/his passing the concerned semester examination. Such a candidate shall also be governed by the clause 2.10. In case the candidate fails to pass the concerned Semester Examination, her/his attendance and studies in the next higher semester in which she or he was allowed to attend classes provisionally, shall stand cancelled.

## **2.10 Reappear**

- (a) The examinations for reappear in any subject(s) in the subsequent semester.
- (b) If a candidate, after attending the classes for the course of studies in the Department has either not appeared or having appeared in any semester examination has failed in one or more paper(s) for that examination, she or he can appear for such paper(s) at subsequent examinations without attending a fresh course of studies for that semester. Such a candidate may, in the meantime, pursue her or his studies for the next semester(s) and appear in the examination(s) for the same along with the examination for the lower semester(s).
- (c) A candidate shall be automatically eligible for promotion to the next semester provided he/she fulfils the other essential eligibility criterion for promotion as mentioned in the ordinance.

## **2.11 Fees**

The amount of Exam/Reappear/ Re-evaluation/ Improvement fee to be paid by the candidates shall be as prescribed by the University from time to time. A candidate who has paid dues for the higher class and is dropped for want of fulfillment of any of the above conditions shall not be required to pay his dues again on re-admission after fulfillment of above conditions.

## **2.12 Re-evaluation**

Re-evaluation is permitted only for end semester examination (Theory course) as per University rules. There will be no revaluation for portfolio examination.

A candidate, who is unable to pass the Master of Construction and Real Estate Management courses within a maximum of four consecutive academic years from the date of his/her admission shall lose the right to pursue the degree programme. In exceptional cases, mercy chance can be given by the Vice-Chancellor to a candidate if he/she applies.

**2.13** The minimum passing marks/grade for passing any semester Examination shall be:

- (a) 40% in each end semester examination (theory paper) of the subject.
- (b) 40% in the sessional and the theory in each subject.
- (c) 40% each Portfolio/Viva-Voce Examination.
- (d) SGPA of 4.0
- (e) 40% in sessional for courses like independent study seminar (where no external exam is being conducted).

A candidate who fails to obtain the requisite marks/grade in any course shall be required to appear in the concerned course in the subsequent examination(s) as per the clause 2.10.

A candidate who fails to appear in Portfolio examination viva voce, the student shall be marked as absent and shall be required to appear in the concerned course in the subsequent examination(s) as per the clause 2.10.

**2.14** The result of a student at the end of each semester Examination and after completion of course shall be declared on the basis of the SGPA (semester grade point average) & CGPA (cumulative grade point average) obtained by the student.

**2.15** At the end of each semester examination, the Controller of Examination shall publish the result, provided that in a case where candidate who was permitted to take examination for higher semester but has not cleared the lower semester examination his result for the higher semester



examination will be declared provisionally. Each successful candidate shall be issued a copy of the result card on having passed the semester examination.

**2.16** If a candidate has completed his/her degree with a CGPA  $\leq 6.5$  and she/he wants to improve her/his grade, she/he may be allowed to improve by depositing the requisite fee as per the University Rules. She/he is allowed to appear in at the most half of the theory papers\_only of a semester along with the regular candidates of that semester and the sessional part will be retained. Such opportunity may be given only twice in succession, subject to the condition that she/he have to complete the degree within 4 consecutive years of her/his registration. If the improved CGPA is less than the original, then the original will be retained.

**2.17** Notwithstanding the integrated nature of the course wherever it is spread over more than one academic year, the Ordinance in force at the time a student joins the course shall hold good only for the examination held during or at the end of the semester and nothing in this Ordinance shall be deemed to debar the University from amending the Ordinance and the amended Ordinance, if any, shall apply to all students whether old or new.

### **3. Scholarship**

Scholarship may be awarded to students as per the terms and conditions stipulated by the funding agencies. However, it should be mentioned in the prospectus.

### **4. The Credit System**

Each Academic Program has a certain number of credits which describe its weightage. A student's performance is measured by the number of credits that he/she has completed satisfactorily. A minimum grade point average is required to be maintained for satisfactory progress.

Each subject (component) has a certain number of credits which reflect its weightage and is normally decided on the basis of effective contacts hours. It is mentioned in the scheme of studies and examinations.

**4.1** The semester examination for all the semesters shall ordinarily be held in the month of December/January and also in the month of May/June, on such dates as may be fixed by University authority. The concerned teacher/ the coordinator of the programme should ensure that 100% syllabus is covered in each subject before the Semester Examination.

**4.2** The marks/grade awarded to a student in any particular subject will be based on the performance of the student evaluated throughout the semester. The syllabus of the minor tests will be what is covered in that particular term. The Semester Examination will be based on the entire syllabus.

**4.3** The marks/grades will be displayed on the notice board of the department by the Coordinator of the Programme with the approval of the Chairperson before forwarding it to the Examination Branch.

**4.4** The Chairperson of the department shall forward the awards/grades to the Examination Branch within a week after the semester ends and examination process starts. The evaluated answer sheets of minor tests are to be kept by the Coordinator of the Programme for at least one year. The Examination Branch will keep the evaluated answer sheets of the semester examination for at least one year.

## 5. Grading Systems

For the award of grades in a subject, all component-wise evaluation shall be done in marks. The marks would be converted to grades as per the guidelines given below:

### 5.1 Award of Grades Based on Absolute Marks

The University will follow system of grading for all (irrespective of no. of students) based on absolute marks (after applying moderation if any) as given below:

<b><u>Range of Marks (%)</u></b>	<b><u>Grade</u></b>
90 to 100	A+
80 to 89	A
70 to 79	B+
62 to 69	B
55 to 61	C+
46 to 54	C
40 to 45	D
Less than 40	F

#### **Note:**

(i) The awards/grades shall be submitted by the teacher concerned through the Coordinator of the Programme to the Chairperson of the department. The awards/grades should be finalized within 7 days of the semester examination.

(ii) In case of any difficulty/issue related to courses/conduct/moderation of awards/grades/reconduct of paper, the matter will be referred to a departmental monitoring committee comprising of Chairperson, senior most teachers by rotation, the Coordinator of the Programme and faculty nominee of the Dean. The committee will be headed by the Coordinator of the Programme. The committee, on receipt of complaint either from the student or from the teacher, shall meet at the earliest and will give its decision within one week. The decision of the committee shall be final subject to approval of the Vice Chancellor.

### 5.2 Grade Points

The grading point of academic performance will be as under:

<b>Academic Performance</b>	<b>Grades</b>	<b>Grade Points</b>
Outstanding	A+	10
Excellent	A	9
Very Good	B+	8
Good	B	7
Average	C+	6
Below Average	C	5
Marginal	D	4
Very Poor	F	0
Absent	G	-
Incomplete Thesis	X	-

**Note:**

1. Pass Grade is Grade D and higher grades
2. Grade F is Fail grade

**‘F’ Grade**

The **F** grade denotes poor performance, i.e. failing a subject (or subject component). A student has to repeat all those components of a subject(s), in which she/he obtains ‘F’ grades, until a passing grade is obtained, within the stipulated time of completion of that programme as mentioned in clause 1(a).

**‘G’ Grade**

If a student, who is otherwise eligible for appearing in the semester examination as per the ordinance, but can not appear in the semester examination then s/he will be awarded ‘G’ grade. The candidate will be allowed to take up the examination next time along with regular students and s/he will be awarded the grade as per grade system explained above.

**Continuous Absence**

If a student is continuously absent from the Department for more than four weeks without intimation to the Coordinator of the Programme, her/his name will be struck off from the roll of the department. The re-admission shall not be allowed to the candidate during the same academic session.

**‘X’ Grade**

This grade is awarded for incomplete Thesis work as per guidelines given below and will be converted to a regular grade on the completion of the Thesis work and its evaluation.

A student who is unable to complete her/his Thesis may be awarded an ‘X’ grade by the Coordinator of the Programme on the recommendation of his/her guide.

A student who has been awarded ‘X’ grade shall be required to formally register for the next semester and pay the requisite fee.

‘X’ grade will be awarded in exceptional circumstances beyond student’s/supervisor’s control. Normally, the following grounds may be considered for the award of ‘X’ grade:

- (i) Technical reasons/grounds such as Guide/equipment not being available.
- (ii) Any other reason to the satisfaction of guide.

**5.3 Evaluation of Performance**

The performance of a student will be evaluated in terms of Cumulative Grade Point Average (CGPA) which is the Grade Point Average for all the completed semesters at any point of time.

The CGPA is calculated on the basis of all pass grades, except audit courses, obtained in all completed semesters.

$$CGPA = \frac{\sum_{\text{sem}}(\text{Course credits} \times \text{Grade point}) \text{ for courses with pass grade except audit courses}}{\sum_{\text{sem}}(\text{Course credits}) \text{ of courses with pass grade except audit courses}}$$

An example of these calculations is given below:

### I Semester

Course No. (1)	Course Credits (2)	Grade Awarded (3)	Earned Credits (4)	Grade Points (5)	Point Secured (6)
MALXXX	5	C+	5	6	30
CSLXXX	4	C	4	5	20
PHLXXX	4	A+	4	10	40
PHPXXX	1.5	B+	1.5	8	12
MELXXX	4	F	0	0	00
AMLXXX	4	B	4	7	28

Credits registered in the semester (total of column 2) = 22.5

Earned Credits in the semester

Total of column 4 (total of column 2 excluding F grade) = 18.5

Point secured in this semester in passed courses = 130

$$\text{SGPA/CGPA} = \frac{\text{Points secured in passed courses}}{\text{Credits earned}} = \frac{130}{18.5} = 7.027$$

### II Semester

Course No. (1)	Course Credits (2)	Grade Awarded (3)	Earned Credits (4)	Grade Points (5)	Point Secured (6)
MALXXX	5	D	5	4	20
EELXXX	5	F	0	0	00
CYLXXX	4	B	4	7	28
CYPXXX	1.5	C+	1.5	6	09
MELXXX	4	A	4	9	36
HULXXX	2	AP	2	N.A.	00

Credits registered in the semester (total of column 2) = 21.5

Earned Credits in the semester

Total of column 4 (total of column 2 excluding F& AP grades) = 14.5

Cumulative Earned Credits (earned credits in previous semesters and current semester) =  
18.5+14.5=33.0

Points Secured in this semester in passed courses = 93

Cumulative points secured (total of point secured in previous semesters and current semester) =  
130 + 93 = 223

$$\text{CGPA} = \frac{\text{Cumulative points secured in all passed courses}}{\text{Cumulative earned credits, excluding audit courses}} = \frac{130+93}{18.5+14.5} = 6.757$$

Each successful candidate shall be issued a copy of the result card on having passed the semester examination.

### **Conversion of CGPA into Marks**

The CGPA if multiplied by 9.5 will give the equivalent marks in percentage.

Candidates who pass all the prescribed subjects for all the semesters, but obtained:-

- |                                     |   |
|-------------------------------------|---|
| (i) Less than CGPA of 5.26          | Pass class  |
| (ii) $5.26 \leq \text{CGPA} < 6.32$ | 2 <sup>nd</sup> Division  |
| (iii) $6.32 \leq \text{CGPA} < 7.9$ | 1 <sup>st</sup> Division  |
| (iv) CGPA of 7.9 or more            | 1 <sup>st</sup> Division with Distinction provided that they have passed all the semester examinations in single sitting within the normal period of course and without reappear in any paper throughout the programme. Will be awarded aforesaid division. |

**DEENBANDHU CHHOTU RAM UNIVERSITY OF SCIENCE & TECHNOLOGY, MURTHAL**  
**SCHEME OF STUDIES & EXAMINATION FOR**  
**MASTER OF CONSTRUCTION AND REAL ESTATE MANAGEMENT**  
**(TWO YEAR FULL TIME)**

(Credit based scheme w.e.f. 2013-14)

**SEMESTER I**

S.No.	Course No.	Course Title	Teaching Schedule		Marks of Class work	Exam Marks		Total marks	Credit	Duration of Exam
			L	P		Theory	Portfolio			
1	MCRM-601	Project Studio-I	-	6	100	-	100	200	6	-
2	MCRM-603	Real Estate and Facilities Life Cycle Management	4	-	75	75	-	150	4	3
3	MCRM -605	Project Development and Management	4	-	75	75	-	150	4	3
4	MCRM -607	Real Estate Economics	4	-	75	75	-	150	4	3
5	MCRM -609	Construction Technology	4	-	75	75	-	150	4	3
6	MCRM -611	Research Methods and Communication Skills	4	-	75	75	-	150	4	3
<b>Total</b>			<b>20</b>	<b>6</b>	<b>475</b>	<b>375</b>	<b>100</b>	<b>950</b>	<b>26</b>	<b>-</b>

**SEMESTER II**

S.No.	Course No.	Course Title	Teaching Schedule		Marks of Class work	Exam Marks		Total marks	Credit	Duration of Exam
			L	P		Theory	Portfolio			
1	MCRM -602	Project Studio-II	-	6	100	-	100	200	6	-
2	MCRM -604	Sustainable Development in Construction and Real Estate Management	4	-	75	75	-	150	4	3
3	MCRM -606	Advanced Mathematical Methods in Economics and Management Science	4	-	75	75	-	150	4	3
4	MCRM -608	Construction Finance Management	4	-	75	75	-	150	4	3
5	MCRM -610	Real Estate Technology	4	-	75	75	-	150	4	3
6	MCRM -612	Product Modelling and Information Technology	4	-	75	75	-	150	4	3
7	MCRM -614	Practical Training	2	-	60		40	100	2	-
<b>Total</b>			<b>22</b>	<b>6</b>	<b>535</b>	<b>375</b>	<b>140</b>	<b>1050</b>	<b>28</b>	<b>-</b>

**DEENBANDHU CHHOTU RAM UNIVERSITY OF SCIENCE & TECHNOLOGY, MURTHAL**  
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(Credit based scheme w.e.f. 2013-14)

**SEMESTER III**

S.No.	Course No.	Course Title	Teaching Schedule		Marks of Class work	Exam Marks		Total marks	Credit	Duration of Exam
			L	P		Theory	Portfolio			
1	MCRM -701	Project Studio-III	-	6	100	-	100	200	6	-
2	MCRM -703	Sustainable Urbanism	4	-	75	75	-	150	4	3
3	MCRM -705	Construction and Real Estate Laws	4	-	75	75	-	150	4	3
4	MCRM -707	Renovation and Reconstruction	4	-	75	75	-	150	4	3
5		Elective -I	4	-	75	75	-	150	4	3
6	MCRM -715	Dissertation		4	75	-	75	150	4	
<b>Total</b>			<b>16</b>	<b>10</b>	<b>475</b>	<b>300</b>	<b>175</b>	<b>950</b>	<b>26</b>	<b>-</b>

**Elective I** (One out of three subjects shall be chosen)

MCRM -709 Advanced building materials

MCRM -711 Disaster Management

MCRM -713 Leadership and Social Competence

**SEMESTER IV**

S.No.	Course No.	Course Title	Teaching Schedule		Marks of Class work	Exam Marks		Total marks	Credit	Duration of Exam
			L	P		Theory	Portfolio			
1	MCRM -702	Thesis Project	-	20	250	-	250	500	20	-
2	MCRM -704	Professional Practice	4	-	75	75	-	150	4	3
3		Elective II	4	-	75	75	-	150	4	3
<b>Total</b>			<b>8</b>	<b>20</b>	<b>400</b>	<b>150</b>	<b>250</b>	<b>400</b>	<b>28</b>	

**Elective II** (One out of three subjects shall be chosen)

MCRM 706 Finance and investment planning

MCRM -708 Urban Design

MCRM -710 Organizational Behaviour & Human Resource Management

# SYLLABUS

## DEENBANDHU CHHOTU RAM UNIVERSITY OF SCIENCE & TECHNOLOGY, MURTHAL MASTER OF CONSTRUCTION AND REAL ESTATE MANAGEMENT

(TWO YEAR FULL TIME)

(Credit based scheme w.e.f. 2013-14)

MCRM 601

PROJECT STUDIO-I

Teaching Schedule		Marks of Sessional work	Marks of Examination		Total marks	Credits	Duration of Examination (h)
L	P		Theory	Portfolio			
-	6	100	-	100	200	6	-

### INTENT:

The intent of the course is to disseminate the application of Construction and Real Estate Management during the Project life cycle i.e., from inception phase to the Post construction phase.

### CONTENT:

The project studio is focused on the selected insights into Construction and Real Estate Management. In project studios students gain a comprehensive understanding of the interdependencies between project goals, management and the individual's personal approach, and develop this understanding through project work in preparation for their later professional occupations. Students' abstract and analytical/dialectical thinking is strengthened with regards to current projects and issues within the construction and real estate sector. Students gain insight into various work-related duties. They thereby learn to take on responsibility and to implement or initiate leadership, planning, and coordination tasks. Their understanding of personal responsibility and a structured approach to process design and decision-making is developed.

Engineers and Architects tend to focus on projects, facts and results. Yet the success of a project depends no less on the people and institutions involved. This demands that students are able to manage themselves well and to act with competence. Such skills should also be the focus of a structured and coherent management philosophy.

The studio will focus on construction management and real estate management of institutions such as University, college, school and specialised institutional campuses.

### NOTE:

Detailed teaching programme to be made and circulated to the students at the commencement of the semester.

This exercise needs to be supported by frequent site visits & detailed case studies.

There should be regular presentations of various internal stages.

I	Sessional evaluation	Weightage
	Seminar	20 %
	Problem formulation	20%
	Concept	20 %
	Preliminary Proposal	40%
II	Portfolio evaluation	
	Detail Proposal	100%



Teaching Schedule		Marks of Sessional work	Marks of Examination		Total marks	Credits	Duration of Examination (h)
L	P		Theory	Portfolio			
4	-	75	75	-	150	4	3

**INTENT:**

The course intends to give an insight into Real Estate and facilities life cycle Management; which are significant in the global structural change from an industrial society towards a service-orientated society. Real estate and facility management are part of an all over development: to "service society", these backgrounds and concepts (lifecycle and three columns concept) have to be understood under topics as client and service orientation.

**CONTENT:****UNIT I: Development of society, economy and sectors**

- From industrial to service society (the management philosophy of P. Drucker): From service and knowledge society, Market orientation: clients, users, goals, Coordinates of construction and real estate business, from product to process orientation
- Theoretical models, systems theory and cybernetics: Fundamentals and elements of the life cycle concept, Main phases, core and secondary processes
- From project to object management: Project development and programming, FM during the design and construction phase, Substantial completion and handover

**The three columns of facility management****UNIT II: Technical FM**

- Inspection, maintenance, preservation
- Maintenance strategies and management
- Revitalisation, restoration, reconstruction
- Redesign, reuse, demolition and recycling
- Quality management (ISO)

**UNIT III: Business administration of FM**

- Central tasks and fields of activity
- Property administration
- Ownership and owners association
- Legislation, legal and contractual basis
- Renting and leasing management, tenants
- Marketing and services,
- Legislation, accounting and administration
- Real estate and object management
- Benchmarking and controlling

**UNIT IV: Infrastructural FM**

- House and concierge services
- Cleaning and maintenance services
- Safety and guard services
- Supply and discharge services
- Relocation and furnishing services
- Catering and special service
- Insourcing and outsourcing
- Corporate real estate management
- Public Private Partnership
- BOT (build, operate and transfer)

**NOTE:**

Detailed teaching programme to be made and circulated to the students at the commencement of the semester.

I	Sessional evaluation	Weightage
	Minor Test – I	20%
	Minor Test – II	20%
	Assignment / Mini Project / Term paper	30%
	Quiz/Tutorial/Class Test	30%
II	Theory examination	100%

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**INSTRUCTIONS TO QUESTION PAPER SETTER:**

1. Exam shall be of 3 hours duration and of maximum marks: 75. (minimum passing marks:30)
2. Total EIGHT questions are to be set (two questions from each unit), and candidate have to attempt any five questions selecting one from each unit, each question of 15 marks each.
3. The question paper should at least have one question with 3 subparts and three questions with 2 subparts.

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**READING LIST:** (to be amplified by the subject teacher)

1. Drucker, P. (1980) Management in Turbulent Times, New York.
2. Heskett, J. L., Sasser, W. E. and Christopher, W. L. (1990) Service Breakthroughs, The Free Press, A Division of Macmillan, Inc. New York.
3. Lunn, S. D. and Stephenson, P. (2000) The Impact of Tactical and Strategic FM Automation. Facilities 18(7/8), p. 312-322.
4. Maister, D. H. (1997) Managing the professional Service Firm, Free Press Paper backs, A Division of Simon & Schuster Inc New York.
5. Pena, W. and Parshall, S. A. (2012) Problem Seeking: An Architectural Programming Primer, John Wiley & Sons Houston.
6. Schulte, K. W. and Pierschke, B.(Hrsg.) (2000) Facility Management, Köln.
7. Sprenger, R. K. (1992) Mythos Motivation, Frankfurt.
8. Waterman, R. (1990) The Renewal Factor, New York.
9. Zeithaml, V. A. (1990) Delivering Quality Service, New York.

Teaching Schedule		Marks of Sessional work	Marks of Examination		Total marks	Credits	Duration of Examination (h)
L	P		Theory	Portfolio			
4	-	75	75	-	150	4	3

**INTENT:**

This course is intended to provide real estate students with the understanding and practical skills required for the project development and management. Understanding and application of the methods, instruments and tools of international settlement of projects and management over the whole life cycle of a building especially concerning adoption, modification and variation

**CONTENT:****UNIT I: Project Development (National and International scenario)**

- Typology of project development: Healthcare and educational projects, Urban and infrastructural Projects, Traffic, Tourism, Sports
- Methods of project development: Target, Goals and Standards, Programming and Organisation, Select strategy and mile stones, Collection and evaluation of data, Location, site and survey
- Detailed project report: Project formulation and feasibility, project briefing

**UNIT II: Project Organisation**

- Organizational Breakdown Structure (OBS) for the project: install project team, Define and select specialists, Job descriptions, responsibilities, procedures, approvals, Flow of information, documents and documentation
- Time schedule and costs frame, Define required quality
- Project control: Propagation and initial phase, Design and planning phase, Construction and hand-over
- Project accompanying activities

**UNIT III: Pre-construction phase**

- Project and project analysis: Design, construction, material, quality, time, budget, risk factors
- Project delivery systems: types of project delivery, Main partners involved and their interests
- Contract administration: types of contracts and payment scheme, international and national contract practices in construction industry, work and change orders, claim management, financial results and cost control
- Procurement and procurement control: methods of contract selection, the contractor's tender decision, the estimating process, proposal preparation, submittal and opening

**UNIT IV: Project Management**

- Time management: The Work Breakdown Structure (WBS) and mapping this structure to the established OBS, project planning and scheduling, deterministic scheduling (CPM, PDM), probabilistic based scheduling (PERT, Monte Carlo), risk based scheduling, schedule control and monitoring, Earned Value Analysis
- Cost management: Project budget and Cost Breakdown Structure and mapping this to the OBS and WBS cost planning, cost estimation, cost control and monitoring tools and techniques, invoicing, costs and payment control
- Resource management: labour, material and equipment, resource scheduling, resource allocation and leveling
- Quality management, Safety, health and environment management
- Project mobilisation: Site organization and site management, site office and management staff, flow of information, documents and documentation Technical office and personal, Navigator and time scheduling, Contract administration and subletting, Commercial administration, Site installations and infrastructure
- Project Learning: project closeout and termination, completing the work, closing out the project

**NOTE:**

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	Minor Test – II	20%
	Assignment / Mini Project / Term paper	30%
	Quiz/Tutorial/Class Test	30%
II	<b>Theory examination</b>	100%

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**READING LIST: (to be amplified by the subject teacher)**

1. BS (2000) BS 6079: Guide to Project Management, British Standard Institute, London.
2. Kwakye, A. A. (1997) Construction project Administration in Practice, Karlow.
3. Turner, R. (2000) Handbook of Project-Based Management, 3rd ed., London.
4. Webb, A. (1994) Managing Innovative Projects, London.

Teaching Schedule		Marks of Sessional work	Marks of Examination		Total marks	Credits	Duration of Examination (h)
L	P		Theory	Portfolio			
4	-	75	75	-	150	4	3

**INTENT:**

Social and economical sciences are the basis of construction and real estate management. Therefore micro and macro economy offer a coherent system of principles: starting with the smallest units (consumers and producers), explaining the principles of markets within the context of national and global economy. This framework is then specified and detailed by the fundamentals of "business administration". The knowledge of these fields is essential for its modified application to "construction and real estate economy" and afterwards to management.

**CONTENT****UNIT I: Fundamentals of Real Estate Economics**

- The Market Dimension: the property market and economic analysis; economic models of the property market; Adjustment in the real property market; factor market theory applied to property space; user markets in real property;
- The Public Policy Dimension: economics of planned intervention; problems of urban areas; regional issues; public finance;
- The Temporal Dimension: long-term decision-making; the investment market; the development market; cycles in the real property market;
- The Spatial Dimension: land use and location; urban structure; core articles in real estate economics

**UNIT II: Micro Economics**

- A short History of Economic Development: Why do we have to economise?
- Basics and Theory of Demand and Consumption: The Value of Goods and Services, Law of Decreasing Marginal Benefit, Law of the Equal Margin, The Consumers Plan
- The Economic Circle
- The Theory of Production and Supply: The Law of Varying Returns, Productivity and Economical Efficiency, Function of Costs and Differentiation of Costs, The Law of Mass Production, Sales Revenues - Marginal Revenues and Prices, The Theory of Profit, The Variation of Prices

**UNIT III: Macro-Economics**

- The Supply and Demand Side Make a Market: Markets and Their Mechanisms: Changes on the Demand and Supply Side, Different Kinds and Forms of Markets
- Distribution of Income and National Wealth: Different Forms of Income, The Gross National Product, National Wealth - The Hyper-Aggregate
- Economic Change - Business Cycles and Growth: The Political Macro Systems

**UNIT IV: Business Administration**

- Aspects and Elements of Enterprises
- Purchasing and Production
- Marketing and Distribution
- Investment and Financing
- From Business Administration to Management

**NOTE:**

Detailed teaching programme to be made and circulated to the students at the commencement of the semester.

I	Sessional evaluation	Weightage
	Minor Test – I	20%
	Minor Test – II	20%
	Assignment / Mini Project / Term paper	30%
	Quiz/Tutorial/Class Test	30%
II	Theory examination	100%

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**INSTRUCTIONS TO QUESTION PAPER SETTER:**

1. Exam shall be of 3 hours duration and of maximum marks: 75. (minimum passing marks:30)
2. Total EIGHT questions are to be set (two questions from each unit), and candidate have to attempt any five questions selecting one from each unit, each question of 15 marks each.
3. The question paper should at least have one question with 3 subparts and three questions with 2 subparts.

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**READING LIST: (to be amplified by the subject teacher)**

1. Samuelson, Paul A. and Nordhaus, William D (1985) Economics, New York.
2. Christopher R Thomas & Charles Maurice (2006) Managerial Economics, Tata McGraw Hill Co.
3. Petersen, H. Craig & Cris, L W (2004) Managerial Economics. Pearson Education (Singapore) Ltd.
4. Dwivedi, D. D. (2007) Managerial Economics, Vikas Publications, New Delhi.
5. Vaish, M. C. (2010) Macro Economic Theory (Latest Edition) Vikas Publishing House Pvt. Ltd. New Delhi.
6. Edward Shapiro (1980) Macro Economic Analysis, Fifth Edition.

Teaching Schedule		Marks of Sessional work	Marks of Examination		Total marks	Credits	Duration of Examination (h)
L	P		Theory	Portfolio			
4	-	75	75	-	150	4	3

**INTENT:**

The course aim to give an insight into advances in the construction technologies

**CONTENT:****UNIT I: Foundation systems**

- Introduction to Geo-technical aspects related to building projects including study and interpretation of soil investigation reports.
- Soil/ground improvement techniques.
- Planning, design and construction of basements including waterproofing systems.
- Planning and design considerations of foundation systems for multi-storeyed buildings including special foundation techniques.
- Foundation repairs and rehabilitation of distressed buildings

**UNIT II: Concrete technology**

- Introduction to concrete and typologies of concrete – fiber reinforced concrete, light weight concrete, heavy weight concrete, foam concrete, high performance concrete
- Principles of concrete mix design by: BIS/ACI/British Standards
- Production and placement of concrete: advanced form work techniques, construction chemicals
- Quality Control of Concrete Construction stages, principles, checklist, statistical controls, procedures

**UNIT III: Precast and Prestressed concrete construction**

- Principle, methods, materials
- Composite construction
- Pre tensioning and post tensioning
- Pre-engineered structure

**UNIT IV: Steel Structures**

- Planning and design consideration
- Fabrication and erection of steel structures

**NOTE:**

Detailed teaching programme to be made and circulated to the students at the commencement of the semester.

I	Sessional evaluation	Weightage
	Minor Test – I	20%
	Minor Test – II	20%
	Assignment / Mini Project / Term paper	30%
	Quiz/Tutorial/Class Test	30%
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**INSTRUCTIONS TO QUESTION PAPER SETTER:**

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2. Total EIGHT questions are to be set (two questions from each unit), and candidate have to attempt any five questions selecting one from each unit, each question of 15 marks each.
3. The question paper should at least have one question with 3 subparts and three questions with 2 subparts.

**READING LIST: (to be amplified by the subject teacher)**

1. Neville, A. M. and Brooks, J. J. (2008) Concrete Technology, Pearson Education India, 2008
2. Blankenbaker, E. Keith (2013) Construction and Building Technology, The Goodheart-Willcox Company Inc., Illinois.
3. Chudley, Roy, Greeno, Roger (2005) Construction Technology Pearson Prentice Hall.

## MCRM 611

## RESEARCH &amp; COMMUNICATION SKILLS

Teaching Schedule		Marks of Sessional work	Marks of Examination		Total marks	Credits	Duration of Examination (h)
L	P		Theory	Portfolio			
4	-	75	75	-	150	4	3

**INTENT:**

The course aims to inculcate competences of research and communication skills for academic and professional life. For this master programme, scientific research, methods and working are of outstanding importance. They are taught and practiced all over the programme. To prepare the students for these tasks and their final thesis and the colloquium.

**CONTENT:****UNIT I: Subject, subject, subject**

- How to find the right subject?
- Research, collection and preparation of material
- Structure and disposition of contents
- Preliminary table of contents
- Preliminary and final subject

**UNIT II: Methods of scientific research**

- Scientific correctness: guidelines and principles
- Study and examination regulations
- The topics of social research
- Literature, citations and excerpts
- Formal requirements, layout and typography

**UNIT III: Techniques of mental working and writing**

- B. Minto: The Pyramid Principle
- Top-down thinking
- Bottom-up writing
- Objectives, strategy and time scheduling
- Self-programming and concentration
- Strategies of success

**UNIT IV: How to prepare a presentation**

- The written and spoken word
- Intentions and contents
- Basic rules of rhetoric
- Tools, media and graphic support
- Self-programming and mental preparation

**NOTE:**

Detailed teaching programme to be made and circulated to the students at the commencement of the semester.

I	Sessional evaluation	Weightage
	Minor Test – I	20%
	Minor Test – II	20%
	Assignment / Mini Project / Term paper	30%
	Quiz/Tutorial/Class Test	30%
II	Theory examination	100%

**INSTRUCTIONS TO QUESTION PAPER SETTER:**

1. Exam shall be of 3 hours duration and of maximum marks: 75. (minimum passing marks:30)
2. Total EIGHT questions are to be set (two questions from each unit), and candidate have to attempt any five questions selecting one from each unit, each question of 15 marks each.
3. The question paper should at least have one question with 3 subparts and three questions with 2 subparts.

**READING LIST: (to be amplified by the subject teacher)**

1. Minto, Barbara (1991) The Pyramid Principle, London.
2. Creswell, JW (2002) Research design: qualitative, quantitative, & mixed methods approaches. Thousand Oaks, Sage.
3. Jang, Yen Tsi (1995) An Outline of Scientific Writing.



Teaching Schedule		Marks of Sessional work	Marks of Examination		Total marks	Credits	Duration of Examination (h)
L	P		Theory	Portfolio			
-	6	100	-	100	200	6	-

**INTENT:**

The intent of the course is to disseminate the application of Construction and Real Estate Management during the Project life cycle i.e., from inception phase to the Post construction phase.

**CONTENT:**

The project studio is focused on the selected insights into Construction and Real Estate Management.

In project studios students gain a comprehensive understanding of the interdependencies between project goals, management and the individual's personal approach, and develop this understanding through project work in preparation for their later professional occupations. Students' abstract and analytical/dialectical thinking is strengthened with regards to current projects and issues within the construction and real estate sector. Students gain insight into various work-related duties. They thereby learn to take on responsibility and to implement or initiate leadership, planning, and coordination tasks. Their understanding of personal responsibility and a structured approach to process design and decision-making is developed.

Engineers and Architects tend to focus on projects, facts and results. Yet the success of a project depends no less on the people and institutions involved. This demands that students are able to manage themselves well and to act with competence. Such skills should also be the focus of a structured and coherent management philosophy.

The studio will focus on construction management and real estate management of commercial, industrial buildings, transport terminals.

**NOTE:**

Detailed teaching programme to be made and circulated to the students at the commencement of the semester.

This exercise needs to be supported by frequent site visits & detailed case studies.

There should be regular presentations of various internal stages.

I	Sessional evaluation	Weightage
	Seminar	20 %
	Problem formulation	20%
	Concept	20 %
	Preliminary Proposal	40%
II	Portfolio evaluation	
	Detail Proposal	100%

Teaching Schedule		Marks of Sessional work	Marks of Examination		Total marks	Credits	Duration of Examination (h)
L	P		Theory	Portfolio			
4	-	75	75	-	150	4	3

**INTENT:**

The course aims to enhance understanding sustainable development on a local, national and global level concerning our natural environment and resources, as well as sustainable economic, social and cultural development.

**CONTENT:**

Relationship between the built and natural environment, efficient use of energy and materials and the health standards of buildings:

**UNIT I: Policy and framework of Sustainability**

- Timeline of sustainable development
- Rio de Janeiro Policies of the UN- agenda 21, Johannesburg and Kyoto agreement
- Political background and strategies: Environmental protection law, International legislation, National legislation

**UNIT II: Sustainability: types and theoretical framework**

- Environmental Sustainability: eco efficiency; restorative design approach; C2C approach; reconciliatory and regenerative approach, Ecological Literacy
- Economic Sustainability: Life cycle costs, Procurement and recycling, Sustainable materials: repair, recycling, reuse
- Social / Cultural Sustainability: Labour rights, human rights, Corporate social responsibilities

**UNIT III: Sustainable and green buildings around the world**

- UK, Europe, USA, Canada, Australia, China, India, The Middle East, Singapore
- Construction Sustainability Assessment Model (CSAM)
- Sustainability assessment: Malcolm Well Check list, Ove Arup Spear, Life Cycle Analysis, LEED, GRIHA, NBC, ECBC

**UNIT IV: Sustainable development in construction and real estate: Exemplars**

- Buildings: Commercial, industrial, health, housing, leisure
- Public transportation and traffic
- Urban space and environment

**NOTE:**

Detailed teaching programme to be made and circulated to the students at the commencement of the semester.

I	Sessional evaluation	Weightage
	Minor Test – I	20%
	Minor Test – II	20%
	Assignment / Mini Project / Term paper	30%
	Quiz/Tutorial/Class Test	30%
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**INSTRUCTIONS TO QUESTION PAPER SETTER:**

1. Exam shall be of 3 hours duration and of maximum marks: 75. (minimum passing marks:30)
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**READING LIST: (to be amplified by the subject teacher)**

1. European Local Agenda 21 Planning Guide, How to engage in long-term environmental Action planning towards Sustainability, (ICLEI), Freiburg 1995
2. Bruntland Commission, *Our Common Future*, UN publication Johannesburg, World Summit on Sustainable development report, United Nations
3. Towards sustainability. The European commissions progress report, 5<sup>th</sup> programme, 1997
4. Rees, W. Wackernagel, M. and Testemale, P. 1996 Our ecological footprint: reducing Human impact on the Earth, New society publishers, 160p.
5. Joachim Spangenberg, SERI, Draft of the OECD Environmental Strategy ENV/EPOC (2000)13/REV3
6. The Baltic University Programme - Baltic 21 Education for sustainable development, <http://www.balticuniv.uu.se/esd/index.ht>, periodicals, internet sources, reports and book title

Teaching Schedule		Marks of Sessional work	Marks of Examination		Total marks	Credits	Duration of Examination (h)
L	P		Theory	Portfolio			
4	-	75	75	-	150	4	3

**INTENT:**

The learning aim is to understand the key concepts and methods of advanced mathematics and data analysis in economics and management science and to apply some of the methods in selected application projects.

**CONTENT:****UNIT I: Fundamentals of System analysis**

- Systems and its relation to other systems
- Defining problems, developing alternative solutions and evaluation these solutions
- Interpretation of results

**UNIT II: Advanced mathematics in Economics**

- Market analysis using linear and nonlinear models
- Nonlinear optimization problems
- Dynamic analysis
- Market equilibrium and market models
- Leontieff input-output models
- Lifetime utility maximization

**UNIT III: Data Analysis in Management**

- Data and business decisions
- Sampling and estimation
- Hypothesis testing using t-test, chi-square test, z test
- Forecasting

**UNIT IV: Mathematical Models**

- Decision modeling
- Risk analysis
- Queues and process simulation
- Optimization modeling
- Game theory
- Transportation and assignment problems
- Dynamic programming
- Market research cases
- Inventory and distribution management

**NOTE:**

Detailed teaching programme to be made and circulated to the students at the commencement of the semester.

I	Sessional evaluation	Weightage
	Minor Test – I	20%
	Minor Test – II	20%
	Assignment / Mini Project / Term paper	30%
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1. Chiang, A.C. & Wainwright, K. (2005) Fundamental Methods of Mathematical Economics. McGraw-Hill.

2. Varian, H.R. (2003) *Intermediate Microeconomics*. Norton.
3. Clark, C.W. (2005) *Mathematical Bioeconomics: The Optimal Management of Renewable Resources*. Wiley.
4. Evans, J.R. (2007) *Statistics, Data Analysis, & Decision Modeling*, Prentice Hall.
5. Taha, H.A. (2006) *Operations Research*. Prentice Hall.
6. Metcalfe, A.V. (1997) *Statistics in Civil Engineering*. Arnold.
7. Metcalfe, A.V. (2000) *Statistics in Management Science*. Arnold.

Teaching Schedule		Marks of Sessional work	Marks of Examination		Total marks	Credits	Duration of Examination (h)
L	P		Theory	Portfolio			
4	-	75	75	-	150	4	3

**INTENT:**

This course aims to give an insight in construction finance and accounting.

**CONTENT:****UNIT I:**

- Overview of topics on construction finance management issues in financial management of construction projects and construction companies.
- Concept of time value money and their applications in financial analysis and evaluation and investment.
- Capital budgeting process and techniques for project appraisal.
- Traditional methods and discounted cash flow methods, NPV, basis of comparison, Incremental Rate of Return, benefit – cost analysis
- Risk adjusted capital budgeting techniques
- Depreciation and amortization

**UNIT II:**

- Project cash flow forecasting methods and analysis of construction projects use of S-curves, cost of capital.
- Cash flow forecasting from client and construction firms
- Project finance and means of finance
- Innovative techniques of construction finance
- Public private partnership strategies.

**UNIT III:**

- Working capital management definition and components of working capital, estimation of requirements of working capital and methods of financing working capital working capital management practices in construction companies.
- Financial accounting principles and procedures budgetary process and budgetary control.
- Development of budgets for construction projects performance based budgeting.
- Risks and uncertainties and management decision in capital budgeting.

**UNIT IV:**

- Construction accounting, financial statements types forecasting analysis and cash flow interpretations.
- Balance sheet, profit and loss account
- Cash flow and fund flow statements of construction companies and their interpretations.
- Tools for analysis of financial statements, basic types of financial ratios and interpretations.
- Business organizations their types and acts governing their functions.
- Financial institutions (national and international) frame work, norms for construction finance.
- Taxation and inflation related to construction industry.
- Construction sector economics, Replacement analysis, Break even analysis

**NOTE:**

Detailed teaching programme to be made and circulated to the students at the commencement of the semester.

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1. Exam shall be of 3 hours duration and of maximum marks: 75. (minimum passing marks:30)
2. Total EIGHT questions are to be set (two questions from each unit), and candidate have to attempt any five questions selecting one from each unit, each question of 15 marks each.

3. The question paper should at least have one question with 3 subparts and three questions with 2 subparts.

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**READING LIST:** (to be amplified by the subject teacher)

1. Peterson, S. (2012) Construction Accounting & Financial Management, Prentice Hall.
2. Ross, A. and Williams, P. (2013) Financial Management in Construction Contracting, Wiley-Blackwell.

Teaching Schedule		Marks of Sessional work	Marks of Examination		Total marks	Credits	Duration of Examination (h)
L	P		Theory	Portfolio			
4	-	75	75	-	150	4	3

**INTENT:**

The course aims to learn how to define and achieve goals when dealing with technical issues within the real estate industry, and which methods and strategies form the basis of solutions to technical problems.

**CONTENT:****UNIT I: Passive and Low Energy Technologies**

- Heating Systems: principles and types: direct gain, Indirect gain (Trombe walls, thermal storage walls), isolated Gain (sunspaces, greenhouses, convective loops)
- Cooling Systems (water as sink): direct evaporative cooling, indirect evaporative cooling, downdraft chimneys
- Cooling Systems (ground as sink): principles of earth cooling, soil temperatures and its variation, climatic applicability, direct coupling of building with soil, indirect coupling (earth air tunnels and pipes)
- Cooling systems (sky as sink): night-sky radiation, climatic applicability, skytherm and night radiant systems

**UNIT II: Heating Ventilation Air Conditioning (HVAC) Technologies**

- System design, fundamentals and Goals of air-conditioning, Thermal loads – heating and cooling Indoor air quality issues Norms and standards- ASHRAE 62- VDI 6022, DIN 1946
- Thermodynamics of humid air, Psychrometric charts – Carrier, Mollier- Construction of psychometric charts- Representation of thermodynamic charts Thermal comfort zone
- Air-conditioning systems- All-air systems- Air-and-water systems- Water systems
- Components of air-conditioners, Sizing of air-conditioning equipment: building thermal load (external, internal, infiltration and ventilation), design conditions (indoor and outdoor), load calculation methods, zoning/space design, building form and orientation, cost benefit analysis
- Refrigeration plant: heat rejection method, part-load performance, plant operation, multiple and variable-speed compressor chillers, heat recovery chiller, gas-fired absorption chiller, cogeneration system, chiller sequencing.
- Other technologies: filters-dry filters, wet filters, air washers, electrostatic, fire fighting and alarm
- Mechanical ventilation systems: extract systems, supply systems, balanced systems

**UNIT III: Electrical and Plumbing Systems**

- General principles: minimize losses in power distribution, reduce losses and wastage in use of electricity, reduce losses due to power factor and quality, appropriate metering and monitoring facilities; maximum demand controller, soft starter, variable speed drive, electronic ballast, lighting control
- Cold water supply and drainage: supply points and equipment capacity, reduce pumping energy, use water (energy) saving equipment, water recycling and rainwater utilization
- Hot water supply: flow rate and temperature, solar hot water and proper design
- Testing water quality as CPHEEO (Central Public Health and Environmental Engineering Organisation) standards both at head works and also at consumer point
- Fire fighting technologies, operation and maintenance
- Sewage disposal system, STPs, storm water drainage and Rain Water Harvesting

**UNIT IV: Lifts and Escalators**

- Traction lifts, gearless lifts and hydraulic lifts, rated load and contract speed, energy management-eco efficient car lights, standby, metering
- Traffic analysis and zoning, operation and braking controls, harmonic distortion and power factor of motor drives
- Intelligent lift traffic control, variable volume and frequency (VVF) system, regenerative drive, green hoisting

**NOTE:**

Detailed teaching programme to be made and circulated to the students at the commencement of the semester.

I	Sessional evaluation	Weightage
	Minor Test – I	20%
	Minor Test – II	20%
	Assignment / Mini Project / Term paper	30%

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	Quiz/Tutorial/Class Test	30%
II	<b>Theory examination</b>	100%

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**INSTRUCTIONS TO QUESTION PAPER SETTER:**

1. Exam shall be of 3 hours duration and of maximum marks: 75. (minimum passing marks:30)
2. Total EIGHT questions are to be set (two questions from each unit), and candidate have to attempt any five questions selecting one from each unit, each question of 15 marks each.
3. The question paper should at least have one question with 3 subparts and three questions with 2 subparts.

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**READING LIST:** (to be amplified by the subject teacher)

1. ASHRAE (2010) – American Society of H/R/A Engineers: Handbook of Fundamentals, Atlanta.
2. Allen, E. (1995) How Buildings Work, Oxford.
3. Stein, B. and Reynolds, J.S.(1992) Mechanical and Electrical Equipment for Buildings, 8th edition, New York.
4. Banal, N.K., Hauser, G.M. (1994) Passive Building Design, Amsterdam, London



Teaching Schedule		Marks of Sessional work	Marks of Examination		Total marks	Credits	Duration of Examination (h)
L	P		Theory	Portfolio			
4	-	75	75	-	150	4	3

**INTENT:**

The course aims to understand the difference between document based and product model based information management in construction projects and to learn new ways to utilize product modelling technologies for design, quantity surveying and cost estimating as well as for constructability analysis, energy simulations and visualizations of three dimensional spaces and to improve the product data management for a building's entire life cycle to support the use and maintenance of buildings.

**CONTENT:****UNIT I: System approach to Project Management**

- System approach to project management
- Database management systems; emerging areas of construction specific information technologies
- Project management information system (PMIS)
- Enterprise Resource Planning (ERP) -Systems within construction and real estate management processes
- The interaction of ERP systems with graphical software-systems (e.g. CAD, CAFM, GIS).

**UNIT II: Information Technology**

- Models of information interchange
- Concept of computer networking, requirement, terminology and various networking configuration (LAN, WAN)
- Basic internet and web based management technologies, Application Server Providers (ASP)
- Information exchange between parties (IFC-specifications); the product libraries and product structures and the applications of product modelling in design and project management as well as in a building's life cycle

**UNIT III: Project Management Software**

- Introduction to Project Management software: MS Project, Primavera Project Planner
- Fundamentals of PMS for project planning, scheduling and monitoring of projects in terms of time, resource and cost planning
- Filtering & viewing project information & their customisation, reports & customization
- Application of PMS for a real life case study projects, reports and customization.

**UNIT IV: Applied Product Modelling**

- Application of software used at various stages of a construction project e.g. for design, quantity surveying and cost estimating, contract management, billing etc.
- CAD applications software: AutoCAD, Revit, thermal simulation (e.g. eQuest, IES), its applications working knowledge
- Building Information Models (BIM) and its support in decision-making and visualizing and comparing alternatives functionally and in terms of costs.

**NOTE:**

Detailed teaching programme to be made and circulated to the students at the commencement of the semester.

I	Sessional evaluation	Weightage
	Minor Test – I	20%
	Minor Test – II	20%
	Assignment / Mini Project / Term paper	30%
	Quiz/Tutorial/Class Test	30%
II	Theory examination	100%

**INSTRUCTIONS TO QUESTION PAPER SETTER:**

1. Exam shall be of 3 hours duration and of maximum marks: 75. (minimum passing marks:30)
2. Total EIGHT questions are to be set (two questions from each unit), and candidate have to attempt any five questions selecting one from each unit, each question of 15 marks each.
3. The question paper should at least have one question with 3 subparts and three questions with 2 subparts.

**READING LIST:** (to be amplified by the subject teacher)

1. Björk Bo-Christer (1995) Requirements and information structures for building product data models. VTT Building Technology.
2. Eastman, Charles M (1999) Building Product Models: Computer Environments, Supporting Design and Construction
3. ProIT project's Building Product Model vocabulary, web site, 2005,  
[http://www.vtt.fi/rte/cmp/projects/proit/julkiset\\_tulokset/proit\\_sanasto\\_v10.pdf](http://www.vtt.fi/rte/cmp/projects/proit/julkiset_tulokset/proit_sanasto_v10.pdf)
4. Laitinen J, (1999) Model based construction process management,
5. Lacasse M A, Vanier D J (ed.); Information technology in construction, volume 4, ISBN 0-660-17743-9; Vancouver, May 30 - June 3, Canada <http://itc.scix.net/cgi-bin/works/Show?w78-1999-2844>
6. Kam C, Fischer M, Hänninen R, Karjalainen A and Laitinen J (2003) The product model and Fourth Dimension project, ITcon Vol. 8, Special Issue IFC - Product models for the AEC arena , pg. 137-166, <http://www.itcon.org/2003/12>
7. AutoDesk (2013) Revit, an object-based design software, web site: <http://www.autodesk.com/>
8. Smit, K; Slaterus, W.H.(1992) Information Model for Maintenance Management.; Gap Gemini Publishing; Rijswijk.
9. Taylor, David A.(1995) Business Engineering with Object Technology. New York, NY: Wiley.

Teaching Schedule		Marks of Sessional work	Marks of Examination		Total marks	Credits	Duration of Examination (h)
L	P		Theory	Portfolio			
2	-	60		40	100	2	-

**INTENT:**

The course intends to give insight into Construction and Real Estate Management practice.

**CONTENT:**

Practical training for 6 weeks is to be carried out during the summer vacation after the second semester. Trainee may undertake the training in Construction, Developers engaged construction and real estate development projects for minimum experience of 5 years and the students should obtain prior approval from the department. The students will work minimum 35 hours per week and submit weekly performance reports. During practical training students are required to study various aspects, as discussed during the preceding semester course and submit a report on the following aspects:

<b>A</b> General Information Name of Student Registration no. of student Placement of training Duration of training
<b>B</b> Nature of organizational enterprise (explain type of design, construction, Real Estate, Project Management activities the organizations involved)
<b>C</b> Organization structure and position of trainee
<b>D</b> Chronological list of responsibilities assigned to the Trainee
<b>E</b> List of the Works done during training (enclose of typical work outputs)
<b>F</b> Experiences and inferences drawn during training
a Typical project work stages followed
b Time management process adopted
c Cost management process adopted
d Quality management
e Scope management process adopted
f HR management process adopted
g Communication systems, practices and management processes adopted
h Procurement management policies and processes adopted
i Risk management processes adopted
j Types of consultancy (architecture, PM, construction contract followed) enclose typical documents
k Special features of the project work (enclose documents to explain and highlight peculiarities)
l any other information

**NOTE:**

Detailed training manual to be made and circulated to the students at the commencement of the semester. Trainee must attach the certified copies of the work carried out by him/ her as an annexure in the report.

<b>I</b>	<b>Sessional evaluation</b>	<b>Weightage</b>
	Training report	60%
<b>II</b>	<b>Portfolio evaluation</b>	
	Viva voce	40%

Teaching Schedule		Marks of Sessional work	Marks of Examination		Total marks	Credits	Duration of Examination (h)
L	P		Theory	Portfolio			
-	6	100	-	100	200	6	-

**INTENT:**

The intent of the course is to disseminate the application of Construction and Real Estate Management during the Project life cycle i.e., from inception phase to the Post construction phase.

**CONTENT:**

The project studio is focused on the selected insights into Construction and Real Estate Management.

In project studios students gain a comprehensive understanding of the interdependencies between project goals, management and the individual's personal approach, and develop this understanding through project work in preparation for their later professional occupations. Students' abstract and analytical/dialectical thinking is strengthened with regards to current projects and issues within the construction and real estate sector. Students gain insight into various work-related duties. They thereby learn to take on responsibility and to implement or initiate leadership, planning, and coordination tasks. Their understanding of personal responsibility and a structured approach to process design and decision-making is developed.

Engineers and Architects tend to focus on projects, facts and results. Yet the success of a project depends no less on the people and institutions involved. This demands that students are able to manage themselves well and to act with competence. Such skills should also be the focus of a structured and coherent management philosophy.

This construction and real estate management studio will focus on contract management, monitoring and control processes, risk management:

1. Study and contract conditions of different types of contract format (FIDIC, CPWD, PSUs)
2. Comparison of contracts: contract scope and conditions for different formats contracts
3. Study of project procurement types and applicability for the project under considerations (EPC, Cost plus, Design build, etc.)
4. Selection procedure for design professional, Quality based selection
5. Contract Management: Tendering processes, prequalification, tender evaluation, items, comparison
6. Monitoring and control processes
7. Risk management

**NOTE:**

Detailed teaching programme to be made and circulated to the students at the commencement of the semester.

This exercise needs to be supported by frequent site visits & detailed case studies.

There should be regular presentations of various internal stages.

I	Sessional evaluation	Weightage
	Seminar	20 %
	Problem formulation	20%
	Concept	20 %
	Preliminary Proposal	40%
II	Portfolio evaluation	
	Detail Proposal	100%

Teaching Schedule		Marks of Sessional work	Marks of Examination		Total marks	Credits	Duration of Examination (h)
L	P		Theory	Portfolio			
4	-	75	75	-	150	4	3

**INTENT:**

The course objective is to build awareness about issues, challenges and opportunities of construction and real estate management in urban context both traditional and contemporary

**CONTENT:****UNIT I: Conventional Urbanism**

- Basic elements of the city; concepts of space, time, scale of cities
- Historical cities in India and across the world
- Effects of Socio cultural, economic and environmental influence on urban form
- Resource management in traditional cities

**UNIT II: Fundamentals of Urbanization**

- Impact of Industrial revolution on urbanization and city form and function, development of Industrial cities
- City planning theories of late 19<sup>th</sup> and early 20<sup>th</sup> centuries: Patrick Geddes, Ebenezer Howard, Le Corbusier, Doxiadis, Soria Mata, Ludwig Hilberseimer
- City planning theories of post war: Arthur Perry, Lewis Mumford, Kevin Lynch, Jane Jacobs, Clarence Stein, Frank Lyod Wright, Rob Krier, Aldo Rossi, Robert Venturi
- Contemporary cities in India

**UNIT III: Sustainable Property – Valuation, Investment, Development**

- Theories and techniques used in valuation and analysis of investments in property development, from an economic, social and environmental perspective.
- Implications of the sustainability agenda and discusses the role of government policy an action for promoting sustainable urban development.
- Regulatory role of government: State Town and Country Planning Acts, National Housing Policy, UDPFI guidelines, Urban Arts Commission, Urban Renewal Mission and other relevant regulations

**UNIT IV: Key Concepts of Contemporary Sustainable Urbanism**

- Urban regeneration as viable tool of sustainable development
- Revitalization of neighbourhoods, precincts, townships
- Sustainable urban and regional development related to Ecocities, nature in the city
- Transit oriented development, sustainable transport planning
- Mix used development, walk to work culture
- Social inclusion, equitable access to resources
- Futuristic concepts and technology.

**NOTE:**

Detailed teaching programme to be made and circulated to the students at the commencement of the semester.

I	Sessional evaluation	Weightage
	Minor Test – I	20%
	Minor Test – II	20%
	Assignment / Mini Project / Term paper	30%
	Quiz/Tutorial/Class Test	30%
II	Theory examination	100%

**INSTRUCTIONS TO QUESTION PAPER SETTER:**

1. Exam shall be of 3 hours duration and of maximum marks: 75. (minimum passing marks:30)
2. Total EIGHT questions are to be set (two questions from each unit), and candidate have to attempt any five questions selecting one from each unit, each question of 15 marks each.
3. The question paper should at least have one question with 3 subparts and three questions with 2 subparts.

**READING LIST:** (to be amplified by the subject teacher)

1. Alexander, C (1977) Pattern Language, Oxford University Press.
2. Cullen, G (1968), Townscape, Architectural Press, London.
3. Farooq, A (1997) Contemporary architecture and city form, Marg Publishers.
4. Farr, D (2007) Sustainable Urbanism: Urban Design with Nature, John Wiley & Sons Inc.
5. Gallion, A (2003), The Urban Pattern, CBS Publishers & Distributors, India.
6. Keeble, L (1968) Town and Country Planning, Ms Havding Gough Ltd. UK.
7. Lynch, K (2000) Image of the city. MIT Press, London.
8. Watson, D; et al (2003) Time Saver Standards for Urban Design, McGraw Hill, New York.

Teaching Schedule		Marks of Sessional work	Marks of Examination		Total marks	Credits	Duration of Examination (h)
L	P		Theory	Portfolio			
4	-	75	75	-	150	4	3

**INTENT:**

This course aims to provide an overview of all laws and regulations related construction and real estate. The course also gives an international perspective to manage the legal aspects of projects and to orientate themselves in the various legal systems and contractual law. Construction projects normally imply the involvement of many participants (from client to users, from architects and engineers, authorities to the involvement of different construction firms). Their development is time consuming and requires huge sums of financial means. Accordingly the relations between the parties involved have to be documented by sound contracts and appropriate regulations. Therefore the basic elements, interrelations and legal systems have to be understood and applied properly. This is of highest importance for international projects with changing systems of law and legislation. The general survey has to be studied in close relation with the FIDIC conditions of contract.

**CONTENT:****UNIT I: Construction and Real Estate Laws**

- Laws related to land development: land acquisition, lease and easement rights, property acts
- Permits and approval for construction activities: statutory requirements and clearance related to environmental impact, urban form, fire regulation, completion certificate
- Laws and regulations relating to construction industry labour laws
- The building and construction workers (regulation and employment and conditions of service) act 1996, workmen's compensation act, payment of wages act, the Employee's Provident Fund and Miscellaneous Provisions Act 1996 etc.
- Taxation laws as applicable to real-estate development

**UNIT II: Contract Administration**

- Principles of law and contracts: Different historical developments, the cultural and social context, constitutions, legislation and law, Indian Contract Act 1872
- Contracts for engagement of professionals: design professionals (architects, engineers, surveyors, etc), project management professionals, special parties involved,
- Service and maintenance contracts
- Contract formats adopted by government organizations (CPWD), Public Sector Undertakings
- Types of building contracts and project procurement systems (Item rate, lump sump, EPC, BOT, PPP etc)
- Methods and principles of tendering: General procedure and phases, different national procedures

**UNIT III: International contract administration**

- International competitive bidding: The FIDIC tendering procedure, Building contracts and contractual relations: National types and their elements, Parties involved and their relations, New forms of organization
- The FIDIC conditions of contract: Red Book: Construction works only, Yellow Book: Design and construction, Silver Book: Turnkey projects, Green Book: Short form of contract, Special aspects of the Red, Yellow and Silver Book
- World Bank policies and procurement

**UNIT IV: Contract Disputes**

- Types of disputes in construction contracts and methods of dispute resolution processes.
- Alternative dispute resolution and dispute review mechanism.
- Arbitration and Conciliation Act 1996
- Managerial approach to dispute minimization, conduct of arbitration proceedings.
- Making of arbitration awards, setting aside of awards and enforcement of awards, appeal and revision and court proceedings.

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**NOTE:**

Detailed teaching programme to be made and circulated to the students at the commencement of the semester.

I	Sessional evaluation	Weightage
	Minor Test – I	20%
	Minor Test – II	20%
	Assignment / Mini Project / Term paper	30%
	Quiz/Tutorial/Class Test	30%
II	Theory examination	100%

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**INSTRUCTIONS TO QUESTION PAPER SETTER:**

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  2. Total EIGHT questions are to be set (two questions from each unit), and candidate have to attempt any five questions selecting one from each unit, each question of 15 marks each.
  3. The question paper should at least have one question with 3 subparts and three questions with 2 subparts.
- 

**READING LIST:** (to be amplified by the subject teacher)

1. Abrahamson, M. W. (1979) Engineering Law and the ICE Contracts, London.
2. CPWD Contracts
3. Duncan Wallace, I. N. (1978) The International Civil Engineering Contract, London.
4. Duncan Wallace, I. N. (1980) Building and Engineering Contracts, London.
5. Gajaria G. T. (2000) Laws Relating to Building and Engineering Contracts in India, LexisNexis Butterworths India.
6. FIDIC (1989) Guide to the Use of FIDIC Conditions of Contract for Works of Civil Engineering Construction, Geneva.
7. Hinze, J. (2001) Construction Contracts, McGraw Hill.
8. Ministry of finance documents
9. Neale, R. H. and Neale, D. E. (1989) Construction planning, Thomas Telford Ltd.
10. Pilcher, R. (1992) Principles of construction management, New York.
11. Project Management Institute (2000) A Guide to the Project Management Body of Knowledge, Pennsylvania.
12. World bank policies and procurement procedure documents



Teaching Schedule		Marks of Sessional work	Marks of Examination		Total marks	Credits	Duration of Examination (h)
L	P		Theory	Portfolio			
4	-	75	75	-	150	4	3

**INTENT:**

Construction and real estate markets in most Asian and Indian societies are although developing markets, yet there is enormous existing stock of buildings. An important part of future construction business, therefore, will occur in existing buildings, i.e. rehabilitation and revitalisation. This requires quite a different approach concerning surveying, design, project management, techniques and site management. These have to be understood and trained by theoretical models and practical examples. The course aims to deepen the students understanding to evaluate overall conditions of existing buildings and potential renovation, preservation and repair strategies, select appropriate design and construction approaches complying with local, state, and national, historic landmark regulations. The subject is strengthened with exemplar studies and research papers.

**CONTENT:****UNIT I: Building technology and renovation**

- Building system definition and description, elements, systems, materials etc.
- Principles of building design and their relation to failure
- Building deterioration: criteria for identifying deterioration phenomena and their causes.
- Building condition assessment, structures, fabric, component materials
- Maintenance plans for different building types and different client types
- Defect diagnostic techniques and instruments, Non destructive testing methods (NDTM)
- Repair and renovation approaches
- Building information management, FM and Qs as information source for renovation

**UNIT II: Understanding renovation**

- Definition and types of renovation
- Differences between renovation and new constructions
- Renovation goals
- Reasons leading to renovation decisions
- Issues to consider in renovation
- Industries and renovation
- Providing solutions to facilities problem and renovation
- Concept and feasibility of renovation projects

**UNIT III: Renovation Process**

- Preliminary engineering and design and estimation
- Detailed engineering and design and estimation
- Design, special reconstruction techniques: Reinforced concrete, Cast-iron and steel, Brickwork and masonry, timber, Construction and production drawings
- Procurement and procurement control
- Construction and site management
- Start-up and implementation, operation or utilisation

**UNIT IV: The management of renovation and reconstruction**

- Building approvals for reconstruction and renovation projects
- Contracts between client and architect and engineer, Client and project management
- Site inspection, surveying: Research of historical documents, Statutory requirements, special case: heritage
- Call for tenders, tendering procedure, subletting: contractors, contracts, contract drawings, Cost records, cost control, final billing
- Practice of execution, site management: WBS, Time schedules, site reports, Negotiations and meetings, Modifications and amendments
- Site inspection - certificate procedure: Site progress reports and photographs, Substantial completion, Inspection, defects liability
- Final certificate, documentation, records

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**NOTE:**

Detailed teaching programme to be made and circulated to the students at the commencement of the semester.

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	Minor Test – II	20%
	Assignment / Mini Project / Term paper	30%
	Quiz/Tutorial/Class Test	30%
II	Theory examination	100%

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**INSTRUCTIONS TO QUESTION PAPER SETTER:**

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  3. The question paper should at least have one question with 3 subparts and three questions with 2 subparts.
- 

**READING LIST (to be amplified by the subject teacher)**

1. Melville, I A and Gordon I A (1997) The Repair and Maintenance of houses, Estates Gazette London.
2. Irvine, W. (1995) Surveying for Construction, London
3. Fielden, B. (2003) Conservation of Historic Buildings, W.I.
4. Oxley, R. (2003) Survey and Repair of Traditional Buildings, Donhead.
5. Glover, P. (2006) Building surveys, Butterworth-Heinemann is an imprint of Elsevier.
6. CPWD (1996) Repair and Rehabilitation of RCC buildings, Central Public Works Department, New Delhi.
7. Noy, E. A. and Douglas, J. (2005) Building Surveys and Reports, Blackwell Publishing.
8. Wood, B. (2003) Building Care, Blackwell Science Ltd.

Teaching Schedule		Marks of Sessional work	Marks of Examination		Total marks	Credits	Duration of Examination (h)
L	P		Theory	Portfolio			
4	-	75	75	-	150	4	3

**INTENT:**

Building materials, technologies and products are constantly advancing in the construction industry which are being standardized and codified. Currently more emphasis is on the use of alternate/substitute and environment friendly materials. This course aims to introduce the advanced building materials and technologies to the construction and real estate management.

**CONTENT:****UNIT I: Fibre reinforced concrete and Light weight concrete**

- Fibre reinforced concrete: properties of constituent materials, mix proportions, mixing and casting Procedures, properties of freshly mixed FRC, Mechanics and properties of Fibre reinforced concrete, Composite Material approach, application of fibre reinforced concrete. Types of fibres, workability, mechanical and physical properties of fibre reinforced concrete
- Light weight concrete: properties of light weight concretes, foams and light weight materials, pumice concrete, aerated cement mortars, no fines concrete, design and applications of light weight concrete.

**UNIT II: High Performance Concrete**

- High performance concrete: materials for high performance concrete, supplementary cementing materials, properties and durability of high performance concrete, introduction to silica fume concrete, properties and applications of silica fume concrete.
- Changes in concrete with time, Corrosion of concrete in various environments. Corrosion of reinforcing steel. Electro-chemical process, measures of protection.

**UNIT III: Polymers in construction**

- Polymer concrete: terminology used in polymer concrete, properties of constituent materials, polymer impregnated concrete, polymer modified concrete, properties and applications of polymer concrete and polymer impregnated concrete.
- Fibre reinforced plastic in sandwich panels, modeling
- Adhesives and sealants. Structural elastomeric bearings and resilient seating.

**UNIT IV: Alternative/ appropriate building materials**

- Ferro cement: constituent materials and their properties, mechanical properties of ferro cement, construction techniques and application of ferro cement Ferro-cement, material and properties.
- Industrial waste materials in concrete, their influence on physical and mechanical properties and durability of concrete
- Fly ash concrete : classification of Indian flyashes, properties of flyash, reaction mechanism, proportioning of flyash concretes, properties of flyash concrete in fresh and hardened state, durability of flyash concrete.

**NOTE:**

Detailed teaching programme to be made and circulated to the students at the commencement of the semester.

I	Sessional evaluation	Weightage
	Minor Test – I	20%
	Minor Test – II	20%
	Assignment / Mini Project / Term paper	30%
	Quiz/Tutorial/Class Test	30%
II	Theory examination	100%

**INSTRUCTIONS TO QUESTION PAPER SETTER:**

1. Exam shall be of 3 hours duration and of maximum marks: 75. (minimum passing marks:30)
2. Total EIGHT questions are to be set (two questions from each unit), and candidate have to attempt any five questions selecting one from each unit, each question of 15 marks each.
3. The question paper should at least have one question with 3 subparts and three questions with 2 subparts.

**READING LIST (to be amplified by the subject teacher)**

1. Schwartz, M. M. (2006) New materials, processes and methods technology. Taylor & Francis/CRC Press.
2. Watson, D. (2000) Time saver standards for building materials and systems. McGraw Hill, NY.

Teaching Schedule		Marks of Sessional work	Marks of Examination		Total marks	Credits	Duration of Examination (h)
L	P		Theory	Portfolio			
	4	75		75	150	4	-

**INTENT:**

The course aims to acquire experience of collating and critically appraising information into topics of possible research in construction and real estate management with appropriate developed literature searches.

**CONTENT:**

The dissertation shall entail the following:

- Identification of an appropriate and focused research topic reflecting social and technological needs of the day
- Formulate synopsis including objectives, scope of work, methodology of work, case studies to be undertaken, site selection culminating in broad functional requirements.
- An investigation of the topic using an analysis of existing literature, case studies and other data sources
- To develop understanding of the research topic.
- Drawing informed and scientific conclusions from the research

(a) The dissertation shall be based on empirical study, field work, and textual analysis in the field of construction and real estate management. It should demonstrate candidate's capacity for analysis and judgment as also her/his ability to carry out independent viewpoint in interpretation. A dissertation may be supplemented by published work, if any.

(b) The dissertation shall present an orderly & critical exposition of existing knowledge of the subject or shall embody results of original interpretation and analysis & demonstrate the capacity of the candidate to do independent research work. While writing the dissertation, the candidate shall lay out clearly the work done by her/him independently and the sources from which she/he has obtained other information.

(c) The dissertation shall be prepared as per guidelines given in the dissertation manual. Nevertheless, the typing shall be done on both sides of the paper, the font size should be 12 point Times New Roman in 1.5 (one and a half) space but the reference and bibliography should be typed in single space in Harvard style. The paper to be used should be A-4 size and orientation should be portrait.

The dissertation shall be based on empirical study, field work, and textual analysis in the field of construction and real estate management. It should demonstrate candidate's capacity for analysis and judgment as also her/his ability to carry out independent viewpoint in interpretation. A dissertation may be supplemented by published work, if any.

The dissertation shall present an orderly & critical exposition of existing knowledge of the subject or shall embody results of original interpretation and analysis & demonstrate the capacity of the candidate to do independent research work. While writing the dissertation, the candidate shall lay out clearly the work done by her/him independently and the sources from which she/he has obtained other information.

The dissertation shall be well structured document of not more than 15000 words with clear objectives and well-argued and appropriate conclusions indicating an appropriate level of expertise. The submission format for all stages shall be print and digital. Seminars in related areas to the dissertation topic (activities and functions to be handled, building typologies, technology applied) are required to be presented at all stages during the entire semester.

**NOTE:**

Detailed teaching programme to be made and circulated to the students at the commencement of the semester.

I	Sessional evaluation	Weightage
	Synopsis	10%
	Mid term submission	50%
	Prefinal submission	40 %
II	Portfolio evaluation	100%

**READING LIST:** (to be amplified by the subject teacher)

1. McMillan, K. & Weyers, J. (2007) How to write dissertations and project reports. Pearson Prentice Hall.
2. Watson, G. (1987) Writing a thesis: a guide to long essays and dissertations, London: Longman. Specialist bibliography according to the project.