



**VINAYAKA MISSIONS UNIVERSITY**

(Deemed to be University under Section 3 of UGC Act, 1956)

SALEM, INDIA



**FACULTY OF ENGINEERING AND TECHNOLOGY**

**REGULATIONS 2012**

**AND**

**CURRICULUM & SYLLABUS**

**(FOR THE STUDENTS ADMITTED FROM 2012-13 ONWARDS)**



**MASTER OF ENGINEERING/ TECHNOLOGY (M.E./M.TECH.)**

**DEGREE PROGRAMME - PART TIME**

**DEPARTMENT OF CIVIL ENGINEERING  
AARUPADAI VEEDU INSTITUTE OF TECHNOLOGY  
PAIYANOR, CHENNAI-603104 TAMILNADU**

**VINAYAKA MISSIONS UNIVERSITY**  
(Deemed to be University under Section 3 of UGC Act, 1956)  
**SALEM, INDIA**  
**MASTER OF ENGINEERING/ TECHNOLOGY (M.E./M.TECH.)**  
**DEGREE PROGRAMME - FULL TIME / PART TIME**  
**UNDER**  
**FACULTY OF ENGINEERING AND TECHNOLOGY**  
**REGULATIONS 2012**  
**(FOR THE STUDENTS ADMITTED FROM 2012-13 ONWARDS)**

In exercise of the powers conferred by the Revised Memorandum of Association (RM2010) and Revised Bye-Laws (RB2010) of the Vinayaka Missions University, Salem, the Board of Management of the University hereby issue the following revised regulations pertaining to the postgraduate Programme and the award of the degree of Master of Engineering/Master of Technology (M.E./M.TECH.) at this University.

**1. TITLE AND COMMENCEMENT**

These revised regulations shall be called "REGULATIONS FOR MASTER OF ENGINEERING / MASTER OF TECHNOLOGY (M.E./M.TECH.) - FULL TIME / PART TIME DEGREE PROGRAMME – (R2012).

These revised regulations come into force with effect from the Academic year 2012-2013 and are subject to such modifications as may be approved by the apex bodies of the University from time to time.

**2. PREAMBLE**

The Degree of MASTER of Engineering / MASTER of Technology (M.E./M.TECH.) in Faculty of Engineering and Technology shall be awarded to a candidate who, as per these regulations, has successfully undergone the programme, passed the prescribed examinations and thereby qualified to receive the degree.

**General Considerations and Teaching Approach**

The tremendous growth of Science and Technology has made inroads in every sphere of human activity. It has created opportunities, challenges and opened new horizon in the pursuit of knowledge, career and accomplishments. Aspirants are crossing oceans in the pursuit of knowledge and for successful career. The globalization and subsequent opening of our economy have provided ample opportunities in the quest of knowledge to the students of our Nation. Hence a need has arisen to provide flexible, need based, versatile and learner oriented Education / Knowledge to our students and make them competitive. If the present rigid academic system and the Institution methodologies are continued to be imposed, the learners may not have the choice of courses of their liking and hence will not meet the requirements to strengthen their knowledge in specific areas needed for their career. In view of the above a move has to be initiated from Institution centric to learner oriented education system.

The Choice Based Credit System (CBCS) provides ample opportunity for multiple entries, large number of electives, flexible pace for earning credits, carryover of such credits, and choice of courses from other branches. Further it has the ability to accommodate diverse choices that the students may like to have. In view of the above advantages the CBCS has been implemented from the academic year 2012-2013 onwards.

### **The objectives of CBCS**

- To enrich the horizon of knowledge of students by means of Core, Inter disciplinary, Extra disciplinary and Life/Job oriented courses.
- To ensure more interaction between the teacher and taught in class room and extra class room programmes.
- To offer flexibility in choosing the courses of study according to their needs and learning capacity.
- To enlighten the students on the rich culture of our nation and ethical values underlying real life situations.
- To allow the advanced learner to earn extra credits.
- To maintain the total credits of each programme on a par with International standards.
- To expose the students to the world of social commitment through specially designed components of study like NSS/NCC/ Sports and Games.

### **3. DEFINITIONS AND NOMENCLATURE**

In the Regulations, unless the context otherwise requires, certain terms used and their meanings are as under.

"MHRD" means Ministry of Human Resources Development.

"UGC" means University Grants Commission.

"AICTE" means All India Council for Technical Education

"University" means Vinayaka Missions University. Deemed to be University declared under section 3 of UGC Act, 1956.

"Vice Chancellor or VC" means Vice Chancellor of the University

"Board of Management or BoM" means Board of the Management, the highest governing body of the University

"Academic Council or AC" means Academic Council the highest academic body of the University, chaired by the Vice Chancellor

"Board of Studies or BoS" means Board of Studies of the University under the Faculty of Engineering and Technology

"CoE" means Controller of Examinations of the University

"AICEE" means All India Common Entrance Examination conducted by the University

"Dean" means Dean for the Faculty of Engineering and Technology of the University

"BoF" means Board of Faculty, academic body of Engineering/Technology Programmes / Colleges, constituted by the Vice Chancellor with the Dean as the Chairperson.

"Institution or College" means Engineering College constituted under University.

"Programme" means Under Graduate Programme leading to the award of Degree M.E./M.TECH. approved by the UGC and University.

"Branch" means specialization or discipline of M.E./M.TECH. Degree Programme, such as Mechanical Engineering, Information Technology, etc.

"Course" means every paper/subject of study offered by various departments.

"Credit" is the Course work which is measured in units, based on hours Conducted/week and content of course.

"Head of Institution or HoI" means Principal of the Constituent Engineering college of the University

"HoD" means Head of the Department of the College.

"Curriculum and Syllabus" mean the various components/courses studied in each programme that provides appropriate knowledge in the chosen branch. The curriculum and syllabus for study is as prescribed by the Board of Studies (BoS) with the approval of the concern Board of Faculty (BoF) and Academic Council (AC) based on the UGC/AICTE regulations.

"Teaching Staff or Teacher" means The Dean of Faculty, The Principal of the college, Professors, Associate Professors, Assistant Professors, Pro-term Lecturers and other like persons engaged in teaching the students and assisting the students in the conduct of studies and Research in the College/University.

#### **4. REGISTRATION**

A candidate admitted in the Post Graduate Programme in the constituent Engineering Colleges of the University shall register with the University by remitting the prescribed fees along with the application form for registration dully filled in and forwarded to the Controller of Examinations of this University through the Head of the Institutions within the stipulated date.

The name of the candidate must be registered in the University within three months from the date of admission.

If the candidate fails to satisfy the above clause 4.2., the admission of the candidate stands cancelled and the permission for re-admission for such candidate will not be issued.

#### **5. ELIGIBILITY FOR ENROLLMENT**

The eligible entry qualifications approved by the University are listed in Annexure-I.

##### **Eligibility Certificate**

The candidate who has passed any qualifying Examination other than the University shall obtain an Eligibility Certificate from the University by remitting the prescribed fee along with the application before seeking admission to the University / Constituent College.

### **Physical Fitness Certificate**

Every candidate before admission to the programme shall submit to the Head of the Institution a Certificate of Medical Fitness from an authorized Medical Officer that the candidate is physically fit to undergo the programme and does not suffer from any contagious disease.

The candidates with disability should produce the Disability Certificate issued by the duly constituted District Medical Board.

## **6. PROGRAMMES OFFERED BY THE UNIVERSITY**

A candidate may be offered one of the branches of study from those approved by the University and as specified in Annexure I.

## **7. MODES OF STUDY:**

### **Full-Time**

Candidates admitted under 'Full-Time' should be available in the University departments during the entire duration of working hours (From Morning to Evening on Full-Time basis) for the curricular, co-curricular and extra-curricular activities.

The Full-time candidates should not attend any other Full- time programme(s) / course(s) or take up any Full-Time job / Part- Time job in any Institution or company during the period of Full- Time programme. Violation of the above rules will result in cancellation of admission to the PG programme.

### **Part-Time**

This mode of study is applicable to those candidates admitted under sponsored category (Government Agencies / Private agencies / Teacher candidates). In this mode of study, the candidates are required to attend classes along with Full-time students for the required number of courses and complete the course in three years.

## **8. ADMISSION**

The Academic council of the University has the power to decide the number of seats for the particular branch and may decide to restrict admission in any particular year to candidates having the subset of qualifications prescribed at the time of admission based on the recommendation of the concern BoF.

### **Full Time Mode**

The students applying for admission to this programme of this University in Full Time mode shall be selected on the basis of merit through the "ALL INDIA COMMON ENTRANCE EXAMINATION (AICEE)" conducted by the University.

The Admission Procedure for the AICEE conducted by the University for this Programme is given separately.

The minimum percentage of marks obtained from the above AICEE for eligibility for admission to this programme shall be 50% for the general category candidates and 40% for the candidates belonging to Scheduled Castes, Scheduled Tribes and Other Backward Classes.

Provided that a candidate who satisfies clause 8.2.3. also must have passed in the qualifying examination mentioned in Annexure - I.

Non Resident / Foreign Nationals can be admitted upto 15% of total seats as per norms and guidelines of the University. They are exempted from the AICEE stated in clause

8.2.1. but their merit will be ascertained based on their performance in qualifying examination approved by the Government and the University.

### **Part Time Mode**

All part time candidates shall be exempted from the AICEE stated in clause 8.2.1.

Selection of the Candidates in Part time mode based on the Merit, Interview, Experience, Sponsorship etc. that may be prescribed by the concern Board of Faculty and approved by the Academic Council of the University.

A candidate seeking admission to Part time mode of study, shall have his/her place of employment not more than 90 Kms from the University/ programmes offered Constituent college(s).

Notwithstanding the qualifying examination the candidate might have passed, he/she shall have a minimum level of proficiency in the appropriate Programme / Courses as prescribed by the Academic Council based on the recommendation of BoF from time to time.

## **9. DURATION OF THE PROGRAMME**

The Duration of certified study of this programme shall extend over the period of 2 years (4 semesters) for Full time candidates and 3 years (6 semesters) for Part time Candidates.

## **10. EXTENSION OF MAXIMUM DURATION**

The candidates who fail to complete the year-wise programme as mentioned in clause 9 would be permitted to complete the programme within a period of 4 years (8 semesters) for Full time

candidates and 6 years (12 semesters) for Part time candidates from the date of admission to the course. Those who fail to complete within the extended period shall be discharged from the course.

#### **11. COMMENCEMENT OF THE COURSE**

The academic year for the programme shall commence in the month of September every year.

#### **12. WORKING DAYS IN AN ACADEMIC YEAR**

Each Academic year shall consist of two semesters of not less than 90 working days or 15 working weeks including the Examination.

The total number of working days and time schedule for this programme will be finalized by the concerned BoF and BoS every year.

#### **13. MIGRATION**

Migration of students from one Engineering college/University to another Engineering college/University may be granted on any genuine ground subject to the availability of vacancy in the college where migration is sought and fulfilling the other requirements laid down in the AICTE Regulations.

The applicant candidate shall be eligible to apply for migration only after qualifying in the end of second semester M.E./M.Tech examination.

The provision of combination of attendance shall be granted to a transferee for admission to the Examinations of this University on satisfactory fulfillment of the regulations of the University.

The Rules/Guidelines for Migration of the students for this Programme is given separately.

All Migrations / Transfer are subject to the approval of the Academic Council based on the recommendation of the Vice-Chancellor

#### **14. BREAK OF STUDY**

Break of study may be permitted for genuine reasons like serious health problems and calamitous family situations. The Vice Chancellor is vested with the power to permit the break for which the candidate must apply in the prescribed form enclosing necessary supporting documents and fees through his/her HoI, sufficiently ahead of the proposed period of break. A break of study may cast for a period of 6 to 12 months.

The period of break of study of the candidate for rejoining the course shall be calculated from the date of commencement of the discontinuance of the course.

A maximum of one year (two spells having six months duration each) of break of study for PG degree courses will be allowed for the entire duration of the course. Any further break of study shall entail the candidate to be de-registered and his/her admission will stand cancelled.

A candidate having a break of more than 12 months for PG Degree course, the course of study shall be extended by that period and the candidate is permitted to appear for the examination only after completing this extension period. The candidate shall apply to the University through his/her HoI for the extension using the prescribed form and fees.

The duration specified for passing all the courses for the purpose of awarding degree as per clause 9 and 10 shall be increased by the period of such break of study permitted.

If a student is detained for want of requisite attendance, progress and good conduct, the period spent in that semester shall not be considered as permitted Break of Study.

#### **15. REJOINING / DISCONTINUING AFTER THE BREAK**

For PG degree courses the Candidate having availed a break of study between 6 and 12 months shall apply for rejoining the course in the prescribed form as in (ANNEXURE - II) by remitting the stipulated fee for condonation of break of study to the Academic Officer of this University through the Principal of the concerned college for issue of necessary permission to rejoin the course. The concerned principal of the College shall not permit any candidate with a Break of study as stipulated above to rejoin the course without obtaining the prior permission from the authorities of the University.

All the postgraduate students have to execute a declaration at the time of registration with this university in this regard in the prescribed form as in Annexure -III

Any break of study beyond two years for full time candidates and three years for part time candidates are considered as discontinuation of study. This is applicable for all the years of study of the post graduate degree courses. However, in exceptional cases, if a candidate having a break of study beyond two years for full time candidates and three years for part time candidates but less than four years for full time candidates and six years for part time candidates and the break of study is in six months one spell, the Board of Management, may, on the recommendation of the Vice Chancellor, permit the candidate to rejoin the course from the beginning of the year. The Candidate shall be permitted to rejoin at the beginning of the first year of the course (i.e.) the candidate has to re-do the course from the beginning and shall after fulfillment of the Regulations this University to the course concerned be admitted to the examinations. The candidate shall not be exempted in the subjects already passed.

#### **16. READMISSION AFTER EXTENSION**

If the candidates name is not registered with the University within three months from the cutoff date prescribed for the respective courses for admission without any valid reasons / ground for



such non-registration, permission for re-admission for such candidates will not be issued by the University.

## **17. PROGRAM STRUCTURE**

### **Training Period and Time Distribution**

Every student shall undergo a period of certified study extending over 2 academic years allocated into 4 semesters for full time candidates and three years allocated into 6 semesters for part time candidates with the duration of six months period from the date of commencement of his/her study for the subjects comprising the Engineering/Technical curriculum to the date of completion of the examination.

The Head of the department shall ensure that every teacher imparts instruction as per the number of periods specified in the syllabus and that the teacher teaches the full content of the specified syllabus for the course (subject) being taught. End-Semester Examination will be scheduled after the last working day of the semester.

### **Curriculum**

The curriculum and the syllabus for the course pertaining to the M.E./ M.Tech Programme for both Full time and Part time are given separately.

The curriculum and the syllabus for the course shall be prescribed by the Academic Council based on the recommendation of concern Board of faculty and Board of Studies.

The P.G. Programmes will consist of core courses, Elective courses Project work. The Programme will also include design projects/seminars/ practicals /practical training, if they are specified in the Curriculum.

Two weeks of practical training in any industrial / research laboratory correspond to one credit, and is applicable to all modes of study.

### **Semester Curriculum**

The curriculum of each semester shall normally be a blend of theory courses not exceeding 7 and practical courses not exceeding 4. The total number of courses per semester shall not exceed 10.

#### **Elective**

1. The electives from the curriculum are to be chosen with the approval of the Head of the Department concerned.

2. A candidate may be permitted by the Head of the Department to choose a maximum of two electives from P.G. Programmes offered in any other department of the University during the period of his/ her study, provided the Head of the Department offering such course also approves such request subject to no clash in the time-table for the lecture classes of both departments.

### **Project Work**

The project work for M.E./M.Tech. consists of Phase-I and Phase-II. The phase - I is to be undertaken during III semester and Phase-II, which is a continuation of Phase-I is to be undertaken during IV semester.

### **Medium of Instruction**

The medium of instruction for lectures, examinations and project work is English, except for language courses other than English.

### **Course Evaluation**

#### **Credits**

Course work is measured in units called credit hours or simply credits. The number of periods or hours of a course per week is the number of credits for that course. The details of credit allocation are follows:

<b>Nature of the Course</b>	<b>Periods / Hours per Week</b>	<b>Credits</b>
Theory	3	3
	4	4
Laboratory	2 or 3	1
Special Laboratory	4 to 6	2
Theory + Laboratory	2 (Theory) + 1 or 2 ( Laboratory)	3
Tutorial	1	1
Project Work (Fourth or Six Semester)	18 ( Minimum)	6

Mini project, Technical Seminar and Industrial Training are also given 1 to 2 credits depending on the amount of time allotted based on the specific requirement of the branch concerned.

#### **Total Credits**

The total number of credits a student earns during the course of study period called the total credits. For successful completion of M.E./M.TECH. programme, a student must earn 68-80 credits. The branches of study approved by the University and it required minimum credit as given in Annexure – IV.

#### **Minimum Credit Requirements to Do the Project**

1. A candidate of M.E./M.TECH. programme, must earn a minimum of 24 credits for doing his/her projects in Phase-I.
2. If the candidate has not earned the requisite minimum credits, he / she has to complete the arrears (at least to the extent of earning the minimum credits specified in clause 17.3.3.1.) and then enroll for the project (Phase - I) work in the subsequent semester.
3. In case of candidates of M.E. / M.TECH. not completing Phase-I of project work successfully, the candidates can undertake Phase-I again

in the subsequent semester. In such cases the candidates can enroll for Phase-II, only after successful completion of Phase I.

4. Project work shall be carried out under the supervision of a "qualified teacher" in the Department concerned. In this context "qualified teacher" means the faculty member possessing PhD degree or PG degree with a minimum of 3 year experience in teaching PG courses.

5. A candidate may, however, in certain cases, be permitted to work on projects in an Industrial/Research Organization, on the recommendations of the Head of his/her Department. In such cases, the Project work shall be jointly supervised by a supervisor of the department and an expert-as a joint supervisor from the organization and the student shall be instructed to meet the supervisor periodically and to attend the review committee meetings for evaluating the progress.

6. The Project work (Phase II in the case of M.E / M.TECH) shall be pursued for a minimum of 16 weeks during the final semester.

7. The deadline for submission of final Project Report is 60 calendar days from the last working day of the semester in which project / thesis / dissertation is done. However, the Phase-I of the Project work in the case M.E. / M.TECH. shall be submitted within a maximum period of 30 calendar days from the last working day of the semester as per the academic calendar published by the University.

### **Faculty Advisor**

To help the students in planning their courses and for general guidance on the academic programme, the Head of the Department will allot a certain number of students to a teacher of the department who shall function as faculty advisor for those students throughout their period of study. The faculty advisor shall advise the students and monitor the courses undergone by the students, check attendance and progress of the students attached to him/her and counsel them periodically. The faculty advisor may also discuss with the HOD and parents about the progress of the students if necessary.

### **Class Committee**

Every class will have a class committee constituted by the HOD. The members of the Class committee consisting of Chairperson (a teacher who is not normally teaching any course for the class), all teachers handling courses for the class, Students (a minimum of 4 consisting of 2 boys and 2 girls on pro-rata basis)

### **Function of the Class Committee**

The functions of the class committee shall include the following.

1. Clarify the regulations of the programme and the details of rules therein.
2. Inform the student representatives, the academic schedule including the dates of assessments and the syllabus coverage for each assessment.

3. Inform the student representatives the details of Regulations regarding weight age used for each assessment. In the case of practical courses (laboratory / drawing / project work / seminar etc.) the breakup of marks for each experiment / exercise / module of work, should be clearly discussed in the class committee meeting and informed to the students.

4. Analyze the performance of the students of the class after each test and initiate steps for improvement.

5. Identify slow learners, if any, and request the teachers concerned to provide additional help / guidance / coaching to such students.

6. Discuss and sort out problems experienced by students in the class room and in the laboratories.

The class committee shall be constituted within the first week of commencement of any semester.

The chairperson of the class committee may invite the faculty advisor and the Head of the Department to the meeting of the class committee.

17.5.4.1. The principal may participate in any class committee meeting of the Institution.

The chairperson is required to prepare the minutes of every meeting, submit the same through the Head of the Department to the Principal within two days of the meeting and arrange to circulate the same among the students and teachers concerned. Points requiring action by the University shall be brought to the notice of the University by the Principal.

The first meeting of the class committee shall be held within ten days from the date of commencement of the semester, in order to inform the students about the nature and weightage of assessments as per the framework of the Regulations. Two or three subsequent meetings may be held in a semester at suitable intervals. During these meetings the student representatives shall meaningfully interact and express opinions and suggestions of the students of the class to improve the effectiveness of the teaching - learning process.

The Head of the Department shall appoint Faculty advisor, Chairperson of the class committee

### **Course Committee for Common Courses**

Each common theory course offered to more than one class / branch by more than one teacher shall have a Course Committee comprising all the teachers teaching the common course with one of them nominated as Course Coordinator. The HoD will nominate the course committee for common course / courses handled in their department. The Principal will nominate the course committee for common courses handled in more than one department. This course committee will ensure that a common question paper is prepared for the tests / exams and uniform evaluation is carried out. The Course committee will meet a minimum of 3 times in each semester.

## 18. EXAMINATION

### **Commencement of Examinations**

The University Examinations will be conducted twice in an academic year. The CoE would notify the dates of examinations to the candidates. The examination shall be commenced in the month of November and April in every academic year.

### **Requirements for Admission to Examinations**

#### **Attendance Requirements**

1. No candidate shall be permitted to appear for the Examination unless he/she put in 75% attendance in individual course(s) including laboratory course(s) inclusive of attendance in non-lecture teaching i.e. seminars, group discussions, and tutorials.

If a candidate fails to satisfy the clause 18.2.1.1., they are required to repeat that incomplete course(s) in the next academic year whenever offered or complete the course(s) in the summer term if offered.

**Note:** All students are expected to attend all classes and secure 100% attendance. The above provision is made to allow for unavoidable reasons such as medical leave/ permitted participation in sports and Co-curricular activities.

2. The Head of the Institutions of the Constituent Colleges has to furnish to the Controller of Examinations of this University, the attendance particulars specifying the number of working days attended by the candidate every 45 days both by E-mail and in hard copy form.

3. Before commencement of examination of the semester the Head of the Institutions of the constituent colleges has to furnish the consolidated attendance particulars of the candidates for all subjects enrolled by him/her, specifying the number of days of attendance in each month for a period of one semester to this University, in the prescribed format.

4. The period of internal test for both theory and practical is also considered as working period for this programme.

5. The attendance particulars for the Examination session for the respective study period are to be submitted two weeks prior to the commencement of the Examination. As the candidate would have paid the fees for the particular Examination, it could be presumed that he/she would attend the rest of the classes in the remaining two weeks after submission of attendance particulars to the University and appear for the Examination.

6. The days of suspension of a student on disciplinary grounds will be considered as days of absence for calculating the percentage of attendance, for individual courses.

### **Condonation of Lack of Attendance**

1. Condonation of shortage of attendance up to a maximum of 10% may be sanctioned by the Vice-Chancellor in deserving cases.

2. A candidate lacking attendance shall submit an application in the prescribed form and remit the stipulated fee 15 days prior to the commencement of the examination.

3. The Head of the Department and Head of the Institution should forward the candidate's request application with their endorsements to the Controller of Examinations who would put it up for the Vice-Chancellor's approval.

4. Application not forwarded through proper channel will not be entertained.

5. Condonation of lack of attendance shall be taken up for consideration under the following circumstances:

Any illness affecting the candidate (The candidate should submit Medical Certificate from a registered Medical Practitioner to the Principal of the college immediately after returning to college after treatment)

Any unforeseen tragedy in the family. (The parent / guardian should give in writing the reason for the ward's absence to the Principal).

Participation in NCC / NSS / YRC and other co-curricular activities representing the college or University. (The Head of the Institution should permit the candidate to participate and instruct the concerned officers in -charge of the student's activities in their college to endorse the leave.)

Any other leave the Head of Institution deems reasonable for Condonation.

### **Other Requirements for Admission to the Examinations**

Registration for all Eligible courses in the current semester and arrear examination where ever applicable M.E./M.TECH. Examination as specified in the curriculum of the regulations.

The University shall ensure that the students of the colleges, who do not fulfill the Regulation for Engineering/Technology (Minimum Standards of Education), are not sent for the University Examination.

Each theory paper shall be of three hours duration.

### **Methods of Evaluation**

Evaluation may be achieved by the written test, practicals, mini project, seminars and viva voce tested methods. It is achieved by two processes.

Formative or Internal assessment (IA) is done through a series of tests and examinations conducted by the institution.

Summative or University examinations are done by the university through examination conducted at the end of the specified course.

### **Internal Assessment**

The IA shall be based on day to day assessment, evaluation of student assignment, preparation for seminar, Internal/model/ online test etc.

Internal assessment shall relate to different ways in which student's participation in learning participation in learning process during semesters in evaluated. For example, Preparation of subject for student's seminar, tutorial, problem solving exercise, Participation in Project in the Engineering/Technology, Proficiency in carrying out a practical or a skill in small research project, Multiple choice questions (MCQ) test after completion of a system/ teaching etc.

Each Assessment mentioned in clause 18.4.1.1. is tested and recorded. Some of the assessment can be assigned as Home work/ Vacation work.

The continuing assessment examinations for theory may be held frequently atleast three (Two Internal tests and one model test) times in a given semester and the marks of that examination shall be taken into consideration for the award of sessional marks.

A minimum of one practical examination shall be conducted during the semester and marks for that examination shall be taken into consideration for award of sessional marks.

Day to day records should be given importance during internal assessment.

Weightage for the internal assessment shall be 50% of the total marks in each subject.

The internal assessment marks (both in theory and Practical) should be submitted to the University endorsed by the Principal of the College 15 days prior to the commencement of the theory examinations.

No candidate shall be permitted to appear for the Examination unless he/she secures 25 marks out of 50 marks in Internal Assessment in all courses registered in that semester.

If a candidate fails to satisfy the clause 18.4.7., he/she is required to Improve the IA in that course(s) in the next semester. Again if he fails to secure the minimum requirement, from third attempt onwards, only university marks alone will be considered.

### **Internal Marks Distribution**

#### **Attendance Record and Marks for attendance**

Every teacher is required to maintain an 'ATTENDANCE AND ASSESSMENT RECORD' for each course handled, which consists of students attendance in each lecture / practical / project work class, the test marks and the record of class work (topics covered). This should be submitted to the Head of the Department periodically (at least 3 times in a semester) for checking the syllabus coverage and the records of test marks and attendance. The HOD after due verification will sign the

above record. At the end of semester, the Record should be verified by the Principal. These records will be kept in safe custody by respective HOD for five years. The marks allocated for attendance is as follows:

% of Attendance	Marks
<= 75	0
76-80	1
81-85	2
86-90	3
91-95	4
96-100	5

### Theory

The distributions of marks for theory are as follows:

S. No	Components for Internal Assessment	Syllabus Coverage for the test / Exam	Duration of the test in minutes.	Marks (max.)	Question Paper Pattern
1.	Internal Test – I	2 Units of the Syllabus	90	7.5	<b>Part A – (Short Answer)</b> 5 X 2 = 10 Marks <b>Part B – 03 X 10 = 30 Marks</b> (Descriptive – Either - OR Type) <b>Total = 40 Marks</b>
2.	Internal Test – II	Next 2 Units of the Syllabus	90	7.5	
3.	Model Exam	Full Syllabus	180	25	<b>Part A – (Short Answer)</b> 10 X 2 = 20 Marks <b>Part B – 05 X 16 = 80 Marks</b> (Descriptive – Either - OR Type) <b>Total = 100 Marks</b>
2	Assignment / Seminar/ Online test		-	5	
3.	Attendance (as per Clause 18.7.1.)		-	5	
	<b>Total</b>			<b>50</b>	

#### 18.7.2.1 Online Test

Each online test contains Ten Objective / Multiple Choice type questions from each subject of the current semester with one minute time for each question. It requires to be



done on the Computer. Students will login with specific password (different password for different batches) Students will start answer by clicking any one of the answer, at the end students can view the score then & there.

### **Practical**

Every practical exercise / experiment in all practical courses will be evaluated based on the conduct of exercise / experiment and records maintained by the students. There will be at least one model practical examination.

The criteria for awarding marks for internal assessment is as follows

<b>Items</b>	<b>Marks (Maximum)</b>
Observation	<b>10</b>
Record	<b>10</b>
Model Practical / Mid Semester Test	<b>25</b>
Attendance (as per clause 18.7.1)	<b>05</b>
<b>Total</b>	<b>50</b>

The maximum marks for Internal Assessment shall be 50 in case of theory courses with Laboratory component. If there is a theory course with Laboratory component, there shall be three tests: the first test for a duration of 90 minutes carrying weightage of 10 marks will be from theory portions and the second test will be for laboratory component carrying weightage of 10 marks and a model examination carrying weightage of 25 marks with duration of 3 hours. The remaining 5 marks shall be distributed for attendance as prescribed in clause 18.7.1

### **Project Work**

1. The evaluation of the project work done by the student will be carried out by a committee constituted by the Principal on the recommendation of HoD. For each programme one such review committee will be constituted.
2. The Review committee consists of three senior faculty members including one supervisor/Guide of the student, having expertise in the areas of project.
3. The student shall make a presentation at least three times, on the progress made by him/her before the review committee. There will be equal weightage for all three assessments (each for 100 marks maximum) and the total marks obtained will be reduced for 45 (15 Marks Each) and the remaining 05 marks will be given for attendance vide clause 18.7.1.
4. The report of the committee will be submitted to the Head of the Department for review. The HoD based on the recommendation of the review committee will take the appropriate action to improve the skill / performance of the student on his/her project with the help of his/her project supervisor.
5. There will be a Viva voce examination for both Phase-I and Phase-II during End semester examination conducted by a committee consisting of the Supervisor, One internal examiner and one external examiner.

6. The both Internal and External examiners are appointed by the CoE of the University from the panel of the examiners approved by the Academic council.
7. The project report prepared as per approved guidelines and duly signed by the Supervisor(s) and HoD shall be submitted to the HoI.
8. If the candidate fails to obtain 50% of the internal assessment marks in the Phase-I and Phase-II, he/she will not be permitted to submit the report for that particular semester and has to re-enroll for the same in the subsequent semester.
9. If a candidate fails to submit the project report on or before the specified time, He/She is deemed to have failed in the project work and shall re-enroll for the same in a subsequent semester. This applies to both Phase-I and Phase-II in the case of M.E/ M.Tech.

If a candidate fails in the viva-voce examinations of Phase-I, he/she has to resubmit the project report within 30 days from the date of declaration of the results. If he / she fails in the viva-voce examination of Phase-II of Project work of M.E. / M.Tech. he/ she shall resubmit the Project report within 60 days from the date of declaration of the results. For this purpose the same Internal and External examiner shall evaluate the resubmitted report.

9. A candidate doing his/her project in any of the phases shall submit a paper/patent related to his/her project for publication in a journal or a conference. An acceptance from the concerned Journal or Conference shall be enclosed by the Supervisor to the report of the concern student's project work. This report shall be sent to the Controller of Examination along with the evaluation marks by the team of examiners without which the thesis/Report shall not be accepted.
10. A copy of the approved project report after the successful completion of viva-voce examinations shall be kept in the library of the college / institution.
11. Practical training / Industrial Attachment / Summer Project if specified in the Curriculum shall not exceed the maximum duration of 4 weeks and should be organized by the Head of the Department for every student.
13. At the end of Practical training / Industrial attachment / Summer Project the candidate shall submit a certificate from the organization where he/she has undergone training and also a brief report. The evaluation will be made based on this report and a Viva-Voce Examination, conducted internally by a Departmental Committee constituted by the Head of the Institution. Certificates submitted by the students shall be attached to the mark list sent by the Head of the Institution.

### **Technical Seminar & Mini Project**

#### **1. Seminar**

If seminar is prescribed in the curriculum, the same is to be considered as purely INTERNAL (with 100% internal marks only). Every student is expected to present a minimum of 3 seminars per semester and for each seminar marks can be equally apportioned. At the end of the semester the marks can be consolidated and taken as the final mark and hence, there is no need for End semester examination for

## SEMINAR.

The evaluation of the credit based seminar will be based on the observation and evaluation by the Seminar in-charge appointed by the HoD and approved by the HoI.

### 2. Mini Project

The mini-project, if specified in the curriculum, the same is to be considered as purely INTERNAL and it will be evaluated based on a report and a viva voce examination.

A three member review committee shall constitute by the Head of the Department having expertise in the areas of mini projects shall conduct a minimum of three presentation including one viva voce examination and marks can be equally allotted. At the end of the semester the marks can be consolidated and the final mark and hence there is no need for End semester examination for MINI PROJECT. The result will be submitted to the CoE through HoI.

## University Examinations

### Theory Courses

1. Theory papers will be prepared by the examiners as prescribed. Nature of questions will be Ten questions each carrying two marks in Part A and five questions Either - Or type each carrying 16 marks in Part B. The Evaluation will be for 100 marks and the weightage for End semester theory will be 50 and the duration of the Examination is 3 hours.

2. The model question paper for each subject is enclosed with Syllabus, which is given separately.

### Practical Courses

1. Practicals will be conducted in the laboratories. The objective will be to assess proficiency in skills, conduct of experiment, interpretation of data and logical conclusion.

2. End Semester examination for practical courses will be conducted jointly by one internal examiner and one external examiner appointed by the Controller of Examinations.

3. The evaluation will be for 100 marks and the weightage for End Semester practical course will be 50.

4. The mini project if specified in the curriculum, will be evaluated based on a report and a viva voce examination. The internal and external examiners shall be appointed by the CoE.

The approval of the Appointment of examiners for theory, practical and Project work evaluation by the academic council of the university based on recommendation of the concerned BOF and BOS

### Malpractice

If a student indulges in malpractice in any internal test / model examination / end semester examination, he / she shall be liable for punitive action as prescribed.

A student who has appeared and passed any course is not permitted to re-enroll / reappear in the course / exam for the purpose of improvement of the grades.

The examinations are to be designed with a view to ascertain whether the candidate has acquired the necessary for knowledge, minimum skills along with clear concepts of the fundamentals which are necessary for him/her to carry out his/her professional day to day work competently. Evaluation will be carried out on an objective basis.

There shall be two main examinations in a year to be held not later than 6 months after the publication of its results.

### **Passing Requirements**

1. A candidate who secures not less than 50% of total marks prescribed for the courses with a minimum of 50% prescribed for the end examination in both theory and practical courses including project work shall be declared to have passed the Examination.

2. For students scoring less than the passing minimum marks in the end semester examinations, the term "RA" against the concerned course will be indicated in the grade sheet. The student has to reappear in the subsequent end semester examinations for the concerned course as arrears. The letter grade "RA" will be indicated in the grade sheet for courses for which the student has insufficient attendance.

In case of a student having shortage of attendance the student shall redo the course as a summer term course or in the regular semester as the case may be required.

For a student who is absent for theory/practical/ project viva- voce, the term "AB" will be indicated against the corresponding course. The student should reappear for the end semester examination of that course as arrear in the subsequent semester.

The letter grade "RA" will be indicated for the courses for which the student has been granted authorized withdrawal as per clause 14.3.

3. If a candidate fails to secure a pass in a particular course, it is mandatory that he/she shall register and reappear for the examination in that course during the subsequent semester when examination is conducted in that course; he/she should continue to register and reappear for the examinations in the failed subjects till he / she secures a pass.

4. The Internal Assessment marks for all the courses including practicals are valid for a minimum of 2 attempts in the end semester examinations, including the first appearance. However, from the third attempt onwards if a candidate fails to obtain pass marks (IA + End Semester Examination) then the passing requirement shall be as follows:

The candidate should secure at least 50% of the maximum marks prescribed for the course in the University examinations alone irrespective of Internal Assessment marks obtained, in addition to 50% in the total Internal Assessment and End semester marks.

### **Examiners**

1. No person shall be appointed as an examiner in any of the subjects of the Professional examination leading to and including the projects for the award of the

M.E./M.Tech degree unless he/ she has atleast five year experience in teaching at PG level, a doctorate degree of a recognized university or an equivalent qualification in the particular subject as per recommendation of the council on teachers? eligibility qualifications and has had at least five years of total teaching experience in the subject concerned in a college affiliated to a recognized university at a faculty position.

2. External examiners shall not be from the same university.
3. External examiners shall rotate at an interval of 3 years
4. There is a separate set of examiners for each constituent engineering college of the University with internal examiners from the concerned college.
5. There shall be a Chairman of the Board of paper-setters who shall be an internal examiner and shall moderate the questions.

#### **Submission of Laboratory Record Note Books**

1. At the time of practical each candidate shall submit to the Examiners in his/her laboratory record note books duly certified by the Head of the Department /Institution as the bonafide record of the work done by the candidate.
2. The practical record shall be evaluated by the concerned Internal Examiner
3. In respect of failed candidates the marks awarded for records at previous examinations will be carried over for the subsequent examination or the candidates shall have the option to improve his/ her performance by submission of fresh records.

### **19. RESULTS & READMISSION TO EXAMINATION**

The University may ensure that the results of the examinations are published in time so that the student who successfully completes M.E./M.Tech. Examination can complete the course in within stipulated time prescribed by the regulation.

A student who fails in the Examination shall be allowed to appear next higher Semester examination.

19.2.1. The student may carry over his/her subject(s) as Arrear(s) till his/her end of the course. But he/she should register all the subjects in each and every semester.

If the University may under exceptional circumstances, partially or wholly cancel any examination conducted by it, shall intimate to the Academic Council of the University and arrange for conduct the re-examination in those subjects within the period of 30 days from the date of such cancellation.

Methods for Redressal of Grievances in Evaluation of Answer Scripts

19.4.1. Students who are not satisfied with the grades awarded can seek redressal by the methods given below

Sl. No.	Redressal Sought	Methodology
1.	Request for photocopy	To apply to CoE within 5

	of the answer script.	days of declaration of result along with the payment of the prescribed fee.
2.	Request for Revaluation of answer script.	
3.	Request for Revaluation along with the photocopy of answer script.	
4.	Request for revaluation after obtaining photocopy of the answer script (Refer at S.No.01.)	To apply to CoE within 5 days of obtaining the photocopy along with the payment of the prescribed fee.

## 20. CLASSIFICATION OF PERFORMANCE

Classification of performance of students in the examinations pertaining to the courses in a programme is done on the basis of numerical value of Cumulative Grade Point Average (CGPA). The concept of CGPA is based on Marks, Credits, Grade and Grade points assigned for different mark ranges. The following Table shows the relation between the range of marks, Grades and Grade points assigned.

Range of Marks	Grade	Grade Points (GP)
100 – 90	S	10
89 – 80	A	9
79 – 70	B	8
69 – 60	C	7
59 – 55	D	6
54 – 50	E	5
< 50	RA – (Re - Appear)	0
Shortage of Attendance	U	-
Withdrawal from examination	W	-
Absent	AB	-

The grade ‘**RA**’ denotes Failed in the particular subject(s) because of insufficient attendance which requires Reappearance (**RA**) for that particular course in the subsequent examinations. The grade ‘**RA**’ will figure in Result sheets and Grade Sheets.

The letter grade ‘**AB**’ denotes Eligible to write the particular subject(s) but absent for that subject(s) which requires Reappearance (**RA**) for that particular course in the subsequent examinations.

## 21. GRADE SHEETS

### Semester Grade Point Average (SGPA)

On completion of a semester, each student is assigned a Semester Grade Point Average which is computed as below for all courses registered by the student during that semester.

$$\text{Semester Grade Point Average (SGPA)} = \sum(C_i \times G_i) / \sum C_i$$

Where  $C_i$  is the credit for a course in that semester and  $G_i$  is the Grade Point earned

by the student for that course. The SGPA is rounded off to two decimals.

## 21.2 Cumulative Grade Point Average (CGPA)

The overall performance of a student at any stage of the Degree programme is evaluated by the Cumulative Grade Degree programme is evaluated by the Cumulative Grade Point Average (CGPA) up to that point of time.

$$\text{Cumulative Grade Point Average (CGPA)} = \frac{\sum_j \left\{ \frac{\sum_i (C_{ij} * G_{ij})}{\sum_i C_{ij}} \right\}}$$

Where 'j' indicates the semester number, 'i' indicates the course number in the semester 'j', C the credit for a course in any semester and G is the grade point earned by the student for that course. The CGPA is rounded off to two decimals.

### Issue of Grade sheets

Separate grade sheet for each semester will be given to the students by the CoE after the publication of the results.

After the completion of the programme a consolidated grade sheet will be issued to the student by the office of the CoE.

After results are declared, Grade Sheets will be issued to each student which will contain the following details:

1. The college in which the candidate has studied
2. The list of courses enrolled during the semester and the grade scored.
3. The Grade Point Average (GPA) for the semester and
4. The Cumulative Grade Point Average (CGPA) of all courses enrolled from first semester onwards.

## 22. CRITERIA FOR A PASS

A student shall be declared to be eligible for the award of the M.E/M.Tech. Degree provided the student has successfully completed the course requirements and has passed all the prescribed examinations in all the Four semesters (Six semesters for Part time candidates) within a maximum period of 4 years (6 years for Part time candidates) reckoned from the commencement of the first semester to which the candidate was admitted.

## 23. CLASSIFICATION OF SUCCESSFUL CANDIDATES

A successful candidate who secures 8.5 or above of the CGPA in aggregate and passing all the subjects in his/ her first appearance will be declared to have passed in First class with Distinction. Authorized break of study and authorized withdrawal examination are permissible

A successful candidate who secures 6.5. or above of the CGPA in aggregate and passing all the subjects within maximum of ten semesters for regular and a maximum of eight semesters for lateral entry students will be declared to have passed in First class.

Authorized break of study and authorized withdrawal from examination are permissible.

Candidates who have passed all the subjects as per regulations and not falling under the

clauses 23.1 and 23.2. shall be declared to have passed in second class.

A student who is absent for the end semester examination in a course / project work Viva-Voce after having registered for the same will be considered to have appeared for that examination for the purpose of classification.

#### **24. RANKING**

Students obtaining top 3 positions or top 10% in CGPA ranking (whichever is higher) in a branch will be considered as a rank holder. They should have passed all the prescribed courses in the first appearance and should have obtained a **CGPA of 8 and above**. The student should also have a clean record of discipline during the period of study. Special certificates will be given to rank holders. There should be at least five candidates to rank in particular discipline.

#### **25. AWARD OF DEGREE**

The award of Degree will be approved by the concern authority of the University. The degree and consolidated Grade Sheet will be issued by Vinayaka Missions University.

#### **26. INDUSTRIAL VISIT**

Every student is expected to complete the field visit / industrial training, if any, as prescribed in the curriculum. The Faculty Advisor in consultation with the Head of the Department will organize the visit. Faculty should accompany the students during Industrial visits.

#### **27. DISCIPLINE**

Every student is required to be disciplined and maintain decorum both inside and outside the college campus. They should not indulge in any activity which can bring down the reputation of the University or College. The Principal shall constitute a disciplinary committee consisting of Principal, Two Head of Department (of which one should be from the faculty of the student) to enquire into acts of indiscipline and notify the Academic Council about the disciplinary action taken.

#### **28. SPECIAL PROVISIONS -Option for Elective Courses**

A student can have the option of taking 2 elective courses from other departments.

#### **29. MODIFICATIONS OF REGULATIONS**

These regulations are subject to modifications from time to time as per the decisions of the apex body of the University

### **ANNEXURE - I**



**ELIGIBLE ENTRY QUALIFICATIONS FOR ADMISSION TO P.G PROGRAMMES OFFERED  
IN UNIVERSITY (VMKVEC & AVIT)**

Sl. No.	PG Programme Offered	Eligible Qualification
1.	M.E. in Structural Engineering	B.E. / B.Tech in Civil Engineering
2.	M.E. in Irrigation, Water Management and Resource Engineering	B.E. / B.Tech in Civil Engineering / Agriculture Engineering/ Geo-informatics
3.	M.E. in Environmental Engineering	B.E./B.Tech in Civil Engineering / Chemical Engineering / Geo-informatics / Biotechnology / Industrial Biotechnology ( or ) B.E./B.Tech ( any branch ) with 3 years of relevant experience / B.Tech. ( Energy and Environment Engineering ) Tamil Nadu Agricultural University, Coimbatore
4.	M.E. in Construction Engineering and Management	B.E. / B.Tech in Civil Engineering
5.	M.E. in Manufacturing Engineering	B.E. / B.Tech. in Production Engineering / Automobile Engineering / Mechanical Engineering / Industrial Engineering / Metallurgy Engineering / Manufacturing Engineering / Mechatronics Engineering / Material Science Engineering
6.	M.E. in Computer Aided Design	B.E. / B.Tech. in Mechanical Engineering / Automobile Engineering / Manufacturing Engineering / Production Engineering / Aerospace Engineering / Industrial Engineering / Mechatronics Engineering / Marine Engineering / Aeronautical Engineering
7.	M.E. in Thermal Engineering	B.E. / B.Tech. in Mechanical Engineering / Production Engineering / Automobile Engineering / Aeronautical Engineering / Aerospace Engineering / Mechatronics Engineering / Marine Engineering / Industrial Engineering / Manufacturing Engineering
8.	M.E. in Power Systems Engineering	B.E. / B.Tech. in Electrical and Electronics Engineering
9.	M.E. in Power Electronics and Drives	B.E. / B.Tech. in Electrical and Electronics Engineering / Electronics and Communication Engineering / Electronics and Instrumentation Engineering / Instrumentation and Control Engineering / Electronics Engineering / Instrumentation Engineering
10.	M.E. in Biomedical Engineering	B.E. / B.Tech. (All branches) M.Sc. in Medical Physics
11.	M.E. in VLSI Design	B.E. / B.Tech. in Electronics and Communication Engineering / Electronics and Tele-communication Engineering / Electrical and Electronics Engineering / Electronics Engineering / Instrumentation Engineering / Electronics and Instrumentation Engineering / Instrumentation and Control Engineering / Computer Science and Engineering / Information Technology
12.	M.E. in Applied Electronics	B.E. / B.Tech. in Electrical and Electronics Engineering / Electronics and Communication Engineering / Electronics

		Engineering / Electronics and Instrumentation Engineering / Instrumentation and Control Engineering / Instrumentation Engineering / Biomedical Engineering / Biomedical Instrumentation Engineering / Medical Electronics
13.	M. Tech. in Information technology (Only Full Time mode available)	B.E. / B.Tech. in Electrical and Electronics Engineering / Electronics and Communication Engineering / Information Technology / Computer Science and Engineering/ Computer Science & Software Engineering / Electronics Engineering / Computer Hardware and Software
14.	M.Tech. in Bio-Technology	B.E. / B.Tech. in Chemical Engineering / Leather Engineering / Genetic Engineering / Bio-Chemical Engineering / Industrial Bio-Technology / Petroleum Engg. / Tech. / Bio-Technology / Petrochemicals Engineering / Agricultural Bio-Technology / Petroleum Refining & Petro Chemicals / Chemical and Electrochemical Engineering
15.	M.E.in Embedded System Technology	B.E. / B.Tech. in Electrical and Electronics Engineering / Electronics and Communication Engineering / Computer Science and Engineering / Instrumentation and Control Engineering / Electronics and Instrumentation Engineering / Information Technology / Electronics Engineering / Instrumentation Engineering
16.	M.E.in Computer Science and Engineering	B.E. / B.Tech. in Electrical and Electronics Engineering / Electronics and Communication Engineering / Electronics Engineering / Electronics and Telecommunication Engineering / Information Technology / Computer Science and Engineering / Instrumentation and Control Engineering / Electronics and Instrumentation Engineering / Instrumentation Engineering / Instrumentation Engineering / Computer Hardware & Software Engineering / Computer Science and Software Engineering M.Sc. (5 years integrated) in Information Technology / Computer Science / Software Engineering B.Sc. (3 years) in IT related major courses & M.Sc. (2 years) in IT related major courses in Information Technology / Computer Science M.C.A (10+2+3+3) years Pattern
17.	M.E. in Disaster Mitigation and Management	B.E. / B.Tech. (All Branches)
18.	M.E.in Solid Waste Management	B.E. / B.Tech. (All Branches)

**ANNEXURE - II**  
**PROFORMA FOR RE-ADMISSION**

1. Name of the student with Register No. :
  2. Name of the course and period of study :
  3. Name of the Faculty / College :
  4. Date of Joining the course :
  5. Duration of break of study :
  6. Details of examinations appeared & Subjects passed :
  7. Reasons for the break of study of the course (Evidence should be produced) :
  8. The details of previous break of study (Enclose Xerox copy of the condonation order) :
  9. Whether his / her own vacancy is available for rejoining the course:
  10. Whether any disciplinary action taken or under investigation :
  11. Whether the candidate has paid the prescribed fee for readmission sought for (furnish the details)
- Processing Fee: Rs.500/- Condonation
- Fee: Rs.1,000/- Per year of part there of (or) as revised by the University from time to time). :
12. Previous correspondence if any (Furnish copies of relevant records) :
  13. Recommendation of the Dean/Principal /Director concerned :

This is to certify that the details furnished above in respect of the candidate are verified and found to be correct.

Signature of Dean / Principal / Director  
(with seal)

Sl. No.	Name of the Candidate (s)	Name of the Course and Branch (if applicable)	Total No. of working days/ hours for the year / semester	Minimum No.ofdays required for attendance certificate	No. of days attended by the candidate	Actual shortage of attendance
1	2	3	4	5	6	7
1.						
2.						
3.						
4.						
5.						

1. Requested condonation of attendance in respect of the above candidate/s as the shortage of attendance is within prescribed condonation limit.

2. The Demand Draft(s) for Rs..... being the fee for condonation of shortage of attendance, drawn in favor of **The registrar, Vinayaka Mission's Research Foundation - Deemed University, Salem** is / are enclosed.

Date :

Place :

Recommended by

Approved by

(Head of the Institution)

(Signature with college seal)

**VICE CHANCELLOR**

(Signature with seal)

**Note :**

1. The fee prescribed for condonation of shortage of attendance as specified by the university shall be paid by the student.
2. The forms should reach the University at least 15 days before the commencement of respective University Examinations.
3. A separate list (Three copies, Degree wise) showing candidates who have not earned the required attendance and are not eligible for condonation should also be sent at least 15 days before the commencement of Examination.

## DECLARATION

I ..... Son of / Daughter of

.....

Residing at .....

and admitted to in I year of.....

(Name of the College) do hereby solemnly affirm and sincerely state as follows.

I declare that I shall abide by the Rules and Regulations  
..... (Course) including prescribed by the Vinayaka Missions

University, Salem for the regulations for re-admission after the break of study.

Date:

Signature of the Candidate

/Counter signed/

Dean/Principal/Director

(Office date seal)

#### ANNEXURE-IV

**M.E. / M.Tech. DEGREE PROGRAMMES OFFERED  
AND IT'S MINIMUMU PRESCRIBED TOTAL CREDITS FOR AWARDING THE DEGREE**

<b>Sl. No</b>	<b>Name of the Degree</b>	<b>Name of the Branch</b>	<b>Minimum Total Credits Required</b>
1.	M.E.	Structural Engineering	80
2.	M.E.	Irrigation, Water Management and Resource Engineering	80
3.	M.E.	Environmental Engineering	80
4.	M.E.	Construction Engineering and Management	80
5.	M.E.	Manufacturing Engineering	68
6.	M.E.	Computer Aided Design	73
7.	M.E.	Thermal Engineering	73
8.	M.E.	Power Systems Engineering	71
9.	M.E.	Power Electronics and Drives	73
10.	M.E.	Solid Waste Management	80
11.	M.E.	Embedded System Technology	72
12.	M.E.	Computer Science and Engineering	69
13.	M.E.	Biomedical Engineering	74
14.	M.E.	VLSI Design	71
15.	M.E.	Applied Electronics	72
16.	M.E.	Disaster Mitigation and Management	80
17.	M.Tech.	M. Tech. Information technology (Only Full Time. Part Time Course is not available.)	69
18.	M.Tech.	M.Tech. Bio-Technology	75

**VINAYAKA MISSION'S RESEARCH FOUNDATION  
DEEMED UNIVERSITY, INDIA**

**FACULTY OF ENGINEERING, TECHNOLOGY AND  
MANAGEMENT SCIENCES**

**VMKV ENGINEERING COLLEGE, SALEM  
&  
ARUPADAI VEEDU INSTITUTE OF TECHNOLOGY, PAIYANOOR  
CHENNAI**

**DEPARTMENT OF CIVIL ENGINEERING**

**MASTER OF ENGINEERING– CONSTRUCTION ENGINEERING  
AND MANAGEMENT**

**(Part Time) – 3 Years**

**CURRICULUM AND SYLLABUS  
2012**

**DURATION OF THE COURSE**

**3 YEARS**

**COURSE OF STUDY**

**MASTER OF ENGINEERING – CONSTRUCTION ENGINEERING AND  
MANAGEMENT**

**(PART TIME)**



**SEMESTER I**

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1		Statistical Methods and Queuing Theory	3	1	0	4
2		Modern Construction Materials	3	1	0	4
3		Construction Equipment	3	1	0	4
Total			9	3	0	12

**SEMESTER II**

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1		Project Formulation and Appraisal	3	1	0	4
2		Elective I	3	1	0	4
3		Elective II	3	1	0	4
Total			9	1	0	10

**SEMESTER III**

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1		Advanced Construction Techniques	3	1	0	4
2		Contract Laws and Regulations	3	1	0	4
3		Construction Planning, Scheduling and Control	3	1	0	4
TOTAL			9	3	0	12

**SEMESTER IV**

<b>SL. NO.</b>	<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>THEORY</b>						
1		Computer Applications in Construction Engineering and Planning	3	1	0	4
2		Elective III	3	1	0	4
3		Elective IV	3	1	0	4
TOTAL			9	1	0	10

**SEMESTER V**

<b>SL. NO.</b>	<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>THEORY</b>						
1		Elective V	3	1	0	4
2		Elective VI	3	1	0	4
3		Elective VII	3	1	0	4
4.		Project work – Phase I	0	0	12	6
TOTAL			9	0	12	15

**SEMESTER VI**

<b>SL. NO.</b>	<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
1		Project Work – Phase II	0	0	24	12

## **ELECTIVES**

<b>SL. No</b>	<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
1		Advanced Concrete Technology	3	1	0	4
2		Shoring, Scaffolding and Formwork	3	1	0	4
3		System Integration in Construction	3	1	0	4
4		Energy Conservation Techniques in Building Construction	3	1	0	4
5		Construction of Pavements	3	1	0	4
6		Construction Project Management	3	1	0	4
7		Quantitative Techniques in Management	3	1	0	4
8		Construction Personnel Management	3	1	0	4
9		Business Economics and Finance Management	3	1	0	4
10		Quality Control and Assurance in Construction	3	1	0	4
11		Resource Management and Control in Construction	3	1	0	4
12		Project Safety Management	3	1	0	4
13		Management Information Systems	3	1	0	4
14		Maintenance and Rehabilitation of Structures	3	1	0	4
15		Cyber Security	3	1	0	4

SEMESTER	COURSE CODE	COURSE TITLE	L	T	P	C
I		STATISTICAL METHODS AND QUEUEING THEORY	3	1	0	4

**OBJECTIVE:**

- To study and understand the concepts of probability function, Random variable.
- To study the role and methods of Estimation theory.
- The students know about testing of hypotheses.
- To Expose the students knowledge of design of Experiments.
- To acquire the knowledge of Queueing Models and steady state analysis.

**UNIT I ONE DIMENSIONAL RANDOM VARIABLE 9**

Random variables - Probability function – moments – moment generating functions and their properties – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions – Function of a Random Variable.

**UNIT II ESTIMATION THEORY 9**

Unbiased Estimators – Method of Moments – Maximum Likelihood Estimation - Curve fitting by Principle of least squares – Regression Lines.

**UNIT III TESTING OF HYPOTHESES 9**

Sampling distributions - Type I and Type II errors - Tests based on Normal, t,  $\chi^2$  and F distributions for testing of mean, variance and proportions – Tests for Independence of attributes and Goodness of fit.

**UNIT IV DESIGN OF EXPERIMENTS 9**

Analysis of variance – One-way and two-way classifications – Completely randomized design – Randomized block design – Latin square design.

**UNIT V QUEUEING MODELS 9**

Poisson Process – Markovian queues – Single and Multi Server Models – Little's formula Machine Interference Model – Steady State analysis – Self Service queue.

**TOTAL: 45 HOURS**

**REFERENCES:**

1. Jay L. Devore, Probability and Statistics and Probability for Engineers, CENGAGE Learning, Indian Edition, Singapore, 2008.
2. D. C. Montgomery, G. C. Runger, Applied Statistics and Probability for Engineers, Third Edition, John Wiley and Sons, 2007.
3. D. Gross, C. M. Harris, Fundamentals of Queueing Theory, Third Edition, John Wiley and Sons, 2002.
4. Walpole, R.E., Myer, R.H., Myer, S.L. and Ye, K., Probability and Statistics for Engineers and Scientists, 7th edition, Pearson Education, Delhi, 2002.

5. Vohra, N.D. “Quantitative Techniques in Management”, Tata McGraw – Hill Company Limited, 2007.
6. Gupta, S. C. and Kapoor, V. K., Fundamentals of Mathematical Statistics, Sultan Chand and Sons, New Delhi, 2001.
7. Taha, H. A., Operations Research: An Introduction, Seventh Edition, Pearson Education Edition, Asia, New Delhi , 2002.

SEMESTER	COURSE CODE	COURSE TITLE	L	T	P	C
I		MODERN CONSTRUCTION MATERIALS	3	1	0	4

#### **OBJECTIVE:**

- To study and understand the concepts of special concretes.
- To study the role of Coating reinforcement and Application.
- The students know about Reinforced polymers.
- To Expose the students knowledge of water proofing Compounds.
- To acquire the knowledge of intelligent materials.

#### **UNIT I SPECIAL CONCRETES 9**

Concretes, Behaviour of concretes - High Strength and High Performance Concrete – Fibre Reinforced Concrete, Self compacting concrete, Alternate Materials to concrete

#### **UNIT II METALS 9**

Steels - New Alloy Steels – Aluminum and its Products –Coatings to reinforcement – Applications.

#### **UNIT III COMPOSITES 9**

Plastics –Reinforced Polymers – FRP – Applications

#### **UNIT IV OTHER MATERIALS 9**

Water Proofing Compounds – Non-weathering Materials – Flooring and Facade Materials

#### **UNIT V SMART AND INTELLIGENT MATERIALS 9**

Smart and Intelligent Materials for intelligent buildings - Special features

**TOTAL:45HOURS**

#### **REFERENCES:**

1. Santhakumar.A.R., Concrete Technology, Oxford University press, New Delhi. 2007.
2. Mamlouk, M.S. and Zaniewski, J.P., Materials for Civil and Construction Engineers, Prentice Hall Inc., 1999.
3. Ashby, M.F. and Jones.D.R.H.H. “Engineering Materials 1: An introduction to Properties, applications and designs”, Elsevier Publications, 2005.
4. Shan Somayaji, Civil Engineering Materials, Prentice Hall Inc., 2001
5. Aitkens , High Performance Concrete, McGraw Hill, 1999
6. Deucher, K.N, Korfiatis, G.P and Ezeldin, A.S, Materials for civil and Highway Engineers, Prentice Hall Inc., 1998.

7. Shetty M.S, Concrete Technology: Theory and Practice, S.Chand & Company Ltd., 2005.
8. ACI Report 440.2R-02, “Guide for the design and construction of externally bonded RP systems for strengthening concrete structures”, American Concrete Institute, 2002.

SEMESTER	COURSE CODE	COURSE TITLE	L	T	P	C
I		CONSTRUCTION EQUIPMENT	3	1	0	4

**OBJECTIVE:**

- To study and understand the concepts of construction Equipment and management.
- To study the role and methods of Earth moving operations and Earth work Equipment.
- The students know about Equipment for Dewatering and Grouting.
- To Expose the students knowledge of portable material bins.
- To acquire the knowledge of Batching and Mixing Equipment.

**UNIT I CONSTRUCTION EQUIPMENT MANAGEMENT 9**

Identification – Planning - Equipment Management in Projects - Maintenance Management – Replacement - Cost Control of Equipment - Depreciation Analysis – Safety Management

**UNIT II EQUIPMENT FOR EARTHWORK 9**

Fundamentals of Earth Work Operations - Earth Moving Operations - Types of Earth Work Equipment - Tractors, Motor Graders, Scrapers, Front end Waders, Earth Movers

**UNIT III OTHER CONSTRUCTION EQUIPMENTS 9**

Equipment for Dredging, Trenching, Tunneling, Drilling, Blasting - Equipment for Compaction - Erection Equipment - Types of pumps used in Construction - Equipment for Dewatering and Grouting – Foundation and Pile Driving Equipment – Equipment for Demolition.

**UNIT IV MATERIALS HANDLING EQUIPME 9**

Forklifts and related equipment - Portable Material Bins – Conveyors - Hauling Equipment

**UNIT V EQUIPMENT FOR PRODUCTION OF AGGREGATE AND CONCRETING 9**

Crushers – Feeders - Screening Equipment - Handling Equipment - Batching and Mixing Equipment - Hauling, Pouring and Pumping Equipment – Transporters

**TOTAL: 45 HOURS**

**REFERENCES:**

1. Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C., Construction Planning, Equipment and Methods, McGraw Hill, Singapore, 2006.
2. Sharma S.C. Construction Equipment and Management, Khanna Publishers, New Delhi, 1988.



3. Deodhar, S.V. Construction Equipment and Job Planning, Khanna Publishers, New Delhi, 1988.
4. Dr.Mahesh Varma, Construction Equipment and its planning and Application, Metropolitan Book Company, New Delhi. 1983.

SEMESTER	COURSE CODE	COURSE TITLE	L	T	P	C
II		PROJECT FORMULATIONS AND APPRAISAL	3	1	0	4

#### **OBJECTIVE:**

- To study and understand the concepts of project formulation.
- To study the role and methods of project cash flows and project costing.
- The students know about International Practice of appraisal.
- To Expose the students knowledge of Project Financing.
- To acquire the knowledge of Private Sector Participation

#### **UNIT I PROJECT FORMULATION 9**

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

#### **UNIT II PROJECT COSTING 9**

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

#### **UNIT III PROJECT APPRAISAL**

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

#### **UNIT IV PROJECT FINANCING 9**

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

#### **UNIT V PRIVATE SECTOR PARTICIPATION 9**

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

**TOTAL: 45**

#### **HOURS**

#### **REFERENCES:**

1. Prasanna Chandra, Projects – Planning, Analysis, Selection, Implementation Review, Tata McGraw Hill Publishing Company Ltd., New Delhi. 2006.
2. Joy P.K., Total Project Management - The Indian Context, New Delhi, Macmillan India Ltd., 1992

3. United Nations Industrial Development Organisation (UNIDO) Manual for the Preparation of Industrial Feasibility Studies, (IDBI Reproduction) Bombay, 1987
4. Barcus, S.W. and Wilkinson.J.W., Hand Book of Management Consulting Services, McGraw Hill, New York, 1986.

<b>SEMESTER</b>	<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
II		ELECTIVE:I	3	0	0	3

<b>SEMESTER</b>	<b>COURSE CODE</b>	<b>SUBJECT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
II		<b>ELECTIVE:II</b>	3	0	0	3

SEMESTER	COURSE CODE	SUBJECT	L	T	P	C
III		<b>ADVANCED CONSTRUCTION TECHNIQUES</b>	3	1	0	4

**OBJECTIVE:**

- To study and understand the Sub Structure Construction.
- To study the role of concrete paving technology, super structure construction for buildings.
- The students know about Advanced construction techniques for offshore structures.
- To Expose the students knowledge of Rehabilitation Technique.
- To acquire the knowledge of Advanced techniques of Demolition.

**UNIT I SUB STRUCTURE CONSTRUCTION 9**

Box jacking - pipe jacking - Under water construction of diaphragm walls and basement - Tunneling techniques - piling techniques - driving well and caisson - sinking cofferdam - cable anchoring and grouting - driving diaphragm walls, sheet piles - laying operations for built up offshore system - shoring for deep cutting - large reservoir construction - well points - dewatering and stand by plant equipment for underground open excavation.

**UNIT II SUPER STRUCTURE CONSTRUCTION FOR BUILDINGS 9**

Vacuum dewatering of concrete flooring – concrete paving technology – techniques of construction for continuous concreting operation in tall buildings of various shapes and varying sections – launching techniques – suspended form work – erection techniques of tall structures, large span structures – launching techniques for heavy decks – insitu prestressing in high rise structures, aerial transporting handling erecting lightweight components on tall structures.

**UNIT III CONSTRUCTION OF SPECIAL STRUCTURES 9**

Erection of lattice towers and rigging of transmission line structures – construction sequence in cooling towers, silos, chimney, sky scrapers, bow string bridges, cable stayed bridges – launching and pushing of box decks – Advanced construction techniques for offshore structures – construction sequence and methods in domes and prestress domes – support structure for heavy equipment and conveyor and machinery in heavy industries – erection of articulated structures, braced domes and space decks.

**UNIT IV REHABILITATION TECHNIQUES 9**

Mud jacking grout through slab foundation - micropiling for strengthening floor and shallow profile - pipeline laying - protecting sheet piles, screw anchors - sub grade water proofing, underpinning, crack stabilization techniques.

**UNIT V DEMOLITION 9**

Advanced techniques and sequence in demolition and dismantling.

**TOTAL: 45 HOURS**

**REFERENCES:**

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

SEMESTER	COURSE CODE	COURSE TITLE	L	T	P	C
III		<b>CONTRACT LAWS AND REGULATIONS</b>	3	1	0	4

#### **OBJECTIVE:**

- To study and understand the Elements of Contracts.
- To study the role of Contract Formation and Interpretation.
- The students know about Comparison of Actions and Laws.
- To Expose the students knowledge of Tax Laws.
- To acquire the knowledge of Labour Regulations and Welfare Legislation.

#### **UNIT – I CONSTRUCTION CONTRACTS 9**

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

#### **UNIT – II TENDERS 9**

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

#### **UNIT – III ARBITRATION 9**

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

#### **UNIT – IV LEGAL REQUIREMENTS 9**

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

#### **UNIT – V LABOUR REGULATIONS 9**

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

**TOTAL: 45 HOURS**



**REFERENCES:**

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

SEMESTER	COURSE CODE	COURSE TITLE	L	T	P	C
III		<b>CONSTRUCTION PLANNING, SCHEDULING AND CONTROL</b>	3	1	0	4

**OBJECTIVE:**

- To study and understand the concepts construction planning.
- To study the role of Method Critical Path and scheduling procedures and techniques.
- The students know about cost control problem, financial accounting system.
- To Expose the students knowledge of quality control.
- To learn about types of project information.

**UNIT – I CONSTRUCTION PLANNING 9**

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

**UNIT – II SCHEDULING PROCEDURES AND TECHNIQUES 9**

Construction Schedules - Critical Path Method – Scheduling Calculations - Float - Presenting Project Schedules - Scheduling for Activity-on-Arrow and with Leads, Lags, and Windows - Scheduling with Resource Constraints and Precedences - Use of Advanced Scheduling Techniques - Scheduling with Uncertain Durations - Calculations for Monte Carlo Schedule Simulation - Crashing and Time/Cost Tradeoffs - Improving the Scheduling Process.

**UNIT – III COST CONTROL, MONITORING AND ACCOUNT 9**

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

**UNIT – IV QUALITY CONTROL AND SAFETY DURING CONSTRUCTION 9**

Quality and Safety Concerns in Construction - Organizing for Quality and Safety - Work and Material Specifications - Total Quality Control - Quality Control by Statistical Methods - Statistical Quality Control with Sampling by Attributes - Statistical Quality Control with Sampling by Variables - Safety

**UNIT – V ORGANIZATION AND USE OF PROJECT INFORMATION 9**

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

**TOTAL: 45 HOURS**

**REFERENCES:**

1. Chitkara, K.K. Construction Project Management: Planning, Scheduling and Control, Tata McGraw-Hill Publishing Company, New Delhi, 1998.
2. Calin M. Popescu, Chotchai Charoenngam, Project Planning, Scheduling and Control in Construction: An Encyclopedia of terms and Applications, Wiley, New York, 1995.
3. Chris Hendrickson and Tung Au, Project Management for Construction – Fundamental Concepts for Owners, Engineers, Architects and Builders, Prentice Hall, Pittsburgh, 2000.
4. Willis, E. M., Scheduling Construction Projects, John Wiley & Sons, 1986.
5. Halpin, D. W., Financial and Cost Concepts for Construction Management, John Wiley & Sons, New York, 1985.

SEMESTER	COURSE CODE	COURSE TITLE	L	T	P	C
IV		COMPUTER APPLICATIONS IN CONSTRUCTIONENGINEERING AND PLANNING	3	1	0	4

#### **OBJECTIVE:**

- To study and understand the introduction of system hardware.
- To study the role and methods of optimization techniques.
- The students know about inventory models.
- To Expose the students knowledge of scheduling application.
- To learn about project planning and scheduling.

#### **UNIT I INTRODUCTION 9**

Introduction to System Hardware – Languages – Feasibility study and analysis – procurement, training, implementation and system management – procedural language - developing application with spread sheet -developing application with files and database software.

#### **UNIT II OPTIMIZATION TECHNIQUES 9**

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

#### **UNIT III INVENTORY MODELS 9**

Deterministic and Probabilistic Inventory Models - Software applications

#### **UNIT IV SCHEDULING APPLICATION 9**

PERT and CPM - Advanced planning and scheduling concepts – Computer applications – case study.

#### **UNIT V OTHER PROBLEMS 9**

Estimating – project planning and scheduling- accounting and cost engineering – Enterprises – Introduction to ERP systems - operations simulation

**TOTAL: 45 HOURS**

#### **REFERENCES:**

1. Billy E.Gillet., Introduction to Operations Research – A Computer Oriented Algorithmic Approach, Tata Mc Graw Hill, 1990
2. Paulson, B.R., Computer Applications in Construction, Mc Graw Hill, 1995

3. Feigenbaum,L., Construction Scheduling with Primavera Project Planner  
Prentice Hall Inc., 2002
4. Ming Sun and Rob Howard, “Understanding I.T. in Construction, Spon Press,  
Taylor and Francis Group, London and New York, 2004.

<b>SEMESTER</b>	<b>COURSE CODE</b>	<b>SUBJECT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
IV		<b>ELECTIVE:III</b>	3	0	0	3

<b>SEMESTER</b>	<b>COURSE CODE</b>	<b>SUBJECT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
IV		<b>ELECTIVE:IV</b>	3	0	0	3

<b>SEMESTER</b>	<b>COURSE CODE</b>	<b>SUBJECT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
V		<b>ELECTIVE:V</b>	3	0	0	3



<b>SEMESTER</b>	<b>COURSE CODE</b>	<b>SUBJECT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
V		<b>ELECTIVE:VI</b>	3	0	0	3

<b>SEMESTER</b>	<b>COURSE CODE</b>	<b>SUBJECT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
V		<b>ELECTIVE:VII</b>	3	0	0	3

<b>SEMESTER</b>	<b>COURSE CODE</b>	<b>SUBJECT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
V		<b>Project work –phase-I</b>	0	0	12	6

<b>SEMESTER</b>	<b>COURSE CODE</b>	<b>SUBJECT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
VI		<b>Project work- phase-II</b>	0	0	24	12

SEMESTER	COURSE CODE	COURSE TITLE	L	T	P	C
		<b>ELECTIVE:ADVANCED CONCRETE TECHNOLOGY</b>	3	0	0	3

#### **OBJECTIVE:**

- To study and understand the concrete ingredients.
- To study the role of fibre reinforced concrete.
- The students know about concrete mix design and high strength concrete.
- To Expose the students knowledge of mechanical properties of concrete.
- To acquire the knowledge of durability of concrete.

#### **UNIT I CONCRETE INGREDIENTS 9**

Composition of OPC – Manufacture – Modified Portland Cements – Hydration Process of Portland Cements – Structure of Hydrated Cement Pastes

Mineral Admixtures – Slags – Pozzolanas and Fillers – Chemical Admixtures – Solutes – Retarders – Air Entraining Agents – Water Proofing Compounds – Plasticizers and Super Plasticizers

Aggregates – Properties and testing of fine and course aggregates – combining of aggregates – Substitute material for aggregates – recent advancements.

#### **UNIT II SPECIAL CONCRETES 9**

Fibre Reinforced Concrete – Self Compacting Concrete – Polymer Concrete – High performance concrete – Sulphur concrete.

#### **UNIT – II CONCRETE MIX DESIGN 9**

Mix Proportioning – Mixes incorporating Fly ash, Silica fume, GGBS – Mixes for High Performance Concrete – High strength concrete – variations in concrete strength.

#### **UNIT IV MECHANICAL PROPERTIES OF CONCRETE 9**

Interfacial Transition Zone – Fracture Strength – Compressive strength – Tensile strength - Impact strength - Bond strength.

#### **UNIT V DURABILITY OF CONCRETE 9**

Factors affecting durability – Chemical Attack – Permeability – chloride penetration – water absorption – creep – Shrinkage.

**TOTAL: 45 HOURS**

#### **REFERENCES:**

1. Santhakumar.A.R., Concrete Technology, Oxford University press, New Delhi. 2007.

2. Gambhir.M.L., Concrete Technology – Tata McGraw Hill Book Co. Ltd.,Delhi, 2004.
3. Neville, A.M., Properties of Concrete, Longman, 1995.
4. Metha P.K.and Montreio P.J.M., Concrete Structure Properties and Materials, Prentice Hall, 1998.
5. Gupta.B.L. and Amit Gupta, Concrete Technology, Standard Publishers Distributer, New Delhi, 2004.

SEMESTER	COURSE CODE	COURSE TITLE	L	T	P	C
		ELECTIVE: SHORING, SCAFFOLDING AND FORMWORK	3	0	0	3

### OBJECTIVE:

- To study and understand the planning and site equipment.
- To study the role of form materials, nails inplywood.
- The students know about design of forms and shores.
- To Expose the students knowledge of form work for building.
- To acquire the knowledge of Hyperbolic Folded plates.

### UNIT I PLANNING AND SITE EQUIPMENT & PLANT FOR FORM WORK 9

At Tender stage – Development of basic system – Planning for maximum reuse – Economical form construction – Planning examples – Crane size, effective scheduling estimate – Recheck plan details – Detailing the forms.

Overall Planning – detail planning – Standard units – Corner units – Schedule for column formwork – Formwork elements – Planning Crane arrangements – Site layout plan – Transporting plant – Formwork beams – Formwork ties – Wales and ties – scaffold frames from accessories – Vertical transport table form work.

### UNIT II FORM MATERIALS 9

Lumber – Types – Finish – Sheathing boards working stresses – Repetitive member stress – Plywood – Types and grades – Textured surfaces and strength – Reconstituted wood – Steel – Aluminum Form lining materials – Hardware and fasteners – Nails in Plywood

Concrete density – Height of discharge – Temperature – Rates of Placing – Consistency of concrete – Live loads and wind pressure – Vibration Hydrostatic pressure and pressure distribution – Examples – Vertical loads - Uplift on shores – Adjustment for non standard conditions.

### UNIT III DESIGN OF FORMS AND SHORES 9

Basic simplification – Beam formulas – Allowable stresses – Deflection bending lateral stability – Shear, Bearing – Examples in wall forms – Slab forms – Beam forms – Ties, Anchors and Hangers – Column forms – Examples in each.

Simple wood stresses – Slenderness ratio – Allowable load – Tubular steel shores patented shores – Site Preparation, Size and spacing – Steel Tower Frames – Safety practices – Horizontal shores shoring for multistories – More concentrated shore loads T- heads – Tow Tier wood shores – Ellis shores – Dayton sure grip and Baker Roofs shores – Safeway Symons shores – Beaver – advance shores Dead shore – Raking and Flying shores.

#### **UNIT IV FORMWORK FOR BUILDINGS**

**9**

Location of job mill – Storage – Equipment – Footings – Wall footings – Column footings Sloped footing forms – Curb and gutter forms – Wall forms –Prefabricated panel systems – Giant forms curved wall forms – Column heads – Beam or girder forms – Beam pockets – Suspended forms – Concrete joint construction – Flying system forms.

Causes of failures – Inadequate shoring inadequate bracing of members – improper vibration – Premature stripping – Errors in design – Failure to follow codes – How formwork affects concretes quality – ACI – Case studies – Finish of exposed concrete design deficiencies – Safety factors – Prevention of rotation – Stripping sequence – Advantages of reshoring.

#### **UNIT V FORMS FOR DOMES AND TUNNELS, SLIP FORMS AND SAFETY PRACTICES FOR SCAFFOLDS**

**9**

Hemispherical, Parabolic, Translational typical barrel vaults, Hyperbolic Folded plates – Shell form design considerations loads – Inserts , Anchors bolts – Building the forms- Placing concrete – Form removed – Strength requirements – Tunnel forming components – Curb forms invert forms – Arch forms – Concrete placement methods – Cut and cover construction – Tolerances – Form construction – Shafts.

Slip Forms - Principles – Types – advantages – Functions of various components – Planning – Desirable characteristics of concrete – Common problems faced – Safety in slip forms special structures built with slip form Technique – Codal provisions - Types of scaffolds – Putlog and independent scaffold – Single pole scaffolds – Fixing ties – Spacing of ties plan – bracing – knots – safety net – General safety requirements – precautions against particular hazards – Truss suspended – Gantry and system scaffolds.

**TOTAL: 45 HOURS**

#### **REFERENCES:**

1. Robert L. Peurifoy and Garold D. Oberlender, Formwork For Concrete Structures, McGraw – Hill , 1996.
2. Hurd, M.K., Formwork for Concrete, Special Publication No.4, American Concrete Institute, Detroit, 1996



3. Michael P. Hurst, Construction Press, London & New York, 2003
4. Austin, C.K., Formwork for Concrete, Cleaver – Hume Press Ltd., London, 1996.

SEMESTER	COURSE CODE	COURSE TITLE	L	T	P	C
		<b>ELECTIVE: SYSTEM INTEGRATION IN CONSTRUCTION</b>	3	0	0	3

**OBJECTIVE:**

- To study and understand the structural integration.
- To study the role of environmental factors and weather resistance.
- The students know about Vertical circulation and their interaction.
- To Expose the students knowledge of Feasibility for replacement of damaged components.
- To acquire the knowledge of fire escape system and design.

**UNIT I STRUCTURAL INTEGRATION**

**9**

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

**UNIT II ENVIRONMENTAL FACTORS**

**9**

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

**UNIT III SERVICES**

**9**

Plumbing – Electricity – Vertical circulation and their interaction - HVAC

**UNIT – IV MAINTENANCE**

**9**

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

**UNIT – V SAFETY**

**9**

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

**TOTAL: 45 HOURS**

**REFERENCES:**

1. William T. Mayer, Energy Economics and Building Design , McGraw-Hill Book Company, 1983.
2. Peter R. Smith and Warren G. Julian, Building Services, Applied Science Publishers Ltd., London, 1993.

3. A.J.Elder and Martiz Vinden Barg, Handbook of Building Enclosure, McGraw-Hill Book Company, 1983.
4. Jane Taylor and Gordin Cooke, The Fire Precautions Act in Practices, 1987.
5. David V.Chadderton, Building Services Engineering, Taylar and Francis, 2007.

SEMESTR	COURSE CODE	COURSE TITLE	L	T	P	C
		<b>ELECTIVE:ENERGYCONSERVATION TECHNIQUES IN BUILDING CONSTRUCTION</b>	3	0	0	3

#### **OBJECTIVE:**

- To study and understand the fundamentals of energy.
- To study the role of energy and resource conservation and design of green building.
- The students know about Advanced building technologies.
- To Expose the students knowledge of energy in building design.
- To acquire the knowledge of energy management

#### **UNIT I INTRODUCTION 9**

Fundamentals of energy- Energy Production Systems-Heating, Ventilating and Air-conditioning – Solar Energy and Conservation – Energy Economic Analysis – Energy conservation and audits – Domestic energy consumption – savings - challenges – primary energy use in buildings - Residential – Commercial – Institutional and public buildings – Legal requirements for conservation of fuel and power in buildings.

#### **UNIT II ENVIRONMENTAL 9**

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

#### **UNIT III DESIGN 9**

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

#### **UNIT IV SERVICES 9**

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

## **UNIT V ENERGY MANAGEMENT**

**9**

Energy management of electrical equipment - Improvement of power factor – Management of maximum demand – Energy savings in pumps – Fans – Compressed air systems – Energy savings in Lighting systems – Air conditioning systems – Applications – Facility operation and maintenance – Facility modifications – Energy recovery dehumidifier – Waster heat recovery – Steam plants and distribution systems – Improvement of boiler efficiency – Frequency of blow down – Steam leakage – steam Flash and condense return.

**TOTAL: 45 HOURS**

### **REFERENCES:**

1. Moore F., Environmental Control system Mc Graw Hill, Inc. 1994.
2. Brown, GZ, Sun, Wind and light: Architectural design strategies, John Wiley & Sons, 1985.
3. Cook, J, Award – Winning passive Solar Design, Mc Graw Hill, 1984.
4. J.R. Waters, Energy conservation in Buildings: A Guide to part L of the Building Regulations, Blackwell Publishing, 2003.

SEMESTER	COURSE CODE	COURSE TITLE	L	T	P	C
		<b>ELECTIVE: CONSTRUCTION OF PAVEMENTS</b>	3	0	0	3

**OBJECTIVE:**

- To study and understand the testing and application of road making aggregates.
- To study the role of properties of bituminous mixtures.
- The students know about Properties of fresh and hardened concrete.
- To Expose the students knowledge of road making machineries.
- To acquire the knowledge of bituminous quality.

**UNIT I ROAD MAKING MATERIALS FOR FLEXIBLE AND RIGID PAVEMENTS**

Classification, testing and applications of road making aggregates – Road binders – Bitumen - Cement

**UNIT II PROPERTIES OF BITUMINOUS MIXTURES** 9

Resistance of bituminous mixtures to permanent deformation – Flexibility and brittleness - Common mechanical tests – Permeability characteristics – Weathering of bituminous road surfacing – Adhesion of bituminous binders to road aggregates – Effect of aggregate size in bituminous courses – Temperature susceptibility of bituminous courses – Design of bituminous mixes.

**UNIT III PROPERTIES OF PAVEMENT QUALITY CONCRETE MIXTURES AND CONSTRUCTION PRACTICE** 9

Properties of fresh and hardened concrete – laboratory tests – Design of concrete mixes for Pavement Quality Concrete.

Construction of various layers in rigid and flexible pavements – Quality assurance during construction – sampling and analysis.

**UNIT IV MACHINERIES** 9

Road making machineries – Road formation, bituminous constructions - Road surface evaluation

**UNIT V LATEST ADVANCEMENTS** 9

Methods to improve bitumen quality – Rheological and chemical additives – Polymer modified bitumen – Super pave concepts – Recycling of bituminous courses – Smart materials for cement concrete pavement – Use of admixtures and fibres.

**TOTAL: 45 HOURS**

## **REFERENCES:**

1. Mix Design Methods for Asphalt Concrete and other Hot mix types MS 2, Sixth Edition, The Asphalt Institute, 1997.
2. Edwin J. Barth, Asphalt Science and Technology, Gordon and Breach Science Publishers, New York, 1984.
3. Bituminous materials in road construction, The English Language Book Society and Her Majesty's Stationery Office, 1966.

SEMESTER	COURSE CODE	COURSE TITLE	L	T	P	C
		<b>ELECTIVE: CONSTRUCTION PROJECT MANAGEMENT</b>	3	0	0	3

**OBJECTIVE:**

- To study and understand the project life cycle and types of construction.
- To study the role of project management, owners perspective.
- The students know about organizing for project management.
- To Expose the students knowledge of labour material and equipment utilization.
- To Acquire the Knowledge Of Cost Estimation

**UNIT I THE OWNERS' PERSPECTIVE 9**

Introduction - Project Life Cycle - Types of Construction - Selection of Professional Services - Construction Contractors - Financing of Constructed Facilities - Legal and Regulatory Requirements - Changing Environment of the Construction Industry - Role of Project Managers

**UNIT II ORGANIZING FOR PROJECT MANAGEMENT 9**

Project Management – modern trends - Strategic Planning - Effects of Project Risks on Organization - Organization of Project Participants -Traditional Designer-Constructor Sequence - Professional Construction Management - Owner-Builder Operation - Turnkey Operation - Leadership and Motivation for the Project Team

**UNIT III DESIGN AND CONSTRUCTION PROCESS 9**

Design and Construction as an Integrated System - Innovation and Technological Feasibility - Innovation and Economic Feasibility - Design Methodology - Functional Design - Construction Site Environment

**UNIT – IV LABOUR, MATERIAL AND EQUIPMENT UTILIZATION 9**

Historical Perspective - Labour Productivity - Factors Affecting Job-Site Productivity - Labour Relations in Construction - Problems in Collective Bargaining - Materials Management - Material Procurement and Delivery - Inventory Control - Tradeoffs of Costs in Materials Management. - Construction Equipment - Choice of Equipment and Standard Production Rates - Construction Processes Queues and Resource Bottlenecks



Costs Associated with Constructed Facilities - Approaches to Cost Estimation - Type of Construction Cost Estimates - Effects of Scale on Construction Cost - Unit Cost Method of Estimation - Methods for Allocation of Joint Costs - Historical Cost Data - Cost Indices - Applications of Cost Indices to Estimating - Estimate Based on Engineer's List of Quantities - Estimation of Operating Costs.

**TOTAL: 45 HOURS**

**REFERENCES:**

1. Chris Hendrickson and Tung Au, Project Management for Construction – Fundamental Concepts for Owners, Engineers, Architects and Builders, Prentice Hall, Pittsburgh, 2000.
2. Chitkara, K.K. Construction Project Management: Planning, Scheduling and Control, Tata McGraw-Hill Publishing Company, New Delhi, 1998.
3. Frederick E. Gould, Construction Project Management, Wentworth Institute of Technology, Vary E. Joyce, Massachusetts Institute of Technology, 2000.
4. Choudhury, S , Project Management, Tata McGraw-Hill Publishing Company, New Delhi, 1988.
5. George J.Ritz , Total Construction Project Management - McGraw-Hill Inc, 1994.



SEMESTER	COURSE CODE	COURSE TITLE	L	T	P	C
		<b>ELECTIVE:CONSTRUCTION PERSONNELMANAGEMENT</b>	3	0	0	3

### **OBJECTIVE:**

- To study and understand the manpower planning and personal principals.
- To study the role of organization charts and span of control.
- The students know about basic individual psychology.
- To Expose the students knowledge of welfare measures.
- To acquire the knowledge of management and development methods.

### **UNIT I MANPOWER PLANNING**

**9**

Manpower Planning, Organising, Staffing, directing, and controlling – Personnel Principles

### **UNIT II ORGANISATION**

**9**

Organisation – Span of Control – Organisation Charts – Staffing Plan - Development and Operation of human resources - Managerial Staffing – Recruitment – Selection - Placement, Training and Development.

### **UNIT III HUMAN BEHAVIOUR**

**9**

Introduction to the field of people management - basic individual psychology; motivation - Job design and performance management - Managing groups at work - self-managing work teams - intergroup behaviour and conflict in organisations – Leadership - Behavioural aspects of decision-making; and communication for people management

### **UNIT IV WELFARE MEASURES**

**9**

Compensation – Safety and health – GPF – EPF – Group Insurance – Housing - Pension – Laws related to welfare measures.

### **UNIT V MANAGEMENT AND DEVELOPMENT METHODS**

**9**

Compensation - Wages and Salary, Employee Benefits, employee appraisal and assessment - Employee services - Safety and Health – Discipline and discharge - Special Human resource problems, Performance appraisal. - Employee hand book and personnel manual - Job descriptions and organization structure and human relations – Productivity of Human resources.

**TOTAL: 45 HOURS**

## **REFERENCES:**

1. Carleton Counter II and Jill Justice Coutler , The Complete Standard Handbook of Construction Personnel Management, Prentice-Hall, Inc., New Jersey, 1989.
2. Memoria,C.B., Personnel Management, Himalaya Publishing Co., 1997.
3. Josy.J. Familiaro, Handbook of Human Resources Administration, McGraw-Hill International Edition, 1987.
4. Charles D Pringle, Justin Gooderi Longenecter, Management, CE Merrill Publishing Co. 1981.
5. Dwivedi R.S, Human Relations and Organisational Behaviour, Macmillian India Ltd.,2005.

SEMESTER	COURSE CODE	COURSE TITLE	L	T	P	C
		<b>ELECTIVE: BUSINESS ECONOMICS AND FINANCE MANAGEMENT</b>	3	0	0	3

#### **OBJECTIVE:**

- To study and understand the role of civil engineering industrial development.
- To study the role of construction economics and transport energy.
- The students know about financing instruments.
- To Expose the students knowledge of Cash basis of a accounting.
- To acquire the knowledge of Loans to Contractors.

#### **UNIT I ECONOMICS 9**

Role of Civil Engineering in Industrial Development – Advances in Civil Engineering - Engineering Economics – Support Matters of Economy related to Engineering – Market demand and supply – Choice of Technology – Quality Audit in economic law of returns governing production.

#### **UNIT II CONSTRCTIION ECONOMICS 9**

Construction development in Housing, transport energy and other infrastructures – Economics of ecology, environment, energy resources – Local material selection – Form and functional designs – Construction workers – Urban Problems – Poverty – Migration – Unemployment – Pollution.

#### **UNIT III FINANCING 9**

The need for financial management - Types of financing – Financing instruments– short term borrowing – Long term borrowing – Leasing – Equity financing – Internal generation of funds – External commercial borrowings – Assistance from government budgeting support and international finance corporations – Analysis of financial statements – Balance Sheet - Profit and Loss account – Cash flow and Fund flow analysis – Ratio analysis – Investment and financing decision – Financial Control - centralized management.

#### **UNIT IV ACCOUNTING METHOD 9**

General Overview – Cash basis of a accounting – Accrual basis of accounting – Percentage completion method – Completed contract method – Accounting for tax reporting purposes and financial reporting purposes – Accounting Standards

#### **UNIT V LENDING TO CONTRACTORS 9**

Loans to Contractors – Interim construction financing – Security and risk aspects.

**TOTAL: 45 HOURS**

**REFERENCES:**

1. Prasanna Chandra, Project Selection, Planning, Analysis, Implementation and Review, Tata McGraw Hill Publishing Company, 1995.
2. Halpin, D.W., Financial and Cost Concepts for Construction Management, John Wiley & Sons, New York, 1985.
3. Warner Z Hirsch, Urban Economics, Macmillan, New York, 1993.
4. Kwaku A, Tenah and Jose M.Guevara, Fundamental of Construction Management and Organisation, Prentice – Hall of India, 1995.
5. Madura, J and Veit, E.T., Introduction to Financial Management, West Publishing Co., St. Paul, 1988.

SEMESTER	COURSE CODE	COURSE TITLE	L	T	P	C
		ELECTIVE: QUALITY CONTROL AND ASSURANCE IN CONSTRUCTION	3	0	0	3

### **OBJECTIVE:**

- To study and understand the quality management, quality plan.
- To study the role of quality system and preparing quality system documents.
- The students know about quality planning.
- To Expose the students knowledge of quality assurance and control.
- To acquire the knowledge of quality improvement techniques

### **UNIT I QUALITY MANAGEMENT 9**

Introduction – Definitions and objectives – Factor influencing construction quality - Responsibilities and authority - Quality plan - Quality Management Guidelines – Quality circles.

### **UNIT II QUALITY SYSTEMS 9**

Introduction - Quality system standard – ISO 9000 family of standards – Requirements – Preparing Quality System Documents – Quality related training – Implementing a Quality system – Third party Certification.

### **UNIT III QUALITY PLANNING 9**

Quality Policy, Objectives and methods in Construction industry - Consumers satisfaction, Ergonomics - Time of Completion - Statistical tolerance – Taguchi's concept of quality – Codes and Standards – Documents – Contract and construction programming – Inspection procedures - Processes and products – Total QA / QC programme and cost implication.

### **UNIT IV QUALITY ASSURANCE AND CONTROL 9**

Objectives - Regularity agent, owner, design, contract and construction oriented objectives, methods - Techniques and needs of QA/QC - Different aspects of quality - Appraisals, Factors influencing construction quality - Critical, major failure aspects and failure mode analysis, -Stability methods and tools, optimum design - Reliability testing, reliability coefficient and reliability prediction.

### **UNIT – V QULAITY IMPROVEMENT TECHNIQUES 9**

Selection of new materials - Influence of drawings, detailing, specification, standardization - Bid preparation - Construction activity, environmental safety, social and environmental factors - Natural causes and speed of construction - Life cycle costing - Value engineering and value analysis.

**TOTAL: 45 HOURS**

**REFERENCES:**

1. James, J.O' Brian, Construction Inspection Handbook – Quality Assurance and Quality Control, Van Nostrand, New York, 1989.
2. Kwaku, A., Tena, Jose, M. Guevara, Fundamentals of Construction Management and Organisation, Reston Publishing Co., Inc., Virginia, 1985.
3. Juran Frank, J.M. and Gryna, F.M. Quality Planning and Analysis, Tata McGraw Hill, 1993
4. Hutchins.G, ISO 9000, Viva Books, New Delhi, 2000
5. Clarkson H. Oglesby, Productivity Improvement in Construction, McGraw-Hill, 1989.
6. John L. Ashford, The Management of Quality in Construction, E & F.N.Spon, New York, 1989.
7. Steven McCabe, Quality Improvement Techniques in Construction, Addison Wesley Longman Ltd, England. 1998.



SEMESTER	COURSE CODE	COURSE TITLE	L	T	P	C
		ELECTIVE: <b>RESOURCE MANAGEMENT AND CONTROL IN CONSTRUCTION</b>	3	0	0	3

**OBJECTIVE:**

- To study and understand the resource planning and types of resources.
- To study the role of labour management and labour schedule.
- The students know about materials and equipment.
- To Expose the students knowledge of time management.
- To acquire the knowledge of resource allocation and levelling.

**UNIT I RESOURCE PLANNING 9**

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

**UNIT II LABOUR MANAGEMENT 9**

Systems approach, Characteristics of resources, Utilization, measurement of actual resources required, Tools for measurement of resources, Labour, Classes of Labour, Cost of Labour, Labour schedule, optimum use Labour.

**UNIT III MATERIALS AND EQUIPMENT 9**

Material: Time of purchase, quantity of material, sources, Transportation, Delivery and Distribution.

Equipment: Planning and selecting by optimistic choice with respect to cost, Time, Source and handling.

**UNIT IV TIME MANAGEMENT 9**

Personnel time, Management and planning, managing time on the project, forecasting the future, Critical path measuring the changes and their effects - Cash flow and cost control

**UNIT V RESOURCE ALLOCATION AND LEVELLING 9**

Time-cost trade off, Computer application - resource leveling, resource list, resource allocation, Resource loading, Cumulative cost - Value Management.

**TOTAL: 45 HOURS**

**REFERENCES:**

1. Andrew,D., Szilagg, Hand Book of Engineering Management, 1982.
2. James.A., Adrain, Quantitative Methods in Construction Management, American Elsevier Publishing Co., Inc., 1973.

3. Harvey, A., Levine, Project Management using Micro Computers, Osborne-McGraw Hill C.A.Publishing Co., Inc. 1988.
4. Oxley Rand Poslcit, Management Techniques applied to the Construction Industry, Granda Publishing Ltd., 1980.

SEMESTER	COURSE CODE	COURSE TITLE	L	T	P	C
		ELECTIVE: PROJECT SAFETY MANAGEMENT	3	0	0	3

**OBJECTIVE:**

- To study and understand the construction accidents and cost of construction injuries.
- To study the role of safety programmes and elements of effective safety programme.
- The students know about International Practice of appraisal.
- To Expose the students knowledge of design for safety.
- To acquire the knowledge of owners' and designers' outlook.

**UNIT I CONSTRUCTION ACCIDENTS 9**  
 Accidents and their Causes – Human Factors in Construction Safety - Costs of Construction Injuries – Occupational and Safety Hazard Assessment – Legal Implications

**UNIT II SAFETY PROGRAMMES 9**  
 Problem Areas in Construction Safety – Elements of an Effective Safety Programme – Job-Site Safety Assessment – Safety Meetings – Safety Incentives

**UNIT III CONTRACTUAL OBLIGATIONS 9**  
 Safety in Construction Contracts – Substance Abuse – Safety Record Keeping

**UNIT IV DESIGNING FOR SAFETY 9**  
 Safety Culture – Safe Workers – Safety and First Line Supervisors – Safety and Middle Managers – Top Management Practices, Company Activities and Safety – Safety Personnel – Sub contractual Obligation – Project Coordination and Safety Procedures – Workers Compensation

**UNIT V OWNERS' AND DESIGNERS' OUTLOOK 9**

**TOTAL: 45 HOURS**

**REFERENCES:**

1. Jimmy W. Hinze, Construction Safety, Prentice Hall Inc., 1997.
2. Richard J. Coble, Jimmie Hinze and Theo C. Haupt, Construction Safety and Health Management, Prentice Hall Inc., 2001.
3. Tamilnadu Factory Act, Department of Inspectorate of factories, Tamil nadu.

SEMESTER	COURSE CODE	COURSE TITLE	L	T	P	C
		ELECTIVE: MANAGEMENT INFORMATION SYSTEM	3	0	0	3

#### **OBJECTIVE:**

- To study and understand the evolution of information system.
- To study the role of system development life cycle.
- The students know about Integrated Construction Management Information System.
- To Expose the students knowledge of implementation and control project.
- To acquire the knowledge of Software Engineering qualities.

#### **UNIT I INTRODUCTION 9**

Information Systems - Establishing the Framework - Business Models - Information System Architecture - Evolution of Information Systems.

#### **UNIT II SYSTEM DEVELOPMENT 9**

Modern Information System - System Development Life Cycle - Structured Methodologies - Designing Computer Based Methods, Procedures, Control - Designing Structured Programs.

#### **UNIT III INFORMATION SYSTEMS 9**

Integrated Construction Management Information System - Project Management Information System - Functional Areas, Finance, Marketing, Production, Personnel - Levels, DSS, EIS, and ES - Comparison, Concepts and Knowledge Representation - Managing International Information System.

#### **UNIT IV IMPLEMENTATION AND CONTROL 9**

Control - Testing Security - Coding Techniques - Defection of Error - Validating - Cost Benefit Analysis - Assessing the value and risk of Information System.

#### **UNIT V SYSTEM AUDIT 9**

Software Engineering qualities - Design, Production, Service, Software specification, Software Metrics, Software quality assurance - Systems Methodology - Objectives - Time and Logic, Knowledge and Human Dimension - Software life cycle models - Verification and Validation.

**TOTAL: 45 HOURS**

#### **REFERENCES:**

1. Kenneth C Laudon and Jane Price Laudon, Management Information Systems - Organisation and Technology, Prentice Hall, 1996.
2. Gordon B. Davis, Management Information System: Conceptual Foundations, Structure and Development, McGraw Hill, 1974.
3. Joyce J Elam, Case series for Management Information Systems , Simon and Schuster, Custom Publishing, 1996.

4. Ralph H Sprague and Huge J Watson, Decision Support for Managers, Prentice Hall, 1996.
5. Michael W. Evans and John J Marciniak, Software Quality assurance and Management, John Wiley and Sons, 1987.
6. Card and Glass, Measuring Software Design quality , Prentice Hall, 1990.

SEMESTER	COURSE CODE	COURSE TITLE	L	T	P	C
		ELECTIVE: MAINTENANCE AND REHABILITATION OF STRUCTURES	3	0	0	3

**OBJECTIVE:**

- To study and understand the maintenance repair and rehabilitation.
- To study the role of serviceability and durability of concrete
- The students know about materials and techniques for repair.
- To Expose the students knowledge of repair to structures.
- To acquire the knowledge of demolition of structures.

**UNIT I MAINTENANCE AND REPAIR STRATEGIES 9**

Maintenance, repair and rehabilitation, Facets of Maintenance, importance of Maintenance various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration.

**UNIT II SERVICEABILITY AND DURABILITY OF CONCRETE 9**

Quality assurance for concrete construction concrete properties- strength, permeability, thermal properties and cracking. - Effects due to climate, temperature, chemicals, corrosion - design and construction errors - Effects of cover thickness and cracking

**UNIT III MATERIALS AND TECHNIQUES FOR REPAIR 9**

Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, sulphur infiltrated concrete, Ferro cement and polymers coating for rebars loadings from concrete, mortar and dry pack, vacuum concrete, Guniting and Shotcrete, Epoxy injection, Mortar repair for cracks, shoring and underpinning. Methods of corrosion protection, corrosion inhibitors, corrosion resistant steels and cathodic protection.

**UNIT IV REPAIRS TO STRUCTURES 9**

Repair of structures distressed due to earthquake – Strengthening using FRP- Strengthening and stabilization techniques for repair.

**UNIT V DEMOLITION OF STRUCTURES 9**

Engineered demolition techniques for structures - case studies

**TOTAL: 45 HOURS**

**REFERENCES:**

1. Denison Campbell, Allen and Harold Roper, "Concrete Structures, Materials, Maintenance and Repair", Longman Scientific and Technical UK, 1991.
2. Allen R.T and Edwards S.C, "Repair of Concrete Structures", Blakie and Sons, UK, 1987.
3. Raikar, R.N., "Learning from failures - Deficiencies in Design, Construction and Service" - R&D Centre (SDCPL), Raikar Bhavan, Bombay, 1987.
4. Santhakumar A.R., "Concrete Technology" Oxford University Press, Printed in India by Radha Press, New Delhi, 2007.
5. Peter H.Emmons, "Concrete Repair and Maintenance Illustrated", Galgotia Publications pvt. Ltd., 2001.

SEMESTER	COURSE CODE	COURSE TITLE	L	T	P	C
		ELECTIVE - CYBER SECURITY	3	0	0	3

### **OBJECTIVE**

- To study the cyber Security Fundamentals.
- To expose the students the principles and methods of Self Replication Malicious code
- At the completion of the course Students will be introduced defense and analysis techniques
- At the end of this course the student is expected to understand Tunneling techniques
- At the completion of the course the students would have learnt about Application of Misdirection, Reconnaissance, and disruption methods

### **UNIT I CYBER SECURITY FUNDAMENTALS**

Network and security concepts – basic cryptography – Symmetric encryption – Public key Encryption – DNS – Firewalls – Virtualization – Radio Frequency Identification – Microsoft Windows security Principles.

### **UNIT II ATTACKER TECHNIQUES AND MOTIVATIONS**

Antiforensics – Tunneling techniques – Fraud Techniques - Threat Infrastructure.

### **UNIT III EXPLOITATION**

Techniques to gain a foot hold – Misdirection, Reconnaissance, and disruption methods.

### **UNIT IV MALICIOUS CODE**

Self Replication Malicious code – Evading Detection and Elevating privileges – Stealing Information and Exploitation.

### **UNIT V DEFENSE AND ANALYSIS TECHNIQUES**

Memory Forensics – Honeypots – Malicious code naming – Automated malicious code analysis systems – Intrusion detection systems – Defense special file investigation tools.

### **TEXT BOOK**



1. James Graham, Richard Howard and Ryan Olson, “Cyber Security Essentials”, CRC Press, Taylor & Francis Group, 2011.

#### REFERENCE BOOKS

1. By Dan Shoemaker, Ph.D., William Arthur Conklin, Wm Arthur Conklin, “Cybersecurity: The Essential Body of Knowledge”, Cengage Learning, 2012.
2. Ali Jahangiri, “Live Hacking: The Ultimate Guide to hacking Techniques & Counter measures for Ethical Hackers & IT Security Experts”, 2009.