Your Dreams Our Goal

POORNIMA UNIVERSITY

Member of Association of Indian Universities & Approved by UGC (Govt. of India) under 2(f) & 12(B)

FACULTY OF ENGINEERING & TECHNOLOGY

DEPARTMENT OF CIVIL ENGINEERING

M.TECH IN CONSTRUCTION TECHNOLOGY AND MANAGEMENT

SCHEME & SYLLABUS BOOKLET

BATCH 2023-2025

SCHEME & SYLLABUS

BATCH: 2023-25

INDEX

Disclaimer: The scheme, syllabus and other materials published in this booklet may be changed or modified as per the requirement after approval of competent authority. The decision taken by the management of Poornima University will be final and abiding to all.

Student Details

Name of Student:

Name of Program:

Semester:

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VISION

To create knowledge based society with scientific temper, team spirit and dignity of labor to face global competitive challenges.

Mission

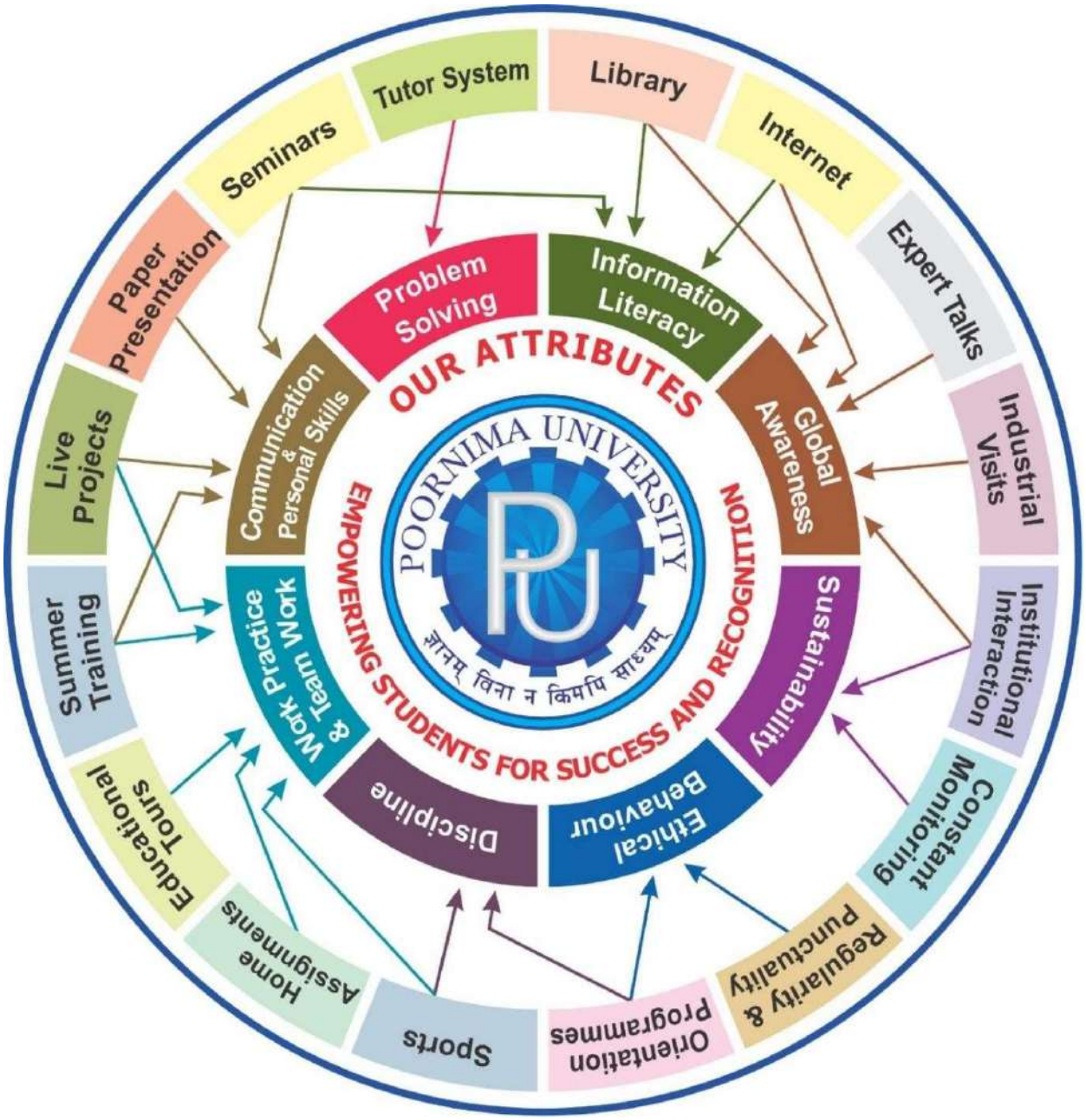
To evolve and develop skill based systems for effective delivery of knowledge so as to equip young professionals with dedication and commitment to excellence in all spheres of life.

Quality Policy

To provide Quality Education through Faculty development, updating of facilities and continual improvement meeting University norms and keeping stake holders satisfied

Knowledge Wheel

At Poornima, the academic atmosphere is a rare blend of modern technical aswell as soft skills and traditional systems of learning processes.



About Program and Program Outcomes (PO):

Title of the Programme: Bachelor of Technology (B. Tech.)

Nature of the Programme: B. Tech. is four year full-time programme.

Program Outcomes (PO) :

Engineering Graduates will be able to:

A. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

B. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

C. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

D. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

E. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

F. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

G. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

H. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

I. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

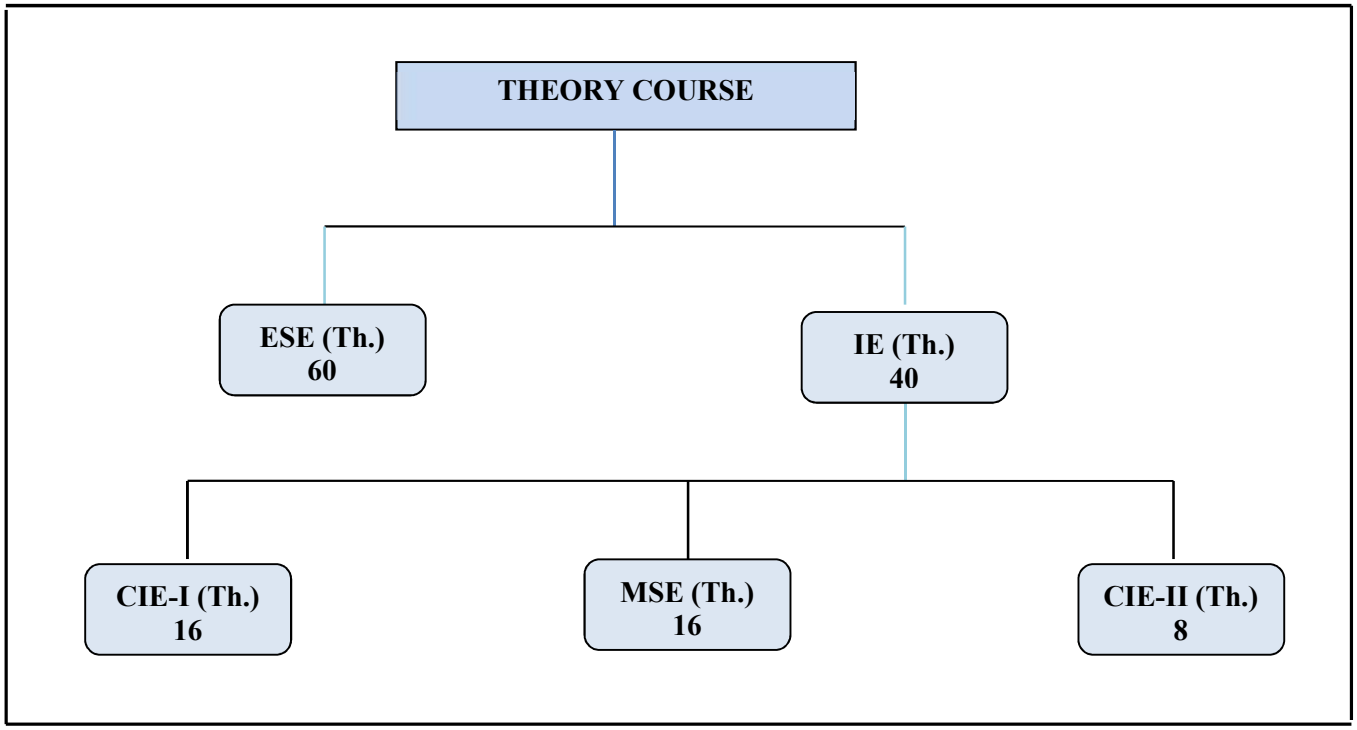
J. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

K. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

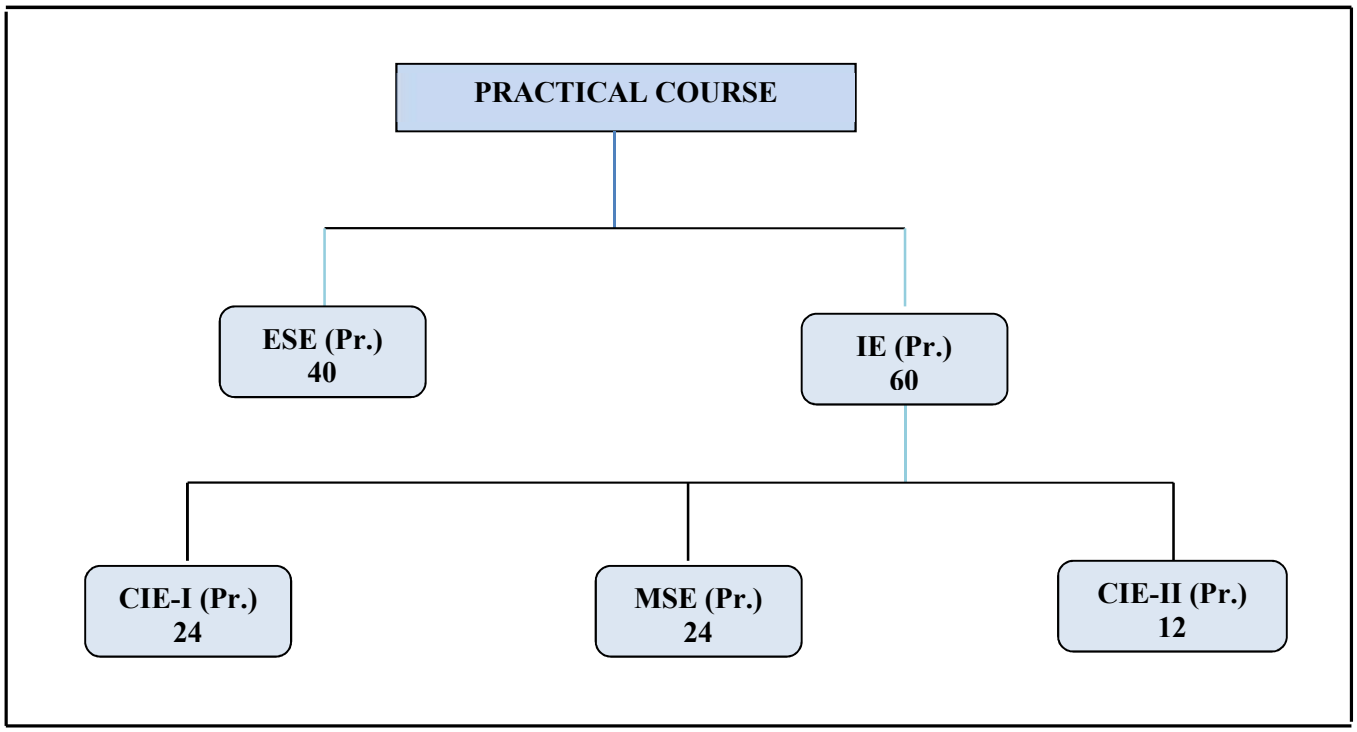
L. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Examination System :

A. Marks Distribution of Theory Course:



B. Marks Distribution of Practical Course :



Th.: Theory, Pr.: Practical, **ESE:** End Semester Examination, **MSE:** Mid Semester Examination, **CIE:** Continuous Internal Evaluation.

CO Wise Marks Distribution:

Exam Entity	Theory Subject		Practical/ Studio Subject	
	Maximum Marks	CO to be Covered	CO to be Covered	Maximum Marks
CIE-I	16 (8 + 8)	1 & 2	1 & 2	24 (12 + 12)
MSE	16 (8 + 8)	3 & 4	3 & 4	24 (12 + 12)
CIE-II (Activity/ Assignment)	8 (8)	5	5	12 (12)
ESE	60	-	-	40
TOTAL	100	-	-	100

Minimum Passing Percentage in All Exams:

S No.	Program Name	Minimum Passing Percentage in		
		IE Component	ESE Component	Total Component
1	Course Work for PhD Registration	-	-	50%
2	B. Arch.	-	45%	50%
3	MBA, MCA, M.Des., M.Tech., M.Plan, MHA, MPH	-	40%	40%
4	MBA, MCA, M.Des., M.Tech., M.Plan, MHA, MPH	-	35%	35%

SGPA Calculation

$$SGPA = \frac{C_1G_1 + C_2G_2 + \ldots\ldots\ldots + C_nG_n}{C_1 + C_2 + \ldots\ldots + C_n}$$

$$SGPA = \frac{\sum_i C_i \times G_i}{\sum_i C_i}$$

where (as per teaching scheme & syllabus):

C_i is the number of credits of subject i,

G_i is the Grade Point for the subject I and i = 1 to n,

n = number of subjects in a course in the semester

CGPA Calculation

$$CGPA = \frac{C_1G_1 + C_2G_2 + \ldots\ldots\ldots + C_nG_n}{C_1 + C_2 + \ldots\ldots + C_n}$$

$$CGPA = \frac{\sum_i C_i \times G_i}{\sum_i C_i}$$

where (as per teaching scheme & syllabus):

C_i is the number of credits of subject i,

G_i is the Grade Point for the subject I and i = 1 to n,

n = number of subjects in a course of all the semesters up to which CGPA is computed

Grading Table:

Applicable for B.Arch. & Ph.D. Courses

Academic Performance	Grade	Grade Point	Marks Range (in %)
Outstanding	O	10	90≤ x ≤100
Excellent	A+	9	80≤ x <90
Very Good	A	8	70≤ x <80
Good	B+	7	60≤ x <70
Above Average	B	6	50≤ x <60
Fail	F	0	x <50
Absent	Ab	0	Absent

Applicable for All Courses except B.Arch. & Ph.D.

Academic Performance	Grade	Grade Point	Marks Range (in %)
Outstanding	O	10	90≤ x ≤100
Excellent	A+	9	80≤ x <90
Very Good	A	8	70≤ x <80
Good	B+	7	60≤ x <70
Above Average	B	6	50≤ x <60
Average	C	5	40≤ x <50
Pass	P	4	35≤ x <40
Fail	F	0	x <35
Absent	Ab	0	Absent

CGPA to percentage conversion rule:

Equivalent % of Marks in the Program = *CGPA* *10

Award of Class

CGPA	Percentage	Equivalent Division
7.50 ≤ CGPA	75% or more	First Division with Distinction
6.00 ≤ CGPA < 7.50	60% ≤ x <75%	First Division
5.00 ≤ CGPA < 6.00	50% ≤ x <60%	Second Division
4.00 ≤ CGPA < 5.00	40% ≤ x < 50%	Pass Class

Guidelines for Massive Open Online Courses (MOOCs)

(Session 2023-24)

Poornima University, in its never ending endeavor to equip students with best-of-class learning and knowledge, has undertaken to include MOOC courses as part of its credit scheme from session 2023-24 onwards. The objective behind this is to enable students to study courses designed by the best teachers in the country and to scale their knowledge base with the rest of learners from the nation. The MOOCs which are included under this scheme is can be chosen from SWAYAM and NPTEL.

1. Introduction of MOOCs: SWAYAM and NPTEL

About SWAYAM:

SWAYAM is a programme initiated by Government of India and designed to achieve the three cardinal principles of Education Policy viz., access, equity and quality. The objective of this effort is to take the best teaching learning resources to all, including the most disadvantaged. SWAYAM seeks to bridge the digital divide for students who have hitherto remained untouched by the digital revolution and have not been able to join the mainstream of the knowledge economy.

This is done through a platform that facilitates hosting of all the courses, taught in classrooms to be accessed by anyone, anywhere at any time. All the courses are interactive, prepared by the best teachers in the country and are available, free of cost to any learner. However learners wanting a SWAYAM certificate should register for the final proctored exams that come at a fee and attend in-person at designated centers on specified dates. Eligibility for the certificate will be announced on the course page and learners will get certificates only if this criteria is matched.

The courses hosted on SWAYAM are in 4 quadrants – (1) video lecture, (2) specially prepared reading material that can be downloaded/printed (3) self-assessment tests through tests and quizzes and (4) an online discussion forum for clearing the doubts. Steps have been taken to enrich the learning experience by using audio-video and multi-media and state of the art pedagogy / technology.

In order to ensure that best quality content is produced and delivered, nine National Coordinators have been appointed. They are:

1. AICTE (All India Council for Technical Education) for self-paced and international courses
2. NPTEL (National Programme on Technology Enhanced Learning) for Engineering
3. UGC (University Grants Commission) for non-technical post-graduation education
4. CEC (Consortium for Educational Communication) for under-graduate education
5. NCERT (National Council of Educational Research and Training) for school education
6. NIOS (National Institute of Open Schooling) for school education
7. IGNOU (Indira Gandhi National Open University) for out-of-school students
8. IIMB (Indian Institute of Management, Bangalore) for management studies
9. NITTTR (National Institute of Technical Teachers Training and Research) for Teacher Training programme

Two types of courses are offered on SWAYAM platform: Credit Courses and Non- Credit Courses. Credit courses are offered for each semester in January and July every year. The list is available on SWAYAM official website: https://onlinecourses.swayam2.ac.in/

About NPTEL:

NPTEL (National Programme on Technology Enhanced Learning), is a joint venture of the IITs and IISc, funded by the Ministry of Education (MoE) Government of India, and was launched in 2003. Initially started as a project to take quality education to all corners of the country, NPTEL now offers close to 600+ courses for certification every semester in about 22 disciplines.

Some highlights:

- Largest online repository in the world of courses in engineering, basic sciences and selected humanities and management subjects
- YouTube channel for NPTEL – most subscribed educational channel, 1.3 billion views and 40+ lakhs subscribers

- More than 56000 hours of video content, transcribed and subtitled
- Most accessed library of peer-reviewed educational content in the world
- Translation of more than 12000 hrs of English transcripts in regional Indian languages

NPTEL Online Certification:

The objective of enabling students obtain certificates for courses is to make students employable in the industry or pursue a suitable higher education programme. Through an online portal, 4, 8, or 12-week online courses, typically on topics relevant to students in all years of higher education along with basic core courses in sciences and humanities with exposure to relevant tools and technologies, are being offered. Enrolment to and learning from these courses is free. Following these online courses, an in-person, proctored certification exam is conducted and a certificate is provided through the participating institutions and industry, as applicable.
Some statistics regarding the open online courses since March 2014 till Dec 2021
Completed courses: 3496;
Enrollments across courses: 1.58 CRORE +
Number of exam registrations: 15.1 LAKH +
All the statistics pertaining to completed courses are available at https://beta.nptel.ac.in/courses. All courses are completely free to enroll and learn from. The certification exam is optional and comes at a fee of Rs 1000/course exam.

2. MOOCs at Poornima University:

MOOCs envelops best in class teaching - learning processes along with meeting the requirements of various courses in terms of quality of teaching and evaluation system. To promote the MOOCs among students of Poornima University, it is decided to consider the credits earned through MOOCs.

(a) Options for MOOCs at Poornima University

(For this document, only those MOOCs will be considered which are available on SWAYAM & NPTEL platforms)

- Credit and Non-credit SWAYAM MOOCs can be opted by anyone, anytime, anywhere and in any language. However, prior-permission of the University Authorities is mandatory if the credits are to be transferred to regular degree.
- In case of credit courses, there are two ways to opt these courses for the purpose of credit transfer to PU system as given below:

OPTION–I: As Open Elective (for batches entered till 2022) / Multidisciplinary Courses (for batches admitted from 2023-24 onwards):

Open Elective (for batches entered till 2022) / Multidisciplinary Courses (for batches admitted from 2023-24 onwards) are available at University level in offline mode for which relevant booklets are already published. **These courses carries 02 credits.** These category/type of courses (similar/different) are also available as MOOC courses. The respective Deans / HODs shall provide both the options to all the students to either select offline courses or MOOCs as per details given below:

- Deans / HODs shall prepare a list of upto 05 appropriate MOOC courses of 02/03 credits each, well in advance (at-least 15 days prior to commencement of semester) and take approval from the Office of Dean, Academics / Pro-President, PU.
- After approval, the respective Deans / HODs shall circulate a notice to all their respective students so that they can select any one course from the list, the credits **(only 02)** of which will be counted against Open Elective/ Multidisciplinary courses pertaining to that particular semester.
- If the students are not willing to opt for MOOC Open Elective/ Multidisciplinary course, they can proceed with the current offline practice of opting for Multidisciplinary courses.
- The tutor of the class shall monitor the progress (assignments, feedback, any problem etc.) on weekly basis and report to Head/Dean.

OR

OPTION–II: As Major / Minor Courses:

- Deans / HODs shall identify a course of **03 credits** for each semester, well in advance (at-least 15 days prior to commencement of semester) and take approval from the Office of Dean, Academics / Pro-President, PU.
- After approval, the respective Deans / HODs shall circulate a notice to all their respective students citing that the particular course will be conducted through MOOCs only and is compulsory for all respective students. The credits of this course will be counted against Major/Minor courses pertaining to that particular semester.
- The tutor of the class shall monitor the progress (assignments, feedback, any problem etc.) on weekly basis and report to Head/Dean.
- This is to be noted that if Deans / HODs decide to conduct any major/minor course in any semester through MOOCs, no offline course will be conducted against that.

(b) Important points related to MOOCs at Poornima University

- Only one MOOC shall be allowed in a particular semester for the purpose of credit transfer in the beginning.
- No attendance will be taken for MOOC courses.
- Last period of T/T/S shall be taken for MOOC courses which shall be in self-study mode.
- The method of assessments of MOOC such as assignments and examination are completely associated with that particular MOOC and no exam will be conducted by the department as well as by the Examination Cell.
- The respective Dean / HOD must submit the detail of course i.e., code, name and credit of MOOC opted against that particular course in particular semester attached with highlighting in the related examination scheme of syllabus of that semester signed by BOS Convener / HoD and Dean of Faculty to the office of Pro-President before commencement of the classes.
- SWAYAM will award a certificate to all the students passing the examination along with the credit earned. The center of examination for SWAYAM MOOCs will be finalized by SWAYAM. All the responsibility related to registration for MOOCs, timely submission of assignments, examinations etc. will be borne by the students only.
- The list of registered students in MOOC along with name of course will be submitted to the Examination Cell by the Deans / HoDs before commencement of the classes.
- Any student who would not be able to register/present/clear/pass the MOOC in the stipulated time, it is the choice of the student that he or she may register in next semester (odd or even) with MOOC again or appear as a back exam candidate of the University as per PU norms.
- There will be no provision of re-evaluation of MOOC.
- The scorecard and related certificate of MOOC along with a consolidated list of students with marks of assignment and final exam will be submitted to the examination cell by the concerned Dean / HOD for further process. It is also recommended that alteration/changes/scaling in marks obtained by the students in any MOOC will not be considered.
- The exam registration fee of MOOC up to Max. INR 1000/- will be reimbursed to the student only after successful completion of the course in first attempt and submission of the fee receipt, score-card and certificate of the MOOC to the concerned department within stipulated time after declaration of the results.

NOTE: This is to be noted that the procedure for getting approval from BOS, Faculty Board, Academic Council and BoM is to be followed as per regular process.

Attached Items:

Open Elective Booklet	Annexure-1
Soft Skills Booklet	Annexure-2
Value Added Course Booklet	Annexure-3

Required credits for Honors:

S.No	Program Duration	Required credits for Honors
1.	2- Year	10- Credits
2.	3- Year	15- Credits
3.	4-Year	20- Credits

S. No	NPTEL/ SWAYAM Course duration (in weeks)	Equivalent Credits
1	4	2
2	8	3
3	12	4

Attached Items:

Open Elective Booklet	Annexure-1
Soft Skills Booklet	Annexure-2
Value Added Course Booklet	Annexure-3

	POORNIMA UNIVERSITY, JAIPUR								
	Faculty of Engineering and Technology								
Name of Program:	**M.Tech. in Construction Technology and Management** **Duration: 2 Years** **Total Credits: 80**								
	Teaching Scheme for Batch 2023-25								
	Semester-I								
Course Code	**Name of Course**	**Teaching Scheme**				**Marks Distribution**			**Credits**
		Lecture (L)	**Tutorial (T)**	**Practical**	**SH**	**IE**	**ESE**	**Total**	
A.		**Major (Core Courses)**							
A.1	**Theory**								
MCMCCV1101	Construction and Safety Management	3	1	-	-	40	60	100	4
MCMCCV1102	Advanced Construction Technology	3	1	-	-	40	60	100	4
A.2	**Practical**								
MCMCCV1201	Construction & Project Management Lab-I	-	-	2		60	40	100	1
B.		**Minor Stream Courses/ Department Electives I and II**							
B.1	**Theory**								
MCMECV1101	Construction Project Management	3	1	-	-	40	60	100	4
MCMECV1102	Energy Conservation Techniques in Building Construction			-	-	40	60	100	
MCMECV1103	Disaster Management			-	-	40	60	100	
MCMECV1104	Maintenance and Rehabilitation of Structures			-	-	40	60	100	
MCMECV1105	Remote Sensing and GIS Applications	3	1	-	-	40	60	100	4
MCMECV1106	Statistical Methods and Queuing Theory			-	-	40	60	100	
MCMECV1107	Mechanization in Construction			-	-	40	60	100	
MCMECV1108	Construction Costing and Financial Management			-	-	40	60	100	
B.2	**Practical**								
	-	-	-	-	-	-	-	-	-
C		**Multidisciplinary Courses**							
		-	-	-	-	-	-	-	-
D		**Ability Enhancement Courses (AEC)**							
MULCHM1201	Soft Skills – I	-	-	2		60	40	100	1
E		**Skill Enhancement Courses (SEC)**							
MULCSE1201	Skill Enhancement Technical Course			2		60	40	100	1
F		**Value Added Courses (VAC)**							
	-	-	-	-	-	-	-	-	-
G		**Summer Internship / Research Project / Dissertation**							
MCMCCV1401	Seminar-I	-	-	4		60	40	100	2
Total		12	4	10					**21**
Total Teaching Hours		**26**							

	POORNIMA UNIVERSITY, JAIPUR								
	Faculty of Engineering and Technology								
Name of Program:	**M.Tech. in Construction Technology and Management** **Duration: 2 Year** **Total Credits: 80**								
	Teaching Scheme for Batch 2023-25								
	Semester-II								
Course Code	**Name of Course**	**Teaching Scheme**				**Marks Distribution**			**Credits**
		Lecture (L)	**Tutorial (T)**	**Practical**	**SH**	**IE**	**ESE**	**Total**	
A.		**Major (Core Courses)**							
A.1	**Theory**								
MCMCCV2101	Building Maintenance	3	1	-		40	60	100	4
MCMCCV2102	Construction Equipment and Management	3	1	-		40	60	100	4
A.2	**Practical**								
MCMCCV2201	Construction & Project Management Lab-II	-	-	2		60	40	100	1
B.		**Minor Stream Courses/ Department Electives I and II**							
B.1	**Theory**								
MCMECV2101	Economics and Finance Management in Construction.	3	1			40	60	100	4
MCMECV2102	Quality Control and Assurance in Construction					40	60	100	
MCMECV2103	Rural Construction Technology					40	60	100	
MCMECV2104	System Integration in Construction					40	60	100	
MCMECV2105	Infrastructure Development	3	0			40	60	100	3
MCMECV2106	Construction Safety					40	60	100	
MCMECV2107	Project Risk Analysis and Mitigation Techniques					40	60	100	
MCMECV2108	Management and Project Planning in Construction					40	60	100	
B.2	**Practical**								
	-	-	-	-	-	-	-	-	-
C		**Multidisciplinary Courses**							
MULEBX2109	Engineering Economics	3	-	-	-	40	60	100	3
D		**Ability Enhancement Courses (AEC)**							
MULCHM2201	Soft Skills – II	-	-	2		60	40	100	1
E		**Skill Enhancement Courses (SEC)**							
MULCSE2201	Skill Enhancement Technical Course-II	-	-	2		60	40	100	1
F		**Value Added Courses (VAC)**							
	-	-	-	-	-	-	-	-	-
G		**Summer Internship / Research Project / Dissertation**							
MCMCCV2401	Seminar-II	-	-	2		60	40	100	1
Total		15	3	8					**22**
Total Teaching Hours		**26**							

	POORNIMA UNIVERSITY, JAIPUR								
	Faculty of Engineering and Technology								
Name of Program:	**M.Tech. in Construction Technology and Management** **Duration: 2 Years** **Total Credits: 80**								
	Teaching Scheme for Batch 2023-25								
	Semester-III								
Course Code	**Name of Course**	**Teaching Scheme**				**Marks Distribution**			**Credits**
		Lecture (L)	**Tutorial (T)**	**Practical**	**SH**	**IE**	**ESE**	**Total**	
A.		**Major (Core Courses)**							
A.1	**Theory**								
MCMCCV3101	Green Buildings and Services	3	1	-		40	60	100	4
MCMCCV3102	Research Methodology	3	1	-		40	60	100	4
A.2	**Practical**								
MCMCCV3201	Construction & Project Management Lab-III	-	-	2		60	40	100	1
MCMCCV3401	Review/Research Paper	-	-	2		60	40	100	1
B.		**Minor Stream Courses/ Department Electives/*Open Elective***							
B.1	**Theory**								
MULEEE3107	E-Commerce and Knowledge Management	3	1	-		40	60	100	3
MULECV3108	Water and Environmental Pollution			-		40	60	100	
MULEME3109	IPR & Patents			-		40	60	100	
MULEEE3110	Robotics			-		40	60	100	
MULEEE3111	Digital India Implementation			-		40	60	100	
MULECV3112	Smart City Design			-		40	60	100	
MULEEE3113	Renewable Energy			-		40	60	100	
B.2	**Practical**								
C		**Multidisciplinary Courses**							
MSTEMC3121	MOOC Course – I	3	-	-	-	-	-	-	3
D		**Ability Enhancement Courses (AEC)**							
E		**Skill Enhancement Courses (SEC)**							
-	-	-	-	-	-	-	-	-	-
F		**Value Added Courses (VAC)**							
G		**Summer Internship / Research Project / Dissertation**							
MCMCCV3402	Dissertation Part – I	-	-	12		60	40	100	6
Total		12	3	16					**22**
Total Teaching Hours		**31**							

	POORNIMA UNIVERSITY, JAIPUR								
	Faculty of Engineering and Technology								
Name of Program:	**M.Tech. in Construction Technology and Management** **Duration: 2 Years** **Total Credits: 80**								
	<u>Teaching Scheme for Batch 2023-25</u>								
	Semester-IV								
Course Code	**Name of Course**	**Teaching Scheme**				**Marks Distribution**			**Credits**
		Lecture (L)	**Tutorial (T)**	**Practical**	**SH**	**IE**	**ESE**	**Total**	
A.		**Major (Core Courses)**							
A.1	**Theory**								
-	-	-	-	-	-	-	-	-	-
A.2	**Practical**								
-	-	-	-	-	-	-	-	-	-
B.		**Minor Stream Courses/ Department Electives/*<u>Core Elective</u>***							
B.1	**Theory**								
-	-	-	-	-	-	-	-	-	-
B.2	**Practical**								
-	-	-	-	-	-	-	-	-	-
C		**Multidisciplinary Courses**							
-	-	-	-	-	-	-	-	-	-
D		**Ability Enhancement Courses (AEC)**							
-	-	-							
E		**Skill Enhancement Courses (SEC)**							
-	-	-	-	-	-	-	-	-	-
F		**Value Added Courses (VAC)**							
	-	-	-	-	-	-	-	-	-
G		**Summer Internship / Research Project / Dissertation**							
MCMCCV4401	Dissertation Part - II	-	-	30		250	250	500	15
Total		0	0	30					**15**
Total Teaching Hours		**30**							

	POORNIMA UNIVERSITY, JAIPUR								
	Faculty of Engineering and Technology								
Name of Program:	**M.Tech. in Construction Technology and Management** **Duration: 2 Years** **Total Credits: 80**								
	Teaching Scheme for Batch 2023-25								
	Semester-I								
Course Code	**Name of Course**	**Teaching Scheme**				**Marks Distribution**			**Credits**
		Lecture (L)	**Tutorial (T)**	**Practical**	**SH**	**IE**	**ESE**	**Total**	
A.		**Major (Core Courses)**							
A.1	**Theory**								
MCMCCV1101	Construction and Safety Management	3	1	-	-	40	60	100	4
MCMCCV1102	Advanced Construction Technology	3	1	-	-	40	60	100	4
A.2	**Practical**								
MCMCCV1201	Construction & Project Management Lab-I	-	-	2		60	40	100	1
B.		**Minor Stream Courses/ Department Electives I and II**							
B.1	**Theory**								
MCMECV1101	Construction Project Management	3	1	-	-	40	60	100	4
MCMECV1102	Energy Conservation Techniques in Building Construction			-	-	40	60	100	
MCMECV1103	Disaster Management			-	-	40	60	100	
MCMECV1104	Maintenance and Rehabilitation of Structures			-	-	40	60	100	
MCMECV1105	Remote Sensing and GIS Applications	3	1	-	-	40	60	100	4
MCMECV1106	Statistical Methods and Queuing Theory			-	-	40	60	100	
MCMECV1107	Mechanization in Construction			-	-	40	60	100	
MCMECV1108	Construction Costing and Financial Management			-	-	40	60	100	
B.2	**Practical**								
	-	-	-	-	-	-	-	-	-
C		**Multidisciplinary Courses**							
		-	-	-	-	-	-	-	-
D		**Ability Enhancement Courses (AEC)**							
MULCHM1201	Soft Skills – I	-	-	2		60	40	100	1
E		**Skill Enhancement Courses (SEC)**							
MULCSE1201	Skill Enhancement Technical Course			2		60	40	100	1
F		**Value Added Courses (VAC)**							
	-	-	-	-	-	-	-	-	-

G		Summer Internship / Research Project / Dissertation							
MCMCCV1401	Seminar-I	-	-	4		60	40	100	2
Total		12	4	10					**21**
Total Teaching Hours		**26**							

PO's and PSO's are as follows

PO No.	PO's
1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental
4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions. Considerations.
5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
PSO No.	**PSO's**
1	A civil engineering graduate is efficient in fundamentals of civil engineering, mathematical & scientific reasoning and are able to plan, design the building structure, roads, sewage and water supply networks & other component of infrastructure system considering environmental, safety & health aspects.
2	A civil engineer is able to use modern tools, techniques, software's to solve complex engineering problems
3	A civil Engineer able to prepare BOQ & cost estimation & able to execute the projects in lined with set project goals.
4	A civil engineer is able to compile detailed project report & give technical specifications to provide required quality of work.
5	A civil engineer is able to access the quality of material used for construction & able to find out deviations & able to suggest preventative and corrective measures for sustainable development.

Major Core Courses

Code: MCMCCV1101	Construction and Safety Management	4 Credits [LTP 3:1:0]

COURSEOVERVIEWANDOBJECTIVES: To bring about an exposure to principle of modern day construction, Network Analysis, cost optimization, site layout, inspection, supervision and quality control, safety in construction, labour laws and Acts.

COURSE OUTCOMES:

After completion of this course, student will be able to:

CO No.	Description
CO1101.1	Understand the concepts and principles of Modern day Construction
CO1101.2	Find the network analysis and time cost optimization of the projects.
CO1101.3	Understand the site layout, inspection, supervision and quality control.
CO1101.4	Implement the safety in construction
CO1101.5	Implement the labour laws and Acts

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	INTRODUCTION, CONSTRUCTION CONTRACTS AND SPECIFICATION	**9**
2.	CONSTRUCTION PLANNING AND TIME-COST OPTIMIZATION	**9**
3.	LABOUR LAWS, ACTS AND PROJECT MANAGEMENT	**10**
4.	SITE LAYOUT, SUPERVISION, INSPECTION AND QUALITY CONTROL	**10**
5.	SAFETY IN CONSTRUCTION AND FIRE SAFETY	**10**

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction, Construction Contracts and Specification**
	Introduction: Definition, functions and scope of construction management; scientific methods of management; construction team. **Construction Contracts and Specifications:** Types of construction contracts; contract documents; Specifications; general and special conditions; contract management; arbitration and settlement.
2.	**Construction Planning and Time-cost Optimization**
	Construction Planning and Network Techniques: Pre-tender planning; contract planning; planning and scheduling construction jobs by bar charts; Planning and scheduling construction jobs by critical path network techniques; allocation of resources; techniques of development and analysis of PERT/CPM networks for building project, bridge project and industrial shed constructions; updating of network; examples and case studies; Computer software for network analysis **Time-cost Optimization:** Direct cost, indirect cost, total cost; purpose, stages and methods of cost control techniques of time cost optimization; examples and case studies.

3.	**Labour Laws, Acts and Project Management**
	Labour Laws and Acts: Different Labour Laws and Acts and their uses in construction project management **Project Management:** Feasibility study; project reports; progress reports; monitoring and controlling project activities.
4.	**Site Layout, Supervision, Inspection and Quality Control**
	Site Layout: Principles governing site lay out; factors effecting site lay out; preparation of site lay out. **Supervision, Inspection and Quality Control:** Supervisor's responsibilities; keeping records; control of field activities handling disputes and work stoppages; storage and protection of construction materials and equipment; testing and quality control. **Purpose of inspection**: Inspection of various components of construction; reports and records; statistical quality control.
5.	**Safety in construction and Fire Safety**
	Safety in Construction: Safety: importance of safety, accident-prone situations at construction site i.e, safety measures for excavation, drilling/blasting, scaffolding/formwork, hoisting & erection demolition and hot bituminous work. **Fire Safety**: Safety record of construction industry, safety campaign

C. RECOMMENDED STUDY MATERIAL:

Sr. No	Reference Book	Author	Edition	Publications
1.	Construction Planning and Management	Gahlot, P.S. & Dhir B.M.	Latest	New Age International
2.	Project Planning & Control with PERT & CPM	Punmia, B.C.; Khandelwal, K.K.	Latest	Laxmi Publications.
3.	Construction Project Management – Planning Scheduling and Controlling	Chitkara, K.K	Latest	Tata McGraw Hill

Websites

https://nptel.ac.in/courses/122107036/
https://nptel.ac.in/courses/122104017/
https://nptel.ac.in/courses/111107127/
https://nptel.ac.in/courses/111107119/
https://nptel.ac.in/courses/111105035/
https://nptel.ac.in/courses/111105134/
https://nptel.ac.in/courses/111105121/

D. COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1101.1	1	1	-	3	-	1	-	-	-	-	1	-
CO1101.2	1	3	-	2	1	-	-	-	-	-	-	-
CO1101.3	1	-	-	3	1	-	-	-	-	-	1	-
CO1101.4	1	1	3	-	-	-	1	-	-	-	1	-
CO1101.5	1	1	3	-	1	1	-	-	-	-	-	1

E. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1101.1	1	2	3	1	-
CO1101.2	-	2	2	-	3
CO1101.3	1	1	-	3	2
CO1101.4	1	3	-	2	-
CO1101.5	1	3	-	2	-

Note: On the basis of mapping of COs with POs, this course is related to Employability / Skill Development

Code: MCMCCV1102 Advanced Construction Technology 4 Credits [LTP: 3-1-0]

COURSE OVERVIEW AND OBJECTIVES:

To bring about a complete understanding of advanced construction techniques in sub structure super structure and repair construction

COURSE OUTCOMES

After completion of the course, student will be able to:

CO	Description
CO1102.1	Understand the necessity and behaviour of the composite construction (Steel and Concrete) and their application.
CO1102.2	Various types of special foundations and their suitability and application areas.
CO1102.3	Various aspects of high rise construction and special methods/techniques deployed in it.
CO1102.4	Understand the necessity of Pre-fab construction, various components and different aspects in planning and execution of it.
CO1102.5	List various new materials like. Geo-synthetics, polymers, Special Coatings etc. and their properties and suitability for use

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	COMPOSITE STRUCTURES AND NEW TECHNOLOGIES	**9**
2.	SPECIAL FOUNDATIONS	**10**
3.	HIGH RISE CONSTRUCTION	**10**
4.	PREFABRICATED CONSTRUCTION	**10**
5.	ADVANCED CONSTRUCTION MATERIALS	**9**

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Composite Structures and New Technologies**
	Composite Structures in Buildings : Introduction to steel - concrete composite construction - theory of composite structures –Comparison of composite and non-composite, Introduction to steel - concrete - steel sandwich construction. Materials in composite construction, Composite columns: Types-Design of concrete encased columns, concrete filled tubular columns. Earthquake resistant design of masonry structures. **New Technologies in Road and Bridges :** Recycling of Pavements – purpose, usage of old material, reclaiming bitumen, usage of granular material. Cold Mix Technologies, Warm Mixes -

2.	**Special Foundations**
	Special Foundations : Necessity for special foundations, Problems in expansive Soils , Loose sand deposits and organic soils, Black cotton soils - soil potential to expand and related soil properties , measures to counteract the problems in expansive soils. ; Frost action and measures to counter the related problems. Foundations for chimney, cooling towers, telecommunication/transmission towers, foundations for underground structures, coastal and off shore structures in different soil conditions, gravity platforms, Raker. Dewatering and its various methods.
3.	**High Rise Construction**
	High Rise Construction : High rise buildings; architectural & structural aspects; special features of construction; tall chimneys, components, design aspects; slip form method , lift slab method; special problems of high rise construction.
4.	**Prefabricated Construction**
	Prefabricated Construction : Advantages of pre-fabricated construction; Basic elements , selection of structural elements; design aspects; assembly of precast elements; jointing , modular co-ordination and tolerances; structural systems for buildings; single and multi- storey building systems; methods and equipment's for handling and placement. Applications for rural and military areas.
5.	**Advanced Construction Materials:**
	Advanced Construction Materials: Geo-synthetics: various, types; geo-textiles, geo-grids, geo-membranes, geo-cell, geo- composites; functions and general applications, advantages, properties of geo- textiles, epoxy , resins, polymers, grouts and anchors, special flooring materials, sealants and adhesives, protective coatings. Micro-Silica in Concrete

C. RECOMMENDED STUDY MATERIAL:

S .No	Reference Book	Author	Edition	Publisher
1.	Modern Foundations - Introduction to Advanced Techniques	Naiman P Kurian	Latest	Tata McGraw Hill
2.	Design of Foundation Systems	Kurian NP	Latest	Alpha Science Publisher Narosa Publications
3.	Foundation Engineering Handbook	Fang H Sai-Yang.	Latest	CBS Publishers
4.	Construction Technology	Sarkar & Sarswati. ,	Latest	Oxford University Publishers
5.	Composite Structures of Steel and Concrete	Johnson R.P,	Latest	Blackwell Scientific Publications.

Websites

https://nptel.ac.in/courses/112104118/
https://nptel.ac.in/courses/112105171/
https://nptel.ac.in/courses/103104043/
https://swayam.gov.in/nd1_noc19_ce28/preview
https://nptel.ac.in/courses/105103192/
https://nptel.ac.in/courses/105101082/
https://nptel.ac.in/courses/105103095/
https://nptel.ac.in/courses/112105269/
https://nptel.ac.in/courses/112105183/

D. COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1102.1	1	1	1	-	-	2	1	-	-	-	-	1
CO1102.2	1	1	2	1	1	-	1	-	-	-	-	-
CO1102.3	1	1	3	1	1	-	-	-	1	-	-	-
CO1102.4	1	1	3	-	-	-	1	-	1	1	1	-
CO1102.5	1	1	3	-	1	1	-	-	-	-	-	1

E. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1102.1	2	3	-	-	1
CO1102.2	1	3	-	2	1
CO1102.3	3	1	1	1	-
CO1102.4	3	2	2	-	-
CO1102.5	3	2	-	-	2

Note: On the basis of mapping of COs with POs, this course is related to Employability / Skill Development

Code: MCMCCV1201 Construction and Project Management Lab-1 1Credits [LTP: 0-0-2]

A. DETAILED SYLLABUS

List of Experiments
Design as per syllabus of theory

Department Elective-I

Code: MCMECV1101 CONSTRUCTION PROJECT MANAGEMENT 4 Credit [LTP: 3-1-0]

COURSE OBJECTIVE: To study the elements of construction project management consisting of owners' perspective, organization, design and construction procedures, resource utilization and cost estimation.

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

CO	Description
CO1101.1	Understand the Concept of a Project–Characteristic features–Project Life cycle–Phases–Project Management
CO1101.2	Development of project plan and objectives–programming–scheduling–project organization–organization.
CO1101.3	Assess as project execution plan–project procedure manual–sub systems of project management
CO1101.4	Evaluate of Project direction – direction during production stage – value engineering review
CO1101.5	Analyze of Labour requirements-Labour productivity–site productivity.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	**Introduction to Project**	**7**
2	**Role of Project Management**	**11**
3	**Working Systems**	**11**
4	**Project Direction**	**10**
5	**Resource Management**	**9**

B. DETAILED SYLLABUS

Unit	Details of Unit
1.	**INTRODUCTION TO PROJECT**
	Concept of a Project–Characteristic features–Project Life cycle–Phases–Project Management–tools and techniques for project management– role of project managers.
2.	**ROLE OF PROJECT MANAGEMENT**
	Development of project plan and objectives–programming–scheduling–project organization–organization and project team–role of communication in project management– controlling systems.
3.	**WORKING SYSTEMS**
	Working systems–Characteristics–class of systems– design of systems– work break down system (WBS)–project execution plan–project procedure manual–sub systems of project management- monitoring of projects- networks–monitoring contracts.
4.	**PROJECT DIRECTION**
	Project direction – direction during production stage – value engineering review – stages – directives – project coordination – procedure – interface management – project control –

	scope for progress control – overall project progress control – stages – methods
5.	**RESOURCE MANAGEMENT**
	Basic concept-Labour requirements-Labour productivity–site productivity – Equipment Management – Material management- procurement organization – procurement planning – functions of material management – inventory control

C. RECOMMENDED STUDY MATERIAL:

S .No	Reference Book	Author	Edition	Publisher
1	"Project Planning, Analysis, Selection, Implementation and review"	Prasanna Chandra	Latest	Blackwell Science Ltd
2	'Construction Project Management	Frederick E. Gould,	Latest	Taylor & Francis Group
3	Project Management	Choudhury, S	Latest	Tata McGraw-Hill Publishing company New Delhi
Websites				

COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1101.1	1	-	2	-	2	-	-	-	-	-	-	2
CO1101.2	2	-	2	-	2	-	-	-	-	-	-	2
CO1101.3	2	-	2	-	2	-	-	-	-	-	-	2
CO1101.4	1	-	2	-	2	-	-	-	-	-	-	2
CO1101.5	1	-	-	-	-	1	-	-	-	-	-	-

COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1101.1	1	-	2	-	-
CO1101.2	2	3	-	2	-
CO1101.3	3	3	-	2	-
CO1101.4	3	1	1	1	-
CO1101.5	3	2	2	-	-

Note: On the basis of mapping of COs with POs, this course is related to Entrepreneur

Code: MCMECV1102 Energy Conservation Techniques in Building Construction 4 Credit [LTP: 3-1-0]

COURSE OBJECTIVE: To bring an about exposure to different sources and production systems of energy and their effective management adopting appropriate design methodology in construction.

COURSE OUTCOMES

After completion of the course, students will be able to:

CO	Description
CO1102.1	Sources of energy and energy production in relation to heating, ventilating and air conditioning.
CO1102.2	Understand the role of elements related to quality of energy utilization.
CO1102.3	Apply the concepts underlying energy management by adopting appropriate design methodology in providing energy related services.
CO1102.4	Evaluate the Energy management of electrical equipment.
CO1102.5	Understand the impacts of Energy in building design and Energy efficient and environment friendly building.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	Fundamentals of Energy	**7**
2	Energy and Resource Conservation	**11**
3	Design Consideration	**11**
4	Energy in Building Design	**10**
5	Energy Management	**9**

B. DETAILED SYLLABUS

Unit	Unit Details
1	**Fundamentals of Energy**
	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
2	**Energy and Resource Conservation**
	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.
3	**Design Consideration**
	Natural building design consideration. Energy efficient design strategies -Contextual factor - Longevity and process Assessment -Renewable Energy Sources and design - advanced building Technologies. Smart buildings –Economics and cost analysis.
4	**Energy in Building Design**

	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 HVACsystems - 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.
5	**Energy Management**
	Energy management of electrical equipment- Improvement of power factor - Management of maximum demand -Energy savings in pumps -Fans.-compressed air systems -Energy savings In Lighting systems- Air conditioning systems- Applications- .Facility operation and maintenance- Facility modifications- Energy recovery dehumidifier- Waste heat recovery. Steam plants and distribution systems Improvement of boiler efficiencies-Frequency of blow down -Steam leakage-steam Flash and condensation

D. RECOMMENDED STUDY MATERIAL:

S .No	Reference Book	Author	Edition	Publisher
1	'"Environmental Control system	Moore F.	Latest	Mc Graw Hill, Inc
2	"Wind and Light: Architectural design strategies	Brown, GZ Sun	Latest	John Wiley,
3	"Energy Conversation in Building: A Guide to part of the building regulations	Waters J.R,	Latest	Black well publishing
Websites				

E. COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1102.1	3	3	-	-	-	-	-	-	-	-	-	-
CO1102.2	2	2	2	-	-	-	-	-	-	-	-	-
CO1102.3	2	-	2	3	-	-	-	-	-	-	-	-
CO1102.4	2	-	2	-	-	2	-	-	-	-	-	-
CO1102.5	2	2	1	-	1	-	-	-	-	-	-	-

A. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1102.1	2	3	1	-	-
CO1102.2	3	3	-	-	-
CO1102.3	3	2	1	-	-
CO1102.4	2	-	1	-	-
CO1102.5	2	2	-	3	-

Note: On the basis of mapping of COs with POs, this course is related to Employability / Skill Development

Code: MCMECV1103	Disaster Management	Credits 4 [LTP: 3-1-0]

COURSE OVERVIEW AND OBJECTIVES:
To define and describe disaster, hazard, emergency, vulnerability, and risk and the importance of disaster management to handle the situation.

COURSE OUTCOMES
After completion of the course, student will be able to:

CO	Description
CO1103.1	Estimate and assess the Disaster Management Cycles.
CO1103.2	Understand the Disaster Community and planning
CO1103.3	Identify various parameters that influences the performance of devices/processes
CO1103.4	Understand the fundamentals of solar air heater based on heat transfer analysis and basics of concentrating collectors
CO1103.5	Understand the basics of solar photovoltaic cell and PV cell configurations

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	Objectives	**8**
2.	Disaster Management Cycle-I	**6**
3.	Disaster Management Cycle-II	**6**
4.	Disaster Community	**8**
5.	Disaster Planning	**8**

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**OBJECTIVES**
	Objectives-Overview of Disaster Management – Distinguishing between an emergency and a Disaster situation. Disaster Management Cycle – Phase I: Mitigation, and strategies; hazard Identification and vulnerability analysis. Disaster Mitigation and Infrastructure, impact of disasters on development programmes, vulnerabilities caused by development, developing a draft country-level disaster and development policy.
2.	**DISASTER MANAGEMENT CYCLE**
	Phases-Disaster Management Cycle – Phase II: Preparedness, Disaster Risk Reduction(DRR), Emergency Operation Plan (EOP), Mainstreaming Child Protection and Gender in Emergency Planning, Assessment,.
3.	**Disaster Management Cycle-II**
	Disaster Management Cycle – Phases III and IV: Response and recovery, Response aims, Response Activities, Modern and traditional responses to disasters, Disaster Recovery, and Plan , Disasters as opportunities for development initiatives.
4.	**Disaster Community**
	Disaster Community-Community-based Initiatives in Disaster management, need for Community-Based Approach, categories of involved organizations: Government, Nongovernment organizations (NGOs), Regional And International Organizations, Panchayaths, Community Workers, National And Local Disaster Managers,

	Policy Makers, Grass-Roots Workers, Methods Of Dissemination Of Information, Community-Based Action Plan, Advantages/Disadvantages Of The CommunityBased Approach.
5.	**Disaster Planning**
	Disaster Planning-Disaster Response Personnel and duties, Community Mitigation Goals, Pre-Disaster Mitigation Plan, Personnel Training, Volunteer Assistance, School-based Programmes, Hazardous Materials, Ways of storing and safely handling hazardous materials, Coping with Exposure to Hazardous Materials

C. RECOMMENDED STUDY MATERIAL:

S. No.	Reference Book	Author	Edition	Edition
1.	Disaster Management: Through the New Millennium	Ayaz	Latest	Anmol Publications.
2.	Emergency Medical Services and Disaster Management: A Holistic Approach	Dave, P. K	Latest	New Delhi: Jaypee Brothers Medical Publishers
3.	Disaster Management	Singh, R. B.	Latest	New Delhi: Rawat Publications

Websites:

http://www.nptelvideos.in/2012/11/building-materials-and-construction.html
https://nptel.ac.in/content/syllabus_pdf/105102088.pdf
https://sites.google.com/a/mitr.iitm.ac.in/iitmcivil/ce2330
https://nptel.ac.in/courses/105102088/

D. COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1103.1	3	-	-	2	1	-	-	-	-	-	-	-
CO1103.2	3	-	-	-	2	-	-	-	-	-	-	-
CO1103.3	3	-	-	-	1	-	-	-	-	-	-	1
CO1103.4	3	-	-	-	-	1	-	-	-	-	-	-
CO1103.5	2	-	1	-	2	-	-	-	-	-	-	-

E. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1103.1	2	-	-	1	3
CO1103.2	2	-	-	1	3
CO1103.3	2	-	-	1	3
CO1103.4	3	-	-	2	1
CO1103.5	3	-	-	2	1

Note: On the basis of mapping of COs with POs, this course is related to Skill Development

Code: MCMECV1104 **Maintenance and Rehabilitation of Structures** **4 Credits [LTP: 3-1-0]**

COURSE OVERVIEW AND OBJECTIVES:

To study the damages, repair and rehabilitation of structures.

COURSE OUTCOMES

After completion of the course, student will be able to:

CO	Description
CO1104.1	To study about Durability of Different Types of Buildings.
CO1104.2	To know about the Phases of Maintenance
CO1104.3	To study about the Techniques for Repair and Strengthening Measures
CO1104.4	Analyze the Techniques for Repair-Surface Repair–Material Selection–Surface Preparation.
CO1104.5	Understand the Importance of Strengthening Measures and Flexural Strengthening

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Durability	**6**
2.	Phases of Maintenance	**6**
3.	Materials for Repair	**6**
4.	Techniques for Repair	**6**
5.	Strengthening Measures	**6**

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**DURABILITY**
	Durability: Life Expectancy of Different Types of Buildings –Influence of Environmental Elements Such as Heat, Moisture, Precipitation and Frost on Buildings- Design and Construction Errors, Corrosion Mechanism- Effect of Biological Agents like fungus, moss, plants, trees, algae, - Termite Control and Prevention - Chemical Attack on Building Materials and Components- Aspects of Fire and Fire Prevention on Buildings- Impact of Pollution on Buildings.
2.	**PHASES OF MAINTENANCE**
	Maintenance- Definitions, objectives, Phases of Maintenance, Repair and Rehabilitation- Common Defects In Buildings And Measures To Prevent And Control The Same- Building Failures – Causes And Effects- Cracks In Buildings -Preventive Measures Various Aspects- Inspection, Assessment Procedure For Evaluating Damaged Structure -Causes of Deterioration - Testing Techniques- Non Destructive Testing Methods.
3.	**MATERIALS FOR REPAIR**
	Materials-Materials For Repair - Special Mortar And Concretes, Concrete Chemicals, Special Cements And High Grade Concrete – Expansive Cement, Polymer Concrete, Sulphur Infiltrated Concrete, Ferro Cement, Fiber Reinforced Concrete-Admixtures Of Latest Origin

4.	**TECHNIQUES FOR REPAIR**
	Techniques for Repair- Surface Repair – Material Selection – Surface Preparation - Rust Eliminators And Polymers Coating For Rebars During Repair – Repair Of Cracks In Concrete And Masonry-Methods Of Repair - Epoxy Injection, Mortar Repair For Cracks -Guniting and Shotcreting -Waterproofing Of Concrete Roofs.
5.	**STRENGTHENING MEASURES**
	Strengthening Measures- Flexural Strengthening, Beam Shear Capacity Strengthening, Column Strengthening, Shoring, Under Pinning And Jacketing Demolition Of Buildings– Introduction – Planning, Precautions And Protective 36 SRM-M.Tech.-CEM (2015-16) Measures In Demolition Work-Sequence Of Operations- Demolition Of Structural Elements.

C. RECOMMENDED STUDY MATERIAL:

S. No	Reference Book	Author	Edition	Publication/Edition
1.	Concrete Structures, Materials, Maintenance and Repair	Denison Campbell Allen and Harold Roper	Latest	Longman Scientific and Technical UK
2.	Repair of Concrete Structures	Allen .R.T and S. C .Edwards	Latest	Blakie and Sons, UK
3.	Concrete Technology	Santhakumar .A.R	Latest	Oxford University Press,
Websites				
http://www.nptelvideos.in/2012/11/engineering-geology.html https://nptel.ac.in/content/syllabus_pdf/105105106.pdf https://nptel.ac.in/courses/105105106/ https://nptel.ac.in/courses/105106055/ https://nptel.ac.in/content/syllabus_pdf/105106055.pdf https://nptel.ac.in/content/storage2/courses/105106055/Mod1/Lecture1.pdf				

D. COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1104.1	2	1	2	-	-	-	1	-	-	-	-	1
CO1104.2	2	1	2	-	1	-	-	-	-	-	-	2
CO1104.3	-	3	-	2	-	-	-	-	-	1	-	-
CO1104.4	1	1	-	2	1	-	-	-	-	1	-	-
CO1104.5	-	1	-	2	1	-	-	-	-	1	-	1

E. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1104.1	2	1	1	2	2
CO1104.2	2	1	1	2	1
CO1104.3	3	2	-	1	-
CO1104.4	1	1	3	1	-
CO1104.5	-	-	-	2	3

Note: On the basis of mapping of COs with POs, this course is related to Skill Development

Department Elective-II

Code: MCMECV1105 Remote Sensing and GIS 4 Credits [LTP: 3-1-0]

COURSE OUTCOME

After completion of this course, student will be able to:

CO No.	Description
CO1104.1	Infer the Indian remote sensing satellites and their platforms.
CO1104.2	Present available GIS and Remote Sensing software like ARC GIS, QGIS and ERDAS Imagine
CO1104.3	Develop the Digital Elevation Model (DEM).
CO1104.4	Analyze the land use and land cover to develop NDVI and EVI.
CO1104.5	Understand the Importance of GIS and Remote Sensing in Environmental Management

A. DETAILED SYLLABUS

Unit	Unit Details
1.	**Basic concepts of Remote sensing**
	Introduction to Remote Sensing, Electromagnetic Spectrum and radiation, Remote Sensing Platforms and Satellite Sensors
2.	**Sensors and Scanning Systems in Remote Sensing**
	Indian Remote Satellites (IRS), Spectral characteristics earth surface features i.e, vegetation, water and soil, Understanding the spectral curves to create spectral library. Digital Image processing of satellite data, Elements of photo / image interpretation , Concepts of digital image processing
3.	**Image Classification**
	Filters, Image registration, Feature extraction techniques, Image classification, Land use and land cover analysis.
4.	**Basic concepts of GIS**
	Introduction to GIS, History of development of GIS, Elements of GIS - Computer hardware and software, Map reading, various maps in GIS. Map overlay and Overlay operations
5.	**Spatial Analysis tools**
	Vector and Raster data model, Data storage and database management, Spatial data analysis techniques.

B. RECOMMENDED STUDY MATERIAL:

S. No	Title of the Book	Author	Edition	Publisher
1.	Biomass – Thermo-chemical Characteristics.	PVR Iyer; T R Rao; P D Grover and N P Singh,,	Latest	Biomass gasifier Action Research Centre, Dept of Chemical Engineering , IIT Delhi
2.	Hand book of biomass down draft gasifier engine systems"	Reed, T. B. and Das, A	Latest	Solar Energy Research Institute, U.S. Dept. of Energy

Websites
https://nptel.ac.in/courses/120108005/ https://nptel.ac.in/courses/105/106/105106056/ https://nptel.ac.in/courses/105105160/

S. No	Important web links
1.	https://nptel.ac.in/courses/105/107/105107155/
2.	https://nptel.ac.in/courses/121/107/121107009/

COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1105.1	1	1	1	-	-	2	1	-	-	-	-	1
CO1105.2	1	1	2	1	1	-	1	-	-	-	-	-
CO1105.3	1	1	3	1	1	-	-	-	1	-	-	-
CO1105.4	1	1	3	-	-	-	1	-	1	1	1	-
CO1105.5	1	1	3	-	1	1	-	-	-	-	-	1

COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1105.1	2	3	-	-	1
CO1105.2	1	3	-	2	1
CO1105.3	3	1	1	1	-
CO1105.4	3	2	2	-	-
CO1105.5	3	2	-	-	2

Code: MCMECV1106 Statistical Methods and Queuing Theory 4 Credits [LTP: 3-1-0]

COURSE OVERVIEW AND OBJECTIVES:

To develop analytical capability and to impart knowledge in statistical methods and Queueing theory and their applications in Engineering and Technology and to apply these concepts in engineering problems they would come across.

COURSE OUTCOMES

After completion of the course, student will be able to:

CO	Description
CO1106.1	Assess the Theoretical Distributions.
CO1106.2	Understand the basics of the Regression Methods
CO1106.3	Identify various parameters by Testing of Hypothesis
CO1106.4	Study the basics of ANOVA and Design of Experiments.
CO1106.5	Examine the Queuing Theory.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Theoretical Distributions	**6**
2.	Regression Methods	**8**
3.	Testing of Hypothesis	**8**
4.	ANOVA And Design of Experiments	**6**
5.	Queuing Theory	**8**

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Theoretical Distributions**
	Binomial, Poisson and Normal distributions - Definitions, Simple problems only (Derivations not included).
2.	**Regression Methods**
	Principle of Least Squares, Fitting of straight line and parabola - Correlation - Karl Pearson's coefficient of correlation and Spearman's rank correlation - Linear regression.
3.	**Testing of Hypothesis**
	Sampling Distributions - Tests based on Normal, t, Chi-Square and F-Distributions.
4.	**ANOVA And Design of Experiments**
	One way and Two way classification of ANOVA - Completely Randomized Design - Randomised Block Design - Latin square Design.

5.	**Queuing Theory**
	Single and multiple server Markovian queuing models - M/M/1 and M/M/c queuing models and Applications (Derivations not included).

C. RECOMMENDED STUDY MATERIAL:

S.No	Reference Book	Author	Edition	Publisher
1.	Fundamentals of mathematical statistics,	Gupta, S.C., and Kapoor, V.K	Latest	Sultan Chand and sons,
2.	Fundamentals of Applied statistics,	Gupta, S.C., and Kapoor, V.K	Latest	Sultan Chand and sons
3.	Probability Statistics and Random processes,	Veerarajan.T	Latest	TMH, First reprint,
Websites				
https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/124107006/lec21.pdf http://www.nptelvideos.in/2012/11/building-materials-and-construction.html				

D. COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1106.1	2	1	2	-	1	-	1	-	-	-	-	1
CO1106.2	1	1	2	-	1	-	-	-	-	-	-	-
CO1106.3	1	-	3	-	1	-	-	-	-	-	-	1
CO1106.4	2	-	3	-	1	-	-	-	-	-	-	-
CO1106.5	2	1	2	-	1	-	-	-	-	-	-	1

E. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1106.1	2	-	2	2	-
CO1106.2	2	-	1	3	1
CO1106.3	1	-	3	1	-
CO1106.4	2	-	3	-	-
CO1106.5	2	-	1	3	1

Note: On the basis of mapping of COs with POs, this course is related to Employability / Skill Development

Code: MCMECV1107	Mechanization in Construction	4 Credits [LTP: 3-1-0]

COURSE OVERVIEW AND OBJECTIVES:

This course will enable students to understand the various types of equipment's used for Construction. Understand the various methods of Construction Techniques.

COURSE OUTCOMES

After completion of the course, student will be able to:

CO	Description
CO1107.1	To decide which type and capacity of construction equipment can be used for a particular job on site
CO1107.2	Analyse the Mechanization in aggregate manufacturing
CO1107.3	Examine the Mechanization in rebar fabrication.
CO1107.4	Examine the Mechanization through construction methods/technologies.
CO1107.5	To Know the methods of drilling and blasting

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	Introduction to mechanization	**6**
2	Mechanization in aggregate manufacturing	**8**
3	Mechanization in rebar fabrication	**8**
4	Mechanization through construction methods/technologies	**6**
5	Mechanization through construction methods	**8**

B. DETAILED SYLLABUS

Unit	Unit Details
1	**Introduction to mechanization**
	Introduction to mechanization: Definition, advantages and limitations of mechanization, Indian scenario and Global scenario. Mechanization through construction equipment: Equipment cost, Machine Power, Production cycle - Dozers, scrapers, Excavators, Finishing equipment, Trucks and Hauling equipment, Hoisting equipment, Draglines and Clamshells
2	**Mechanization in aggregate manufacturing**
	Mechanization in aggregate manufacturing: Natural aggregates and recycled aggregates
3	**Mechanization in rebar fabrication**
	Mechanization in rebar fabrication Mechanization in concrete production and placement Mechanization through construction: formwork and scaffolding types, materials and design principles
4	**Mechanization through construction methods/technologies**
	Mechanization through construction methods/technologies: segmental construction of

	bridges/flyovers, box pushing technology for tunneling, trench-less technology. Pile Driving Equipment : Pile hammers, selecting a pile hammer, loss of energy due to impact, Energy losses due to causes other than impact
5	**Mechanization through construction methods**
	Mechanization through construction methods of Drilling, Blasting and Tunneling Equipment : Definition of terms, bits, Jackhammers, Drifters, wagon drills, chisel drills piston drills, blast hole drills, shot drills, diamond drills, tunneling equipment, selecting the drilling method equipment; selecting drilling pattern. Safety and Environmental issues in mechanization

C. RECOMMENDED STUDY MATERIAL:

S. No	Reference Book	Author	Edition	Publisher
1	Construction Equipment and its Planning and Applications	Mahesh Varma	Latest	Metropolitan Book Co.(P) Ltd.,New Delhi. India
2	Construction Equipment and Management	Sharma S.C.	Latest	, Khanna Publishers
3	Construction Equipment	James F Russell	Latest	Prentice Hall
Websites				
https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/124107006/lec21.pdf http://www.nptelvideos.in/2012/11/building-materials-and-construction.html				

D. COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1107.1	2	1	2	-	1	-	1	-	-	-	-	1
CO1107.2	1	1	2	-	1	-	-	-	-	-	-	-
CO1107.3	1	-	3	-	1	-	-	-	-	-	-	1
CO1107.4	2	-	3	-	1	-	-	-	-	-	-	-
CO1107.5	2	1	2	-	1	-	-	-	-	-	-	1

E. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1107.1	2	-	2	2	-
CO1107.2	2	-	1	3	1
CO1107.3	1	-	3	1	-
CO1107.4	2	-	3	-	-
CO1107.5	2	-	1	3	1

Note: On the basis of mapping of COs with POs, this course is related to Employability / Skill Development

Code: MCMECV1108 Construction Costing and Financial Management 4 Credits [LTP: 3-1-0]

COURSE OVERVIEW AND OBJECTIVES:

To enable essential and practical understanding of the basic energy requirements in buildings for different applications 2. To understand the external and internal energy processes which control the built environment 3. To study emerging technologies in building energy management.

COURSE OUTCOMES

After completion of the course, student will be able to:

CO	Description
CO1108.1	Understand the various Construction Costing.
CO1108.2	Infer the knowledge on using proper Cash flow
CO1108.3	Understand the interaction of various Cash and payment of works.
CO1108.4	Analyze of proper methodology for Material Management.
CO1108.5	Analyze the Financial Management.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	Construction Costing	**6**
2	Cash flow	**8**
3	Cash and payment of works	**8**
4	Material Management	**6**
5	Financial Management	**8**

B. DETAILED SYLLABUS

Unit	Unit Details
1	**Construction Costing**
	Construction Costing: Costing of construction Works; different methods of costing, cost elements in a projects; analysis of rates; non-scheduled items of work; cost estimation for a small construction job; purpose, methods and stages of cost control; cost monitoring; cost forecasting methods; variations in individual items of work and their effect on total contract price; valuation of variations. Methods of measurement of earthwork ,RCC , Brickwork, Woodwork joinery, steel and iron work plastering/ painting and white/colour washing & painting
2	**Cash flow**
	Cash flow: Determining the funds required for a construction job; preparing cash flow statements; cash inflow and outflow during contract period; project expectations.
3	**Cash and payment of works**

	Cash and payment of works; Precautions in custody of cash, imprest account and temporary advance; maintenance of temporary advance; and advance account; different types of payment, first, running, advance and final payments.
4	**Material Management**
	Material Management: Objectives and scope of material management classification, codification, ABC analysis, standardization and substitution; introduction to inventory control; stores management; organization and lay out; receipt, inspection and issue; care and safety; store records and store accounting.
5	**Financial Management**
	Financial Management: Meaning and scope financial statement analysis, funds flow analysis, Capital budgeting, cost benefit analysis.

C. RECOMMENDED STUDY MATERIAL:

.No	Reference Book	Author	Edition	Publisher
1	Integrated cost and schedule control for construction projects.	Mueller, F.W	Latest	by CRC Press,
Websites				
https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/124107006/lec21.pdf http://www.nptelvideos.in/2012/11/building-materials-and-construction.html				

D. COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1108.1	2	1	2	-	1	-	1	-	-	-	-	1
CO1108.2	1	1	2	-	1	-	-	-	-	-	-	-
CO1108.3	1	-	3	-	1	-	-	-	-	-	-	1
CO1108.4	2	-	3	-	1	-	-	-	-	-	-	-
CO1108.5	2	1	2	-	1	-	-	-	-	-	-	1

E. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1108.1	2	-	2	2	-
CO1108.2	2	-	1	3	1
CO1108.3	1	-	3	1	-
CO1108.4	2	-	3	-	-
CO1108.5	2	-	1	3	1

Note: On the basis of mapping of COs with POs, this course is related to Employability / Skill Development

Code: MULCHM1201	Soft Skills-I	1 Credits [LTP:0-0-2]

COURSE OUTCOME

CO01201.1: To present themselves in an effective manner and know about their short-term and long-term goals.

CO01201.2 To works in a team by managing time properly and focus on personal grooming, etiquettes and body language.

CO01201.3 To demonstrate their abilities by improving skills of LSRW (Listening /Speaking/Reading/Writing).

CO01201.4 To present different viewpoints or ways of thinking about a situation , expand their abilities to resolve situations and get experience within the given context

CO01201.5To enhance their employability skills by working on the presentation of Résumé and giving impactful performance during Group Discussion.

A. DETAILED SYLLABUS

1.	Self-Introduction& knowing your environment
2.	Goal Setting & Planning
3.	Etiquettes (Personal, Social, Professional & Corporate) etiquettes
4.	Personal Grooming and Body language
5.	Time Management & Team Work
6.	Negotiation and conflict management
7.	Oral Communication &Writing Skills: Extempore & Paper Presentations.
8.	Resume Writing
9.	Group Discussion
10.	Interview Skills

Code: MCMCCV1401	SEMINAR-I	1 Credits [LTP:0-0-2]

A. SYLLABUS

Unit	Contents
	Students will be grouped in two to three, will have to decide final thesis area, download research papers from IEEE, ACM, Elsevier, Springer etc. Summarizing paper – Reading abstracts and finding ideas, conclusion, Advantages of Their approach, and the drawbacks of the papers. Generalize results from a research paper to related research problems. Comparing the approach - Identify weaknesses and strengths in recent research articles in the subject. Practice sessions on how to read, analyze and summarize research papers. Students in group will have to deliver seminar, prepare a report and a review paper based on analysis.

	POORNIMA UNIVERSITY, JAIPUR								
	Faculty of Engineering and Technology								
Name of Program:	**M.Tech. in Construction Technology and Management** **Duration: 2 Year** **Total Credits: 80**								
	Teaching Scheme for Batch 2023-25								
	Semester-II								
Course Code	**Name of Course**	**Teaching Scheme**				**Marks Distribution**			**Credits**
		Lecture (L)	**Tutorial (T)**	**Practical**	**SH**	**IE**	**ESE**	**Total**	
A.		**Major (Core Courses)**							
A.1	**Theory**								
MCMCCV2101	Building Maintenance	3	1	-		40	60	100	4
MCMCCV2102	Construction Equipment and Management	3	1	-		40	60	100	4
A.2	**Practical**								
MCMCCV2201	Construction & Project Management Lab-II	-	-	2		60	40	100	1
B.		**Minor Stream Courses/ Department Electives I and II**							
B.1	**Theory**								
MCMECV2101	Economics and Finance Management in Construction.	3	1			40	60	100	4
MCMECV2102	Quality Control and Assurance in Construction					40	60	100	
MCMECV2103	Rural Construction Technology					40	60	100	
MCMECV2104	System Integration in Construction					40	60	100	
MCMECV2105	Infrastructure Development	3	0			40	60	100	3
MCMECV2106	Construction Safety					40	60	100	
MCMECV2107	Project Risk Analysis and Mitigation Techniques					40	60	100	
MCMECV2108	Management and Project Planning in Construction					40	60	100	
B.2	**Practical**								
	-	-	-	-	-	-	-	-	-
C		**Multidisciplinary Courses**							
MULEBX2109	Engineering Economics	3	-	-	-	40	60	100	3
D		**Ability Enhancement Courses (AEC)**							
MULCHM2201	Soft Skills – II	-	-	2		60	40	100	1
E		**Skill Enhancement Courses (SEC)**							
MULCSE2201	Skill Enhancement Technical Course-II	-	-	2		60	40	100	1
F		**Value Added Courses (VAC)**							
	-	-	-	-	-	-	-	-	-

G		Summer Internship / Research Project / Dissertation							
MCMCCV2401	Seminar-II	-	-	2		60	40	100	1
Total		15	3	8					**22**
Total Teaching Hours		**26**							

PO's and PSO's are as follows

PO No.	PO's
1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that MCMt the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental
4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions. Considerations.
5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
PSO No.	**PSO's**
1	A civil engineering graduate is efficient in fundamentals of civil engineering, mathematical & scientific reasoning and are able to plan, design the building structure, roads, sewage and water supply networks & other component of infrastructure system considering environmental, safety & health aspects.
2	A civil engineer is able to use modern tools, techniques, software's to solve complex engineering problems
3	A civil Engineer able to prepare BOQ & cost estimation & able to execute the projects in lined with set project goals.
4	A civil engineer is able to compile detailed project report & give technical specifications to provide required quality of work.
5	A civil engineer is able to access the quality of material used for construction & able to find out deviations & able to suggest preventative and corrective measures for sustainable development.

Major Core Courses

Code: MCMCCV2101	Building Maintenance	4 Credits [LTP: 3-1-0]

COURSE OVERVIEW AND OBJECTIVES:

To study about the Understand the significance of Principles of maintenance.

COURSE OUTCOMES

After completion of the course, student will be able to:

CO	Description
CO2101.1	Understand the significance of Principles of maintenance
CO2101.2	Analyze of Design and economic consideration in Maintenance.
CO2101.3	Evaluate of Maintenance Management
CO2101.4	Evaluate of Materials for maintenance
CO2101.5	Analyze of Investigation and diagnosis for Repair of structures

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Principles of maintenance	**9**
2.	Design and economic consideration in Maintenance	**10**
3.	Maintenance Management:	**9**
4.	Materials for maintenance	**12**
5.	Investigation and diagnosis for Repair of structures	**8**

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Principles of Maintenance**
	Principles of Maintenance: Importance of Maintenance, Deterioration and durability, Factors affecting decision to carryout maintenance, Maintenance and GNP Agencies causing deterioration, effect of deterioration agencies on materials.
2.	**Design and economic consideration in Maintenance**:
	Design and economic consideration in Maintenance: Factors to reduce maintenance at design stage, Consideration of maintenance aspects in preparing tender document and specifications, Sources of error in design which enhances maintenance, Importance of working drawings and schedules Provision of access for maintenance and its importance at design stage. **Economic consideration in maintenance**: physical life, functional life, economic life of different types of buildings, discounting technique for assessment of economic life.
3.	**Maintenance Management**
	Maintenance Management: Definition, organization structure, work force for maintenance, communication needs, building inspections, maintenance budget and estimates, property inspections and reports, specification for maintenance jobs, health and safety in maintenance, quality in maintenance, maintenance manual and their importance.

4.	**Materials for maintenance**
	Materials for maintenance: Compatibility of repair materials, Durability and maintenance. Types of materials, their specification and application, Criteria for selection of material, Use of Commercial available materials in maintenance.
5.	**Investigation and diagnosis for Repair of structures**
	Investigation and Diagnosis for Repair of Structures: Basic approach to investigations, physical inspection, material tests, non-destructive testing for diagnosis, estimation of actual loads and environmental effects, study of design and construction practices used in original construction, retrospective analysis and repair steps. **Maintenance Problems and Root Causes:** Classification of defects, need for diagnosis, type of defects in building elements and building materials defect location, symptoms and causes.

C. RECOMMENDED STUDY MATERIAL:

S. No	Reference Book	Author	Edition	Publisher
1.	Microbial Ecology Book	Larry L. Barton, Diana E. Northup	Latest	Wiley, Blackwell
2.	Ecology of Fresh Waters - A View for the Twenty-First Century Book	Brian Moss	Latest	Wiley, Blackwell
Websites				
https://nptel.ac.in/content/syllabus_pdf/105105166.pdf https://nptel.ac.in/courses/105105166/ https://nptel.ac.in/courses/105101085/				

D. COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO2101.1	1	2	2	-	1	-	1	-	-	-	-	-
CO2101.2	1	1	2	-	1	-	-	-	1	-	-	1
CO2101.3	3	-	-	2	1	-	-	-	-	1	-	-
CO2101.4	-	3	-	1	-	-	-	-	-	-	-	-
CO2101.5	1	-	1	3	-	-	-	-	-	-	-	1

E. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO2101.1	2	-	3	-	-
CO2101.2	1	3	-	1	1
CO2101.3	2	-	3	-	-
CO2101.4	2	3	-	1	-
CO2101.5	-	-	-	2	3

Note: On the basis of mapping of COs with POs, this course is related to Employability / Skill Development

Code: MCMCCV2102	Construction Equipment and Management	Credit 4 [LTP:3-1-0]

COURSE OVERVIEW AND OBJECTIVES:

To study the finer aspects of planning, scheduling and controlling of construction projects

COURSE OUTCOMES

After completion of the course, student will be able to:

CO	Description
CO2102.1	To study the elements of construction planning and scheduling and to apply appropriate tools and techniques like networks and coding systems.
CO2102.2	To study the monitoring of projects through cost control.
CO2102.3	To study the elements of quality control and safety of construction projects.
CO2102.4	Analyze the concept of gathering and using project information
CO2102.5	Understand the standard methodologies for PROJECT INFORMATION.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Basic Concepts in Construction Plans	**10**
2.	Construction Schedules	**8**
3.	Introduction to Project Budget	**7**
4.	Quality and Safety Management	**5**
5.	Project Information	**6**

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Basic Concepts in Construction Plans**
	Introduction: **Construction economy;** Factors affecting the selection of construction equipment; rolling resistance, effect of grade on required tractive effort, effect of altitude and temperature on the performance of internal combustion engines, drawbar pull, rimpull and acceleration, owning and operating cost of equipment. **Earth Moving Equipment** : Crawler and wheel tractors-their functions, types and specifications; grade-ability, bull dozers and their use; tractor pulled scrapers, their sizes and output; effect of grade and rolling resistance on the output of tractor pulled scrapers; earth loaders; placing and compacting earth fills. **Power shovels** - functions, selection, sizes, shovel dimensions and clearances, output, Draglines – functions types ,sizes ,output, Clamshells; Safe lifting capacities and working ranges of cranes; Hoes ,trenching machines, types and production rates calculation of

	production rates of equipment; examples.
2.	**Construction Schedules**
	Hauling Equipment: Trucks; capacities of trucks, balancing the capacities of hauling units with the size of excavator; effect of grade and rolling resistance on the cost/performance of hauling equipment. Compaction Equipment: **Roller class:** sheep's foot rollers, pneumatic tyre rollers, steel wheel rollers, vibrating rollers, grid type rollers-their applications.
3.	**Introduction to Project Budget**
	Drilling, Blasting and Tunneling Equipment: Definition of terms ,bits, jackhammers, drifters, wagon drills, churn drills, piston drills, blast hole drills, shot drills, diamond drills; Tunneling equipment; selecting the drilling method and equipment; selecting drilling pattern; rates for drilling rock, air compressors.
4.	**Quality and Safety Management**
	Piling Equipment: Pile hammers, selecting a pile hammer loss of energy due to impact, energy losses due to causes other than impact. Equipment for bored and cast in-situ piles **Pumping Equipment:** Pumping equipment in construction, Classification of pumps; Selection of pumps –Air-operated centrifugal type sump pumps; performance of centrifugal pumps; well point system.
5.	**Project Information**
	Economic Considerations in the procurement and use of construction equipment; Time value of money; ROR and IROR analysis; depreciation; costing of construction equipment operation;

C. RECOMMENDED STUDY MATERIAL:

S. No.	Reference Book	Author	Edition	Publisher
1.	Construction equipment and its planning and applications	Verma, Mahesh	Latest	Metropolition Book Co. Ltd.
2.	Construction Equipment and its management	Sharma SC	Latest	Khanna Publishers
Websites:				
http://www.nptelvideos.in/2012/11/surveying.html https://nptel.ac.in/courses/105107122/ https://nptel.ac.in/courses/105108077/ https://nptel.ac.in/courses/105102015/				

D. COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO2102.1	1	2	-	-	3	-	-	-	-	-	1	-
CO2102.2	1	1	-	-	3	-	-	-	-	-	1	-
CO2102.3	1	-	-	-	3	-	-	-	1	-	1	-
CO2102.4	1	1	-	-	3	-	-	-	-	-	1	-
CO2102.5	1	1	-	-	3	-	-	-	1	-	1	-

E. COs AND POs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO2102.1	1	3	-	2	-
CO2102.2	1	3	-	2	-
CO2102.3	1	3	-	2	-
CO2102.4	1	3	-	2	-
CO2102.5	1	3	-	2	-

Note: On the basis of mapping of COs with POs, this course is related to Entrepreneur

Code: MCMCCV2201 Construction & Project Management Lab-II 1 Credits [LTP: 0-0-2]

A. DETAILED SYLLABUS

List of Experiments
Design as per syllabus of theory

Department Elective-I

Code: MCMECV2101 Economics and Finance Management in Construction 4 Credits [LTP: 3-1-0]

COURSE OVERVIEW AND OBJECTIVES:

To study the concepts of Construction Economic and Finance such as comparing alternatives proposals, evaluating alternative investments, management of funds, and management of accounting.

COURSE OUTCOMES

After completion of the course, student will be able to:

CO	Description
CO2101.1	Know the concepts in economics and finance in constructions
CO2101.2	Evaluate the comparing Alternatives Proposals
CO2101.3	Evaluating Alternative Investments.
CO2101.4	Analyze the Funds Management
CO2101.5	Analyze of Fundamentals of Management Accounting.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Basic Principles	**8**
2.	Comparing Alternatives Proposals	**8**
3.	Evaluating Alternative Investments	**6**
4.	Funds Management	**6**
5.	Fundamentals of Management Accounting	**8**

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Basic Principles**
	Time Value of Money – Cash Flow diagram – Nominal and effective interest- continuous interest. Single Payment Compound Amount Factor (P/F,F/P) – Uniform series of Payments (F/A,A/F,F/P,A/P)– Problem time zero (PTZ)- equation time zero (ETZ). Constant increment to periodic payments – Arithmetic Gradient(G), Geometric Gradient (C).
2.	**Comparing Alternatives Proposals**
	Comparing alternatives- Present Worth Analysis, Annual Worth Analysis, Future Worth Analysis, Rate of Return Analysis (ROR) and Incremental Rate of Return (IROR)Analysis, Benefit/Cost Analysis, Break Even Analysis.
3.	**Evaluating Alternative Investments**
	Real Estate - Investment Property, Equipment Replace Analysis, Depreciation – Tax before and after depreciation – Value Added Tax (VAT) – Inflation
4.	**Funds Management**
	Project Finance, Sources of finance, Long-term and short-term finance, Working Capital Management, Inventory valuation, Mortgage Financing - International financial management, foreign currency management.

5.	**Fundamentals of Management Accounting**
	Management accounting, Financial accounting principles- basic concepts, Financial statements – accounting ratios - funds flow statement – cash flow statement.

C. RECOMMENDED STUDY MATERIAL:

S. No	Reference Book	Author	Edition	
1.	Engineering Economy	Blank, L.T., and Tarquin,A.J	22nd edition (2017)	Mc-Graw Hill Book Co.
2.	Engineering Economics & Cost Analysis	Collier C and GlaGola C	Latest	Addison Wesley Education Publishers
3.	Engineering Economic principles	Steiner, H.M	Tenth edition (2018)	Mc-Graw Hill Book
Websites				
https://nptel.ac.in/courses/105103096/ https://nptel.ac.in/courses/105103021/ https://nptel.ac.in/courses/112105182/ https://nptel.ac.in/courses/112104117/ https://nptel.ac.in/courses/112/105/112105206/				

D. COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO2101.1	2	1	2	-	1	-	-	-	-	-	-	1
CO2101.2	1	2	2	-	1	-	1	-	-	-	-	-
CO2101.3	1	1	2	-	1	-	-	-	1	-	-	1
CO2101.4	1	-	2	-	2	-	-	1	-	-	-	1
CO2101.5	1	1	2	-	1	-	-	-	1	-	-	1

E. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO2101.1	-	2	3	-	1
CO2101.2	3	1	-	2	-
CO2101.3	1	3	-	1	1
CO2101.4	2	-	1	-	3
CO2101.5	3	2	1	-	1

Note: On the basis of mapping of COs with POs, this course is related to Employability / Skill Development

Code: MCMECV2102 Quality Control and Assurance in Construction 4 Credits [LTP: 3-1-0]

COURSE OVERVIEW AND OBJECTIVES:

To study the concepts of quality assurance and control techniques in construction. • To study of the design philosophy, design of special elements, flat slabs and yield line-based design, and ductile detailing.

COURSE OUTCOMES:

After completion of the course, student will be able to:

CO	Description
CO2102.1	Analyze the quality control aspects in planning, systems, and management, assurance and Improvement techniques.
CO2102.2	Analyze of various type of Quality Systems.
CO2102.3	Examine the various Quality Planning
CO2102.4	Computation of various types of Quality Assurance and Control.
CO2102.5	Demonstrate the Quality Improvement Techniques.

A. OUTLINE OF THE COURSE

Unit	Title of the unit	Time Required for the Unit (Hours)
1	Quality Management	8
2	Quality Systems	6
3	Quality Planning	8
4	Quality Assurance and Control	6
5	Quality Improvement Techniques	8

B. DETAILED SYLLABUS

Unit	Unit Details
1	**Quality Management**
	Introduction–Definitions and objectives–Factors influencing construction quality– Responsibilities and authority– Quality plan– Quality Management Guidelines–Quality circles
2	**Quality Systems**
	Introduction-Quality system standard– ISO 9000 family of standards – Requirements – Preparing Quality System Documents – Quality related training – Implementing a Quality system – Third party Certification.
3	**Quality Planning**
	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.
4	**Quality Assurance and Control**
	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.
5	**Quality Improvement Techniques**
	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.

B. RECOMMENDED STUDY MATERIAL

S. No	Book	Author	Edition	Publication
1	Construction Inspection Handbook- Total Quality Management	James, J.O' Brian	Latest	Van Nostrand
Websites				
https://www.bdcnetwork.com/building-types https://en.wikipedia.org/wiki/Building_design https://nptel.ac.in/courses/105106177/				

C. COs AND POs MAPPING

COs and LOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO2102.1	3	2	-	1	-	-	-	-	-	-	-	1
CO2102.2	3	1	-	1	-	-	-	-	-	-	-	1
CO2102.3	3	2	-	1	-	-	-	-	-	-	-	1
CO2102.4	3	1	2	1	-	-	-	-	-	-	-	1
CO2102.5	3	-	-	1	1	-	-	-	-	-	-	1

D. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO2102.1	3	-	-	2	-
CO2102.2	3	-	-	2	-
CO2102.3	3	-	-	2	-
CO2102.4	3	-	-	2	1
CO2102.5	3	1	-	-	1

Note: On the basis of mapping of COs with POs, this course is related to Employability / Skill Development

Code: MCMECV2103	Rural Construction Technology	4 Credits [LTP: 3-1-0]

COURSE OVERVIEW AND OBJECTIVES:

This is the course work which gives the knowledge of Rural Development Planning and Concept of Appropriate Technology.

COURSE OUTCOMES

After completion of the course, student will be able to:

CO	Description
CO2103.1	Evaluate of Rural Development
CO2103.2	Analyze Rural Housing
CO2103.3	Evaluate the Water Supply and Rural Sanitation
CO2103.4	Analyze of Low Cost Roads and Transport.
CO2103.5	Analyze the Low Cost irrigation.

A. OUTLINE OF THE COURSE

Unit	Title of the unit	Time Required for the Unit (Hours)
1	Rural Development	**8**
2	Rural Housing	**6**
3	Water Supply and Rural Sanitation	**8**
4	Low Cost Roads and Transport	**6**
5	Low Cost irrigation	**8**

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Rural Development**
	Rural Development Planning and Concept of Appropriate Technology: Scope; development plans; various approaches to rural development planning; concept of appropriate technology. Rural development programme/ projects.
2.	**Rural Housing**
	Rural Housing: Low cost construction materials for housing; Architectural considerations for individual and group housing; Composite material - ferro-cement & fly ash, autoclaved calcium silicate bricks and soil-stabilized un-burnt brick; Plinth protection of mud walls; design consideration and construction of: non-erodable mud plaster, Water-proof and fire-retardant roof treatment for thatch roofs. Pre-cast stone masonry; rat-trap bond for walls; Panels for roof, ferro-cement flooring / roofing units, Thin R.C. ribbed slab for floors & roofs, pre-cast R.C. channel, Unit for flooring/roofing scheme, pre-cast R.C. flooring/ roofing scheme-Pan roofing scheme; manual & power scaffold hoist, lifting device for prefab components; Earthquake resistant measures for low cost houses.

3.	**Water Supply and Rural Sanitation**
	Water Supply and Rural Sanitation: Sources of water. BIS & WHO water standards. Quality, Storage and distribution for rural water supply works; basic design principles of treatment-low cost water treatment technologies; Hand pumps-types, installation operation, and maintenance of Mark-II hand pumps; conservation of water; rainwater harvesting; drainage in rural areas, design of low cost waste disposal systems; design and construction of low cost latrines: 2 pit pour flush water seal, VIP latrines, septic tank etc; Biogas technology; low cost community & individual Garbage disposal systems, Ferro-cement water storage tanks.
4.	**Low Cost Roads and Transport**
	Low Cost Roads and Transport: Broad categories of Pavement Layers, types of Granular Sub-Bases and Bases, Bituminous Construction, Surface Treatments for roads in rural areas. Detailed features and Quality Control of Modified Penetration Macadam, Soil Stabilization, Lime, Lime-Flyash and Cement Treated Course. Crusher-run-Macadam. Use of local materials. Flexible Pavement: Design factors, Basic Principles, Guidelines for Surfacing for Rural Road. CBR method for Design of Flexible Pavement. PMGSY – highlights of Scheme.
5.	**Low Cost irrigation**
	Low Cost Irrigation: Design Consideration and construction of tube-well, drip & sprinkler irrigation systems. Watershed and catchments area development - problems and features of watershed management, watershed structures.

D.RECOMMENDED STUDY MATERIAL:

S. No	Title of the Book	Author	Editio	Publisher
1.	Apprority Technologies for low cost Housing.	A.G.Madhov Rao, D.S. Ramachandra Murthy	Latest	Oxford and IBH Pblishing Co. Pvt. Ltd
2.	Design of Minor Irrigation and Canal Structures	C.Satyanarayan Murthy	Latest	Wiley Eastern Ltd
Websites				
https://nptel.ac.in/courses/120108005/ https://nptel.ac.in/courses/105/106/105106056/ https://nptel.ac.in/courses/105105160/				

E. COs AND POs MAPPING

COs and LOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO2103.1	2	-	2	-	1	1	1	-	-	-	-	1
CO2103.2	2	-	3	2	-	-	-	-	-	-	-	-
CO2103.3	-	1	1	-	2	2	-	-	-	-	-	-
CO2103.4	2	2	3	-	-	-	-	-	-	-	-	-
CO2103.5	-	-	3	-	2	2	-	-	-	-	-	-

E. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO2103.1	3		-	-	2
CO2103.2	-	-	2	2	2
CO2103.3	2		2	-	1
CO2103.4	2		-	2	-
CO2103.5	-		2	-	2

Note: On the basis of mapping of COs with POs, this course is related to Skill Development

MCMECV2104	**System Integration in Construction**	**4 Credits [LTP: 3-1-0]**

COURSE OVERVIEW AND OBJECTIVES:

To study and understand the construction system integration, environmental factors, services, maintenance and safety systems.

COURSE OUTCOMES

After completion of the course, student will be able to:

CO	Description
CO2104.1	Analyze of Structural Integration.
CO2104.2	Analyze of various Environmental Factors.
CO2104.3	Analyze of Services.
CO2104.4	Analyze of Maintenance.
CO2104.5	Analyze the Safety.

A. OUTLINE OF THE COURSE

Unit	Title of the unit	Time Required for the Unit (Hours)
1	Structural Integration	**8**
2	Environmental Factors	**6**
3	Services	**8**
4	Maintenance	**6**
5	Safety	**8**

C. DETAILED SYLLABUS

Unit	Unit Details
1.	**Structural Integration**
	Structural System, Systems for enclosing Buildings, Functional aesthetic system, Materials Selection and Specification.
2.	**Environmental Factors**
	Qualities of enclosure necessary to maintain a specified level of interior environmental quality – weather resistance – Thermal infiltration – Acoustic Control – Transmission reduction – Air quality – illumination – Relevant systems integration with structural systems.

3.	**Services**
	Plumbing – Electricity – Vertical circulation and their interaction – HVAC
4.	**Maintenance**
	Component longevity in terms of operation performance and resistance to deleterious forces - Planning systems for least maintenance materials and construction – access for maintenance – Feasibility for replacement of damaged components – equal life elemental design – maintenance free exposed and finished surfaces.
5.	**Safety**
	Ability of systems to protect fire – Preventive systems – fire escape system design – Planning for pollution free construction environmental – Hazard free Construction execution.

D.RECOMMENDED STUDY MATERIAL:

S. No	Title of the Book	Author	Edition	Publisher
1.	Handbook of Building Enclosure	A.J.Elder and Martiz Vinden Barg	Latest	McGraw-Hill Book Company
2.	Building Services Engineering	David V.Chadderton	Latest	Taylar and Francis
Websites				
https://nptel.ac.in/courses/120108005/ https://nptel.ac.in/courses/105/106/105106056/ https://nptel.ac.in/courses/105105160/				

E. COs AND POs MAPPING

COs and LOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO2104.1	2	-	2	-	1	1	1	-	-	-	-	1
CO2104.2	2	-	3	2	-	-	-	-	-	-	-	-
CO2104.3	-	1	1	-	2	2	-	-	-	-	-	-
CO2104.4	2	2	3	-	-	-	-	-	-	-	-	-
CO2104.5	-	-	3	-	2	2	-	-	-	-	-	-

F. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO2104.1	3		-	-	2
CO2104.2	-	-	2	2	2
CO2104.3	2		2	-	1
CO2104.4	2		-	2	-
CO2104.5	-		2	-	2

Note: On the basis of mapping of COs with POs, this course is related to Skill Development

Department Elective-II

MCMECV2105	Infrastructure Development	3 Credits [LTP: 3-0-0]

COURSE OVERVIEW AND OBJECTIVES:

This is the course work which gives the knowledge of Construction Industry, Status of Infrastructure in India, Public Private Partnership (PPP), Issues related to infrastructure development, Provisions made for Infrastructure Development.

COURSE OUTCOMES

After completion of the course, student will be able to:

CO	Description
CO2105.1	Analyze of various Construction Industry
CO2105.2	Analyze of various Status of Infrastructure in India
CO2105.3	Analyze of Public Private Partnership (PPP).
CO2105.4	Analyze of Issues related to infrastructure development
CO2105.5	Analyze of Provisions made for Infrastructure Development

A. OUTLINE OF THE COURSE

Unit	Title of the unit	Time Required for the Unit (Hours)
1	Construction Industry	**8**
2	Status of Infrastructure in India	**6**
3	Public Private Partnership (PPP)	**8**
4	Issues related to infrastructure development	**6**
5	Provisions made for Infrastructure Development	**8**

D. DETAILED SYLLABUS

Unit	Unit Details
1.	**Construction Industry**
	Nature, characteristics, size and structure. Role of infrastructure development in employment generation and improving of the National economy. Various Agencies associated with infrastructure development in India as regards various sectors.
2.	**Status of Infrastructure in India**
	Road sector Port , Railway, communication, water supply and drainage, Power sector, oil and gas industry, Health and educational services. Infrastructure Development, Indian budget and its relation with Infrastructure development projects in India. Various programs related with Infrastructure development in rural and urban sector
3.	**Public Private Partnership (PPP)**
	Public Private Partnership (PPP) in Infrastructure, Draft Concession Agreement for PPP projects, Escrow Agreement.
4.	**Issues related to infrastructure development**
	Issues related to infrastructure development – pre – requisites necessary to ensure success for switching over from public sector management to private sector management, issues in developing, funding and managing infrastructure projects, role, and responsibility of project

	management consultants. FDI in Infrastructure development, Problem areas and solutions.
5.	**Provisions made for Infrastructure Development**
	Provisions made for Infrastructure Development in the 12th and 13th five year plans of the planning commission Government of India. Formation of the Indian Infrastructure Development Corporation.

D.RECOMMENDED STUDY MATERIAL:

S. No	Title of the Book	Author	Edition	Publisher
1.	Construction Engineering & management of Projects (For Infrastructure & Civil Works).	S. C. Sharma	Latest	Khanna Publishers
2.	Public Private Partnership in Infrastructure	R. N. Joshi	Latest	Vision Publications
Websites				
https://nptel.ac.in/courses/120108005/ https://nptel.ac.in/courses/105/106/105106056/ https://nptel.ac.in/courses/105105160/				

E. COs AND POs MAPPING

COs and LOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO2105.1	2	-	2	-	1	1	1	-	-	-	-	1
CO2105.2	2	-	3	2	-	-	-	-	-	-	-	-
CO2105.3	-	1	1	-	2	2	-	-	-	-	-	-
CO2105.4	2	2	3	-	-	-	-	-	-	-	-	-
CO2105.5	-	-	3	-	2	2	-	-	-	-	-	-

G. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO2105.1	3		-	-	2
CO2105.2	-	-	2	2	2
CO2105.3	2		2	-	1
CO2105.4	2		-	2	-
CO2105.5	-		2	-	2

Note: On the basis of mapping of COs with POs, this course is related to Skill Development

Code: MCMECV2106	Construction Safety	3 Credits [LTP: 3-0-0]

COURSE OVERVIEW AND OBJECTIVES:

This is the course work which gives the knowledge of safety parameter to be adopted during the construction.

COURSE OUTCOMES

After completion of the course, student will be able to:

CO	Description
CO2106.1	To identify the hazards and risks involved in construction industries
CO21062	To improve safety culture within the organization
CO2106.3	To reduce the workplace injuries through incident prevention methods
CO2106.4	To use the modern tools to minimize the accident using monitoring methods, permits, exposure limits and ventilation
CO2106.5	To apply the Effective Safety Management System at Construction Site

A. OUTLINE OF THE COURSE

Unit	Title of the unit	Time Required for the Unit (Hours)
1	Construction Safety Management	**8**
2	Safety in construction operations	**6**
3	Prevention of accidents	**8**
4	Safety equipment	**6**
5	Safety policies	**8**

E. DETAILED SYLLABUS

Unit	Unit Details
1.	**Construction Safety Management**
	Construction Safety Management – Role of various parties, duties and responsibilities of top management, site managers, supervisors etc. role of safety officers, responsibilities of general employees, safety committee, safety training, incentives and monitoring. Writing safety manuals, preparing safety checklists and inspection reports.
2.	**Safety in construction operations**
	Safety in construction operations – Safety of accidents on various construction sites such as buildings, dams, tunnels, bridges, roads, etc. safety at various stages of construction
3.	**Prevention of accidents**
	Prevention of accidents. Safety measures. Safety in use of construction equipment e.g. vehicles, cranes, hoists and lifts etc. safety of scaffolding and working platforms. Safety while using electrical appliances. Explosives used
4.	**Safety equipment**
	Various safety equipment and gear used on site. First aid on site, Safety awareness

	program. Labor laws, legal requirement and cost aspects of accidents on site, Incentive for safety practices
5.	**Safety policies**
	Study of safety policies, methods, equipment, training provided on any ISO approved construction Company, safety in office, working on sites of high rise construction, deep excavation

D.RECOMMENDED STUDY MATERIAL:

S. No	Title of the Book	Author	Edition	Publisher
1.	Construction Safety Handbook	Davies V.S.Thomasin K, Thomas Telford	Latest	London.
2.	Safety management	Girimaldi and Simonds	Latest	AITBS, New Delhi.
Websites				
https://nptel.ac.in/courses/120108005/ https://nptel.ac.in/courses/105/106/105106056/ https://nptel.ac.in/courses/105105160/				

E. COs AND POs MAPPING

COs and LOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO2106.1	2	-	2	-	1	1	1	-	-	-	-	1
CO21062	2	-	3	2	-	-	-	-	-	-	-	-
CO2106.3	-	1	1	-	2	2	-	-	-	-	-	-
CO2106.4	2	2	3	-	-	-	-	-	-	-	-	-
CO2106.5	-	-	3	-	2	2	-	-	-	-	-	-

H. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO2106.1	3		-	-	2
CO21062	-	-	2	2	2
CO2106.3	2		2	-	1
CO2106.4	2		-	2	-
CO2106.5	-		2	-	2

Note: On the basis of mapping of COs with POs, this course is related to Skill Development

Code: MCMECV2107 Project Risk Analysis and Mitigation Techniques 3 Credits [LTP: 3-0-0]

COURSE OVERVIEW AND OBJECTIVES:

This is the course work which gives the knowledge of Risk analysis, identifying risk events, dealing with uncertainties, Use of risk prompts, Residual risk

COURSE OUTCOMES

After completion of the course, student will be able to:

CO	Description
CO2107.1	To analyze the risk at site
CO2107.2	Analyze of Identifying risk events
CO2107.3	Evaluate of Dealing with uncertainties
CO2107.4	Analyze of use of risk prompts
CO2107.5	Evaluate of Residual risk

A. OUTLINE OF THE COURSE

Unit	Title of the unit	Time Required for the Unit (Hours)
1	Risk analysis	8
2	Identifying risk events	6
3	Dealing with uncertainties	8
4	Use of risk prompts	6
5	Residual risk	8

F. DETAILED SYLLABUS

Unit	Unit Details
1.	**Risk analysis**
	General–Importance of Risk, types of risks, quantifiable and un-quantified risks. Micro,market, project level risk analysis approach. Risk analysis and Management for projects (RAMP).
2.	**Identifying risk events**
	Identifying risk events. Probability distribution. Stages in Investment, life-cycle; determination of NPV and its standard deviation for perfectly co-related, moderately co-related and un-correlated cash flows.
3.	**Dealing with uncertainties**
	Sensitivity analysis, scenario analysis simulation, decision tree analysis, risk profile method, certainly equivalent method; risk adjusted discount rate method, certainty indexmethod, point estimated method.
4.	**Use of risk prompts**
	Use of risk prompts, use of Risk Assessment tables, details of RAMP process, utility of Grading of construction entities for reliable risk assessment. Risk Mitigation – byelimination, reducing, transferring, avoiding, absorbing or pooling

5.	**Residual risk**
	Residual risk, mitigation of un-quantified risk. Coverage of risk through CIDC's MOU with the Actuarial Society of India 60 through risk premium such as (BIP) – Bidding Indemnity Policy (DIMO) – Delay in meeting obligation by client policy, (SOC) – Settlement of claims policy (LOP)- Loss of profit policy (TI). Transit Insurance policy (LOPCE) Loss of performance of construction equipment policy.

D. RECOMMENDED STUDY MATERIAL:

S. No	Title of the Book	Author	Edition	Publisher
1.	Project Risk Analysis and Management	John Bartlett	Latest	APM Publishing Limited
Websites				
https://nptel.ac.in/courses/120108005/ https://nptel.ac.in/courses/105/106/105106056/ https://nptel.ac.in/courses/105105160/				

E. COs AND POs MAPPING

COs and LOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO2107.1	2	-	2	-	1	1	1	-	-	-	-	1
CO2107.2	2	-	3	2	-	-	-	-	-	-	-	-
CO2107.3	-	1	1	-	2	2	-	-	-	-	-	-
CO2107.4	2	2	3	-	-	-	-	-	-	-	-	-
CO2107.5	-	-	3	-	2	2	-	-	-	-	-	-

I. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO2107.1	3		-	-	2
CO2107.2	-	-	2	2	2
CO2107.3	2		2	-	1
CO2107.4	2		-	2	-
CO2107.5	-		2	-	2

Note: On the basis of mapping of COs with POs, this course is related to Skill Development

MCMECV2108 Management and Project Planning in Construction 3 Credits [LTP: 3-0-0]

COURSE OVERVIEW AND OBJECTIVES:

To understand the concepts of Basics of Management, Project Management, Project Scheduling, Project Controlling, Construction site management.

COURSE OUTCOMES

After completion of the course, student will be able to:

CO	Description
CO2108.1	Evaluate the Basics of Management
CO2108.2	Understand the role of Project Management
CO2108.3	Apply the mechanism of Project Scheduling
CO2108.4	Analyze the project Controlling & Construction site management
CO2108.5	Evaluate the work Study

A. OUTLINE OF THE COURSE

Unit	Title of the unit	Time Required for the Unit (Hours)
1	Basics of Management	**8**
2	Project Management	**6**
3	Project Scheduling	**8**
4	Project Controlling & Construction site management	**6**
5	Work Study	**8**

G. DETAILED SYLLABUS

Unit	Unit Details
1.	**Basics of Management**
	Modern scientific management (Contribution by Fayol , F.W. Taylor , Mayo), Management Functions, Management Styles, SWOT Analysis in construction
2.	**Project Management**
	Basic forms of organization with emphasis on Project and matrix structures; project life cycle, planning for achieving time, cost, quality, project feasibility reports based on socio-techno-economic environmental impact analysis, project clearance procedures and necessary documentation for major works like dams, multistoried structures, ports, tunnels, Qualities, role and responsibilities of project manager, Role of Project Management Consultants, Enterprise Resource Planning (ERP)
3.	**Project Scheduling**
	Construction Scheduling, Work break down structure, activity cost and time estimation in CPM, PERT, RPM (Repetitive Project Modeling) techniques. LOB technique, Mass haul diagrams. Precedence Network Analysis, software in Construction scheduling (MSP, primavera, Construction manager).
4.	**Project Controlling & Construction site management**
	Monitoring and Control, Crashing, Resource Leveling, Updating, Site mobilization – demobilization aspects, various Resources management based on funds availability, 10 coordinating, communicating & reporting Techniques, Application of MIS to construction,

	Training for Construction Managers, Engineers, Supervisors.
5.	**Work Study**
	a) Definition, Objectives, basic procedure, method study and work measurement, Work study applications in Civil Engineering. b) Method study – Definition, Objective, Procedure for selecting the work, recording facts, symbols, flow process charts, multiple activity charts, string diagrams. c) Work measurement – Time and motion studies, Concept of standard time and various allowances, time study, equipment performance rating. Activity sampling, time-lapse , photography technique, Analytical production studies.

D.RECOMMENDED STUDY MATERIAL:

S. No	Title of the Book	Author	Edition	Publisher
1.	Construction Planning & management	P S Gahlot & B M Dhir	Latest	Blackwell Science
2.	Construction Project planning & Scheduling	Charles Patrick	Latest	Pearson
Websites				
https://nptel.ac.in/courses/120108005/ https://nptel.ac.in/courses/105/106/105106056/ https://nptel.ac.in/courses/105105160/				

E. COs AND POs MAPPING

COs and LOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO2108.1	2	-	2	-	1	1	1	-	-	-	-	1
CO2108.2	2	-	3	2	-	-	-	-	-	-	-	-
CO2108.3	-	1	1	-	2	2	-	-	-	-	-	-
CO2108.4	2	2	3	-	-	-	-	-	-	-	-	-
CO2108.5	-	-	3	-	2	2	-	-	-	-	-	-

J. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO2108.1	3		-	-	2
CO2108.2	-	-	2	2	2
CO2108.3	2		2	-	1
CO2108.4	2		-	2	-
CO2108.5	-		2	-	2

Note: On the basis of mapping of COs with POs, this course is related to Skill Development

Code: MULEBX2109	Engineering Economics	3 Credits [LTP:3-0-0]

COURSE OVERVIEW AND OBJECTIVES:

This course Acquire knowledge of economics to facilitate the process of economic decision making.
Acquire knowledge on basic financial management aspects.
Develop the skills to analyze financial statements.

COURSE OUTCOME
The student would be able
CO1101.1. Evaluate the economic theories, cost concepts and pricing policies.
CO1101.2 Understand the market structures and integration concepts
CO1101.3 Understand the measures of national income, the functions of banks and concepts of globalization
C01101.4 Apply the concepts of financial management for project appraisal
CO1101.5 Understand accounting systems and analyze financial statements using ratio analysis

A.	Outline of the Course	
Unit No.	**Title of the unit**	**Time required for the Unit (Hours)**
1	Economics, Cost and Pricing Concepts	9
2	Concepts on Firms and Manufacturing Practices.	9
3	National Income, Money and Banking, Economic Environment	9
4	Concepts of Financial Management	9
5	Accounting System, Statement and Financial Analysis	9

B.	DETAILED SYLLABUS
1	**Economics, Cost and Pricing Concepts**
	Economic theories – Demand analysis – Determinants of demand – Demand forecasting – Supply – Actual cost and opportunity cost – Incremental cost and sunk cost – Fixed and variable cost – Marginal costing – Total cost – Elements of cost – Cost curves – Breakeven point and breakeven chart – Limitations of breakeven chart – Interpretation of breakeven chart – Contribution – P/V-ratio, profit-volume ratio or relationship – Price fixation – Pricing policies – Pricing methods
2	**Concepts on Firms and Manufacturing Practices**.
	Firm – Industry – Market – Market structure – Diversification – Vertical integration – Merger – Horizontal integration
3	**National Income, Money And Banking, Economic Environment**
	National income concepts – GNP – NNP – Methods of measuring national income – Inflation – Deflation – Kinds of money – Value of money – Functions of bank – Types of bank – Economic liberalization – Privatization – Globalization
4	**Concepts of Financial Management**
	Financial management – Scope – Objectives – Time value of money – Methods of appraising project profitability – Sources of finance – Working capital and management of working capital
5	**Accounting System, Statement And Financial Analysis**
	Accounting system – Systems of book-keeping – Journal – Ledger – Trail balance – Financial

	statements – Ratio analysis – Types of ratios – Significance – Limitations

C.	RECOMMENDED STUDY MATERIAL:	
S. No	**Title of the Book**	**Author**
1	Financial Management‖ (Theory & Practice) TMH	Prasanna Chandra
2	Essentials of Managerial Finance	Weston & Brigham
3	Financial Management	Pandey, I. M
4	Fundamentals of Financial Management	James C. Van Horne
Important Web links		
1	https://www.youtube.com/watch?v=mX9nd0eQ-6g&ab_channel=KrassimirPetrov	
2	https://www.youtube.com/watch?v=CCQwz_Gwo6o&ab_channel=IITRoorkeeJuly2018	

D	COs AND POs MAPPING											
COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1101.1	1	1	-	3	-	1	-	-	-	-	1	-
CO1101.2	1	3	-	2	1	-	-	-	-	-	-	-
CO1101.3	1	-	-	3	1	-	-	-	-	-	1	-
CO1101.4	1	1	3	-	-	-	1	-	-	-	1	-
CO1101.5	1	1	3	-	1	1	-	-	-	-	-	1

E	COs AND PSOs MAPPING				
COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1101.1	1	2	3	1	-
CO1101.2	-	2	2	-	3
CO1101.3	1	1	-	3	2
CO1101.4	1	3	-	2	-
CO1101.5	1	3	-	2	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/ Skill Development

Code: MULCHM2201	Soft Skills-II	1 Credits [LTP:0-0-2]

COURSE OUTCOME

CO02201.1: To present themselves in an effective manner and know about their short-term and long-term goals.

CO02201.2 To works in a team by managing time properly and focus on personal grooming, etiquettes and body language.

CO02201.3 To demonstrate their abilities by improving skills of LSRW (Listening /Speaking/Reading/Writing).

CO02201.4 To present different viewpoints or ways of thinking about a situation , expand their abilities to resolve situations and get experience within the given context

CO02201.5 To enhance their employability skills by working on the presentation of Résumé and giving impactful performance during Group Discussion.

B. DETAILED SYLLABUS

1	Self-Introduction & knowing your environment
2	Goal Setting & Planning
3	Etiquettes (Personal, Social, Professional & Corporate) etiquettes
4	Personal Grooming and Body language
5	Time Management & Team Work
6	Negotiation and conflict management
7	Oral Communication &Writing Skills: Extempore & Paper Presentations.
8	Resume Writing
9	Group Discussion
10	Interview Skills

Code: MCMCCV2401	SEMINAR-II	1 Credits [LTP:0-0-2]

SYLLABUS

Contents
Students will be grouped in two to three, will have to decide final thesis area, download research papers from IEEE, ACM, Elsevier, Springer etc. Summarizing paper – Reading abstracts and finding ideas, conclusion, Advantages of Their approach, the drawbacks of the papers. Generalize results from a research paper to related research problems. Comparing the approach - Identify weaknesses and strengths in recent research articles in the subject. Practice sessions on how to read, analyze and summarize research papers. Students in group will have to deliver seminar, prepare a report and a review paper based on analysis.

	POORNIMA UNIVERSITY, JAIPUR								
	Faculty of Engineering and Technology								
Name of Program:	**M.Tech. in Construction Technology and Management** **Duration: 2 Years** **Total Credits: 80**								
	<u>Teaching Scheme for Batch 2023-25</u>								
	Semester-III								
Course Code	**Name of Course**	**Teaching Scheme**				**Marks Distribution**			
		Lecture (L)	**Tutorial (T)**	**Practical**	**SH**	**IE**	**ESE**	**Total**	
A.		**Major (Core Courses)**							
A.1	**Theory**								
MCMCCV3101	Green Buildings and Services	3	1	-		40	60	100	4
MCMCCV3102	Research Methodology	3	1	-		40	60	100	4
A.2	**Practical**								
MCMCCV3201	Construction & Project Management Lab-III	-	-	2		60	40	100	1
MCMCCV3401	Review/Research Paper	-	-	2		60	40	100	1
B.		**Minor Stream Courses/ Department Electives/*<u>Open Elective</u>***							
B.1	**Theory**								
MULEEE3107	E-Commerce and Knowledge Management	3	1	-		40	60	100	3
MULECV3108	Water and Environmental Pollution			-		40	60	100	
MULEME3109	IPR & Patents			-		40	60	100	
MULEEE3110	Robotics			-		40	60	100	
MULEEE3111	Digital India Implementation			-		40	60	100	
MULECV3112	Smart City Design			-		40	60	100	
MULEEE3113	Renewable Energy			-		40	60	100	
B.2	**Practical**								
C		**Multidisciplinary Courses**							
MSTEMC3121	MOOC Course – I	3	-	-	-	-	-	-	3
D		**Ability Enhancement Courses (AEC)**							
	-	-	-	-	-	-	-	-	-
E		**Skill Enhancement Courses (SEC)**							
-	-	-	-	-	-	-	-	-	-
F		**Value Added Courses (VAC)**							
	-	-	-	-	-	-	-	-	-
G		**Summer Internship / Research Project / Dissertation**							
MCMCCV3402	Dissertation Part – I	-	-	12		60	40	100	6
Total		12	3	16					

Total Teaching Hours	**31**	

PO's and PSO's are as follows

PO No.	PO's
1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental
4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions. Considerations.
5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
PSO No.	**PSO's**
1	A civil engineering graduate is efficient in fundamentals of civil engineering, mathematical & scientific reasoning and are able to plan, design the building structure, roads, sewage and water supply networks & other component of infrastructure system considering environmental, safety & health aspects.
2	A civil engineer is able to use modern tools, techniques, software's to solve complex engineering problems
3	A civil Engineer able to prepare BOQ & cost estimation & able to execute the projects in lined with set project goals.
4	A civil engineer is able to compile detailed project report & give technical specifications to provide required quality of work.
5	A civil engineer is able to access the quality of material used for construction & able to find out deviations & able to suggest preventative and corrective measures for sustainable development.

Major Core Courses

Code: MCMCCV3101	Green Buildings and Services	4 Credits [LTP: 3-1-0]

COURSE OVERVIEW AND OBJECTIVES: To provide students with a framework that will help them choose the General principle of foundation Design, Shallow Foundations, Pile Foundations, Soil Stability, Improvement of Foundation Soils.

COURSE OUTCOMES

After completion of the course, student will be able to:

CO	Description
CO3101.1	Understand the issues of environmental degradation on account of Buildings Sector
CO3101.2	Understand the Concept of Green Buildings and its importance.
CO3101.3	Learn the Design factor of Green Buildings
CO3101.4	Be able to apply the concepts to Building Design & Rehabilitation
CO3101.5	Understand the Rating Systems and Certification for Green Building

A. OUTLINE OF THE COURSE

Unit	Title of the unit	Time Required for the Unit (Hours)
1	General principle of foundation Design	**6**
2	Shallow Foundations	**8**
3	Pile Foundations	**8**
4	Soil Stability	**8**
5	Improvement of Foundation Soils	**6**

C.DETAILED SYLLABUS

Unit	Unit Details
1	**Introduction and Design Features for Green Building**
	Introduction to Green Buildings: Definition of Green Building, Benefits of Green Building, Components/features of Green Building – Site selection, Energy Efficiency, Water Efficiency, Material Efficiency, Indoor Air Quality. **Design Features for Green Building Construction:** Site selection strategies, landscaping, building form, orientation, building envelope and fenestration – material and construction techniques, roofs, walls, and fenestration and shaded finishes, advanced passive heating and cooling techniques, Waste reduction during construction.
2	**Water and Waste Water Management**
	Water and Waste Water Management: Compliance, fixtures, rainwater harvesting and techniques, water and waste water management, solid waste management.
3	**Energy Management**
	Energy Management: Appliances, compliance energy performance, solar water heating system, use of renewable energy options. High performance glass, other energy saving options, provisions of ECBC, insulating materials.
4	**Eco-friendly Materials and Indoor Air Quality**
	Eco-friendly Materials: Various types of eco-friendly materials, use of recycled materials like: flyash bricks, recycled ceramic tiles, recycled glass tiles, porcelain tiles, natural terracotta tile, wood, steel, aluminium and renewable materials, agrifibre, linoleum, salvaged material – properties and

	applications. Recycling of aggregate, use of plastic, recycled material **Indoor Air Quality:** Natural air ventilation systems, different types of low VOC materials, day lighting.
5	**Rating Systems and Certification for Green Building**
	Rating Systems and Certification for Green Building: Different rating of rating like lead, systems and their special features. Criteria, compliance, appraisal for rating systems. Case study on rating of green buildings.

C. RECOMMENDED STUDY MATERIAL

Sr. No.	Book	Author	Publication
1	Proceeding of Training Programme on Energy Efficient & Green Buildings	Sharma, S.K., Gupta Himmi, Singh Balkar	Excel India Publishers, New Delhi
2	Green Building with Concrete, Sustainable Design & Construction	Sabnis, Gajanan M.	Taylor & Francis Group, New Delhi
Websites			
https://nptel.ac.in/courses/105105166/ https://nptel.ac.in/courses/105101085/ https://nptel.ac.in/courses/105105109/ https://nptel.ac.in/courses/105105109/			

D. COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO3101.1	2	3	-	-	1	-	-	-	-	-	-	-
CO3101.2	3	1	2	1	-	-	-	-	-	-	-	-
CO3101.3	1	-	3	2	1	-	-	-	-	-	-	-
CO3101.4	-	2	-	2	3	-	-	-	-	-	-	-
CO3101.5	2	-	2	3	-	-	-	-	-	-	-	-

E. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO3101.1	3	-	2	-	2
CO3101.2	1	3	-	2	1
CO3101.3	2	1	3	1	-
CO3101.4	-	2	-	3	2
CO3101.5	2	-	2	-	3

Note: On the basis of mapping of COs with POs, this course is related to Employability / Skill Development.

Code: MCMCCV3102	Research Methodology	4 Credits [LTP: 3-1-0]

COURSE OVERVIEW AND OBJECTIVES

- To familiarize students with basic of research and the research process. To enable the students in conducting research work and formulating research synopsis and report. Develop understanding on various kinds of research, objectives of doing research, research process, research designs and sampling

A. COURSE OUTCOME

After completion of this course, student will be able to:

CO No.	Description
CO3102.1	Distinguish a purpose statement, a research question or hypothesis, and a research objective.
CO3102.2	Define the meaning of a variable, and to be able to identify independent, dependent, and mediating variables
CO3102.3	Compare between categorical and continuous measures.
CO3102.4	Design a good quantitative purpose statement and good quantitative research questions and hypotheses
CO3102.5	Analyze the link between quantitative research questions and data collection and how research questions are operationalized in educational practice.

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Overview of Research Methodology** Introduction, Mathematical tools for analysis, Research problems in management, Types of research, Research Process, Data Collection & Presentation: Introduction, Primary data, Secondary data, Data Presentation
2.	**Review of Basic Statistical Measures & Basic Multivariate Analysis** Introduction, Measures of Central Tendencies, Measures of Variation, Measures of Skewness. Basic Multivariate Analysis: Introduction, Correlation analysis, Forecasting, Linear regression & Timeseries
3.	**Design and Analysis of Experiments** Introduction, Analysis of Variance, Completely Randomized design, Randomized complete block design, Latin square design, Duncan‟s multiple Range Test, Functional design, second factorial experiment, Expected Mean Square.
4.	**Algorithmic Research &Simulation** Introduction, Algorithmic Research Problems, Types, Types of Solution Procedures, Steps of development, Steps of Algorithmic Research, Design of Experiments, Meta Heuristics for Combinational Problems. Simulation: Introduction, Need for simulation, Types, Simulation Languages, case study.
5.	**Report Writing and Presentation** Introduction, Types of report, Guidelines for review draft, Report format, Typing Instructions, Oral Presentations

C. RECOMMENDED STUDYMATERIAL:

S. No	Title of the Book	Author
1.	Research Methodology	R. Panneerselvam, PHI
2.	Research Methodology: Methods and Trends	Dr. C. R. Kothari
3.	Research Methodology: A Step by Step Guide for Beginners	Ranjit Kumar

Important Web Links

1. https://libguides.wits.ac.za/c.php?g=693518&p=4914913
2. https://www.scribbr.com/dissertation/methodology/
3. https://www.open.edu/openlearn/money-management/understanding-different-research-perspectives/content-section-8
4. https://www.researchgate.net/publication/270956555_CHAPTER_3_-_RESEARCH_METHODOLOGY_Data_collection_method_and_Research_tools
5. https://www.youtube.com/watch?v=ze5bS-DNERk

D. COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO3201.1	3	2	1	1	-	-	-	-	-	-	-	-
CO3201.2	-	2	3	-	2	-	-	-	-	-	-	-
CO3201.3	2	1	3	-	1	-	-	-	-	-	-	-
CO3201.4	2	3	-	2	-	-	-	-	-	-	-	-
CO3201.5	1	1	2	3	-	-	-	-	-	-	-	-

E. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO3201.1	3	2	1	-	1
CO3201.2	2	-	3	2	-
CO3201.3	1	-	3	1	2
CO3201.4	-	2	2	-	3
CO3201.5	2	1	-	3	1

Note: On the basis of mapping of COs with POs, this course is related to Employability / Skill.

Code: MCMCCV3201 Construction & Project Management Lab-III 1 Credits [LTP: 0-0-2]

A. DETAILED SYLLABUS

List of Experiments
Design as per syllabus of theory

Code: MTECCV3401	Review/Research Paper	1 Credits [LTP: 0-0-2]

A. COURSE OVERVIEW AND OBJECTIVES

To familiarize students with basic of research and the research process. To enable the students in conducting research work and formulating research synopsis and report. Develop understanding on various kinds of research, objectives of doing research, research process, research designs and sampling

COURSE OUTCOME

The student will be able to:

CO02102.1 To be able to distinguish a purpose statement, a research question or hypothesis, and a research objective.

CO02102.2 To be able to define the meaning of a variable, and to be able to identify independent, dependent, and mediating variables

CO02102.3 To be able to distinguish between categorical and continuous measures

CO02102.4 To be able to design a good quantitative purpose statement and good quantitative research questions and hypotheses.

CO02102.5 To understand the link between quantitative research questions and data collection and how research questions are operationalized in educational practice.

A. DETAILED SYLLABUS

Unit	Contents
1.	**Foundations of Research**
	Foundations of Research: Meaning, Objectives, Motivation, Utility. Concept of theory, empiricism, deductive and inductive theory. Characteristics of scientific method – Understanding the language of research – Concept, Construct, Definition, Variable. Research Process
2.	**Problem Identification & Formulation**
	Problem Identification & Formulation – Research Question – Investigation Question – Measurement Issues – Hypothesis – Qualities of a good Hypothesis –Null Hypothesis & Alternative Hypothesis. Hypothesis Testing – Logic & Importance
3.	**Research Design**
	Research Design: Concept and Importance in Research – Features of a good research design – Exploratory Research Design – concept, types and uses, Descriptive Research Designs – concept, types and uses. Experimental Design: Concept of Independent & Dependent variables.
4.	**Qualitative and Quantitative**
	Qualitative and Quantitative Research: Qualitative research – Quantitative research – Concept of measurement, causality, generalization, replication. Merging the two approaches.
5.	**Data Analysis**
	Data Analysis: Data Preparation – Univariate analysis (frequency tables, bar charts, pie charts, percentages), Bivariate analysis – Cross tabulations and Chi-square test including testing hypothesis of association.
6.	**Interpretation of Data and Paper Writing**
	Interpretation of Data and Paper Writing – Layout of a Research Paper, Journals in Computer Science, Impact factor of Journals, When and where to publish ? Ethical issues related to publishing, Plagiarism and Self-Plagiarism.
7.	**Use of Encyclopedias, Research Guides, Handbook**
	Use of Encyclopedias, Research Guides, Handbook etc., Academic Databases for Computer Science Discipline
8.	**Use of tools / techniques for Research**
	Use of tools / techniques for Research: methods to search required information effectively, Reference Management Software like Zotero/Mendeley, Software for paper formatting like

	LaTeX/MS Office, Software for detection of Plagiarism

B. RECOMMENDED STUDY MATERIAL:

S.No	Title of the Book	Author
1.	Research Methodology	R. Panneerselvam, PHI
2.	Research Methodology: Methods and Trends	Dr. C. R. Kothari
3.	Research Methodology: A Step by Step Guide for Beginners	Ranjit Kumar

Code: MULEEE3107 E- Commerce & Knowledge Management 3 Credits [LTP: 3-1-0]

COURSE OVERVIEW AND OBJECTIVES

This course provides an introduction to information systems for business and management. It is designed to familiarize students with organizational and managerial foundations of systems, the technical foundation for understanding information systems

COURSE OUTCOME

The student would be able to

CO3107.1 Understand the basic concepts and technologies used in the field of management information systems;

CO3107.2To impart the knowledge of the different types of management information systems;

CO3107.3 To Understand the processes of developing and implementing information systems;

CO3107.4 To aware of the ethical, social, and security issues of information systems;

CO3107.5 To familiarize students with organizational and managerial foundations of systems

A. OUTLINE OF COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	**INTRODUCTION TO ELECTRONIC COMMERCE**	9
2.	**BUILDING OWN WEBSITE**	8
3.	**INTERNET AND EXTRANET**	9
4.	**ELECTRONIC DATA INTERCHANGE**	9
5.	**PLANNING FOR ELECTRONIC COMMERCE**	9

B. Detailed Syllabus

Unit	Unit Details
Unit 1	**INTRODUCTION TO ELECTRONIC COMMERCE** Introduction of Unit, what is E-Commerce (Introduction and Definition), Main activities E-Commerce, Goals of E-Commerce, Technical Components of E-commerce, Functions of E-commerce, Advantages and Disadvantages of E-commerce, Scope of E-commerce, Electronic commerce Applications, Electronic commerce and Electronic Business, Conclusion of Unit.
Unit 2	**BUILDING OWN WEBSITE** Introduction of Unit, Reasons for building own website, Benefits of website, Bandwidth requirements, Cost, Time, Reach, Registering a Domain Name, Web promotion, Target email, Banner Exchange, Shopping Bots, Conclusion of Unit
Unit 3	**INTERNET AND EXTRANET** Introduction of Unit, Definition of Internet, Advantages and Disadvantages of the Internet, Component of an Intranet Information technology structure, Development of a Intranet, Extranet and Intranet Difference, Role of Intranet in B2B Application, Conclusion of Unit.
Unit 4	**ELECTRONIC DATA INTERCHANGE** Introduction of Unit, Concepts of EDI and Limitation, Application of EDI, Disadvantages of EDI, EDI model, Conclusion of Unit.
Unit 5	**PLANNING FOR ELECTRONIC COMMERCE** Introduction of Unit, planning electronic commerce initiatives, linking objectives to business strategies, measuring cost objectives, comparing benefits to costs, strategies for developing electronic commerce web sites, Conclusion of Unit.

RECOMMENDED STUDY MATERIAL:

S. No	Title of the Book	Author
1.	E-Commerce	Greenstein &Feinman, Tata McGrew Hill
2.	Frontiers of Electronic Commerce	KalakotaWinston ,Pearson Education

Important Web Links:

1. https://www.kmslh.com/3-reasons-why-ecommerce-must-have-knowledge-management/
2. https://link.springer.com/chapter/10.1007/978-3-642-23993-9_31
3. https://ieeexplore.ieee.org/document/5279962
4. https://www.sciencedirect.com/science/article/pii/S0268401207001120
5. https://www.slideshare.net/monoaziz/knowledge-management-1852596

A. COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO3107.1	2	-	-	-	-	2	-	-	-	-	-	-

CO3107.2	2	-	-	-	-	2	2	-	-	-	-	-
CO3107.3	2	-	-	-	-	2	2	-	-	-	-	-
CO3107.4	2	-	-	-	-	1	-	-	-	-	-	-
CO3107.5	2	-	-	-	-	2	2	-	-	-	-	-

B. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO3107.1	2	-	-	-	2
CO3107.2	2	-	-	-	2
CO3107.3	2		1	-	2
CO3107.4	2	-	-	-	2
CO3107.5	1	-	-	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability / Skill Development / Entrepreneur

Code: MULECV3108	Water and Environmental Pollution	3 Credits [LTP: 3-1-0]

COURSE OVERVIEW AND OBJECTIVES

The aim of this course is to teach students about current environmental problems. From an environmental perspective, the student will learn how to develop an activity using various strategies to control, reduce and monitor all environmental problems that might arise as a result.

COURSE OUTCOME

The student would be able to

CO3108.1 To be able to identify and value the effect of the pollutants on the environment: atmosphere, water and soil.

CO3108.2 To be able to analyse an industrial activity and identify the environmental problems.

CO3108.3 TO be able to plan strategies to control, reduce and monitor pollution.

CO3108.4 To be able to select the most appropriate technique to purify and/or control the emission of pollutants.

CO3108.5 To be able to apply the basis of an Environmental Management System (EMS) to an industrial activity.

A.OUTLINE OF COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	**WATER AND WATER ANALYSIS**	9
2.	**WASTEWATER AND THEIR TREATMENT**	8
3.	**GLOBAL ATMOSPHERIC CHANGE**	9
4.	**AIR POLLUTION & METEOROLOGY**	9
5.	**SOLID WASTE MANAGEMENT**	9

A. DETAILEDSYLLABUS

Unit 1	**WATER AND WATER ANALYSIS** Water resources, Sources of water, characteristics of water, water pollutants, oxygen demanding wastes, surface water quality, and ground water quality. Municipal water supply: Requisites of drinking water, Steps involved in treatment of water
Unit 2	**WASTEWATER AND THEIR TREATMENT** Wastewater Characteristics: Quality parameters: BOD, COD, TOC, Solids, DO, Nitrogen, Phosphorus, And standards of disposal into natural watercourses and on land, Indian standards.wastewater treatment systems, disposal scope
Unit 3	**GLOBAL ATMOSPHERIC CHANGE** The atmosphere of earth, greenhouse effect, radioactive forcing of climate change, global warming Potential, carbon cycle, carbon emissions from fossil fuels, regional impacts of temperature change, global initiatives.

Unit 4	**AIR POLLUTION & METEOROLOGY** Atmospheric motion, Lapse rate, atmospheric stability, inversion, atmospheric dispersion, maximum mixing depth, Air quality standards, plume rise, emission controls. Air pollution control methods in industries. **NOISE POLLUTION:** Effect of noise on people, rating systems, community noise sources and criteria, traffic noise prediction, noise control
Unit 5	**SOLID WASTE MANAGEMENT** Integrated solid waste management, hazardous waste management, biomedical waste treatment technologies and disposal options, e-waste management, waste minimization for sustainability, waste management – Indian scenario.

B. RECOMMENDED STUDYMATERIAL:

S.No	Title of the Book	Author
1.	Environmental Engineering	Howard S Peavy, Donald RRowe, George Tchobanoglous
2.	Engineering: Treatment, and Reuse, 4th edition, Tata McGraw Hill, 2007.	Metcalf and Eddy Inc
3.	Manual for Water Treatment.	Ministry of Urban development, Govt of India
4.	Manual for Sewage Treatment	Ministry of Urban development, Govt of India
5.	Air Pollution	M N Rao
6.	Air Pollution Control Engineering	De Nevers
7	Solid Wastes: Engineering principles and Management issues	Tchobanoglous G.

Important Web Links:

1. https://www.google.co.in/search?biw=1366&bih=608&ei=Y4HLXvytHffYz7sPn9eB4AY&q=water+and+enviroment+polluation+nptel&oq=water+and+enviroment+polluation+nptel&gs_lcp=CgZwc3ktYWIQAzIKCCEQFhAKEB0QHjIKCCEQFhAKEB0QHjIKCCEQFhAKEB0QHjoECAAQRzoGCAAQFhAeOgcIIRAKEKABUIsYWP4mYMItaABwAXgAgAG8AogBuw2SAQcwLjEuNS4xmAEAoAEBqgEHZ3dzLXdpeg&sclient=psy-ab&ved=0ahUKEwi868D4y87pAhV37HMBHZ9rAGwQ4dUDCAw&uact=5\
2. https://www.nrdc.org/stories/water-pollution-everything-you-need-know
3. https://www.environmentalpollutioncenters.org/water/
4. https://www.explainthatstuff.com/waterpollution.html
5. https://wwf.panda.org/knowledge_hub/teacher_resources/webfieldtrips/water_pollution/

F. COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO3108.1	2	-	-	-	-	2	-	-	-	-	-	-
CO3108.2	2	-	-	-	-	2	2	-	-	-	-	-
CO3108.3	2	-	-	-	-	2	2	-	-	-	-	-
CO3108.4	2	-	-	-	-	1	-	-	-	-	-	-
CO3108.5	2	-	-	-	-	2	2	-	-	-	-	-

F. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO3108.1	2	-	-	-	2
CO3108.2	2	-	-	-	2
CO3108.3	2		1	-	2
CO3108.4	2	-	-	-	2
CO3108.5	1	-	-	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability / Skill Development / Entrepreneur

Code: MULEME3109	IR& Patents	3 Credits [LTP: 3-1-0]

COURSE OVERVIEW AND OBJECTIVES: The main objective of the IPR is to make the students aware of their rights for the protection of their invention done in their project work.Further teacher will have to demonstrate with products and ask the student to identify the different types of IPR's

COURSE OUTCOME:

CO3109.1 To introduce fundamental aspects of Intellectual property Rights to students who are going to play a major role in development and management of innovative projects in industries.

CO3109.2 To disseminate knowledge on patents, patent regime in India and abroad and registration aspects

CO3109.3 To acquire knowledge on copyrights and its related rights and registration aspects

CO3109.4 To understand knowledge on trademarks and registration• aspects

CO3109.5 To disseminate knowledge on Design, Geographical Indication (GI), Plant Variety and Layout Design Protection and their registration aspects

A. OUTLINE OF COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	**INTRODUCTION TO IPR**	9
2.	**TYPES OF IPR AND WIPO**	8
3.	**LEGAL AND COMMERCIAL ASPECTS OF IPR**	9
4.	**INTRODUCTIONS TO PATENTS**	9
5.	**PATENT PROCEDURES**	9

B. DETAILED SYLLABUS

Unit	Unit details
Unit 1	**INTRODUCTION TO IPR** General Regime of Intellectual Property Rights, Concept of Property vis-à-vis Intellectual Property, Concept of Property and Theories of Property - An Overview. Theories of Intellectual Property Rights, Intellectual Property as an Instrument of Development, Need for Protecting. Intellectual Property- Policy Consideration-National Perspectives and International demands.
Unit 2	**TYPES OF IPR AND WIPO** Types of Intellectual Property- Origin and Development- An Overview, Intellectual Property Rights as Human Right, Role of International Institutions, World Intellectual Property Organization (WIPO), Function of WIPO, Membership of WIPO, Agreement between the WIPO and the WTO.
Unit 3	**LEGAL AND COMMERCIAL ASPECTS OF IPR** Dispute Settlement- New Treaties, Commercialization of Intellectual Property Rights by Licensing, Determining Financial Value of Intellectual Property Rights, Negotiating Payments Terms in Intellectual Property Transaction, Intellectual Property Rights in the Cyber World.

Unit 4	**INTRODUCTIONS TO PATENTS** Introduction to Patent Law, Paris Convention, Patent Cooperation Treaty, WTO- TRIPS, Harmonization of CBD and TRIPs, Indian Patent Law, The Patents Act, 1970, Amendments to the Patents Act, Patentable Subject Matter, Patentability Criteria.
Unit 5	**PATENT PROCEDURES** Procedure for Filing Patent Applications, Patent Granting Procedure, Revocation, Patent Infringement and Remedies, Relevant Provisions of the Biological Diversity Act, 2002, Access and Benefit SharingIssues.

C. RECOMMENDED STUDY MATERIAL:

S. No	Title of the Book	Author
1.	Intellectual Property Rights in India	VK Ahuja (Lexis Nexis butter worths Publications)
Important Web Link:		
1. https://www.cencenelec.eu/ipr/Pages/default.aspx		
2. http://www.ipindia.nic.in/		
3. https://en.wikipedia.org/wiki/Intellectual_property		
4. https://en.wikipedia.org/wiki/Intellectual_propert		
5. https://www.itu.int/en/ITU-T/ipr/Pages/default.aspx		

H. COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO3109.1	2	-	-	-	-	2	-	-	-	-	-	-
CO3109.2	2	-	-	-	-	2	2	-	-	-	-	-
CO3109.3	2	-	-	-	-	2	2	-	-	-	-	-
CO3109.4	2	-	-	-	-	1	-	-	-	-	-	-
CO3109.5	2	-	-	-	-	2	2	-	-	-	-	-

I. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO3109.1	2	-	-	-	2
CO3109.2	2	-	-	-	2
CO3109.3	2		1	-	2
CO3109.4	2	-	-	-	2
CO3109.5	1	-	-	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability / Skill Development / Entrepreneur

Code: MULEEE3110	Robotics	3 Credits [LTP: 3-1-0]

COURSE OVERVIEW AND OBJECTIVES: To understand the basic concepts associated with the design and Functioning and applications of Robots To study about the drives and sensors used in Robots To learn about analyzing robot kinematics and robot programming.

COURSE OUTCOME:

The student would be able to:

CO3110.1 To be able to introduce basics of robotics.

CO3110.2 To understand robot kinematics and robot programming

CO3110.3 To understand the application of Robots

CO3110.4 To learn about force and torque sensing

CO3110.5 To acquire knowledge of robotics programming.

A. OUTLINE OF COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	FUNDAMENTALS	9
2.	ROBOT KINEMATICS	9
3.	ROBOT DYNAMIC ANALYSIS AND FORCES	8
4.	ACTUATORS AND SENSORS	9
5.	ROBOT PROGRAMMING, SYSTEMS AND APPLICATIONS	9

B. Detailed Syllabus

Unit	Unit details
Unit 1	**FUNDAMENTALS** Historical information, robot components, Robot characteristics, Robot anatomy,Basic structure of robots, Resolution, Accuracy and repeatability, Position Analysis forward and inverse kinematics of robots, Including frame representations.
Unit 2	**ROBOT KINEMATICS** Transformations, position and orientation analysis and the Denavit-Hartenberg representation of robot kinematics, The manipulators, The wrist motion and grippers. Differential motions, Inverse Manipulator Kinematics: Differential motions andvelocity analysis of robots and frames.
Unit 3	**ROBOT DYNAMIC ANALYSIS AND FORCES** Analysis of robot dynamics and forces, Lagrangian mechanics is used as the primary method of analysis and development. Trajectory Planning: Methods of path and trajectory planning, Both in joint-space and in Cartesian-space.
Unit 4	**ACTUATORS AND SENSORS** Actuators, including hydraulic devices, Electric motors such as DC servomotorsandstepper motors, Pneumatic devices, as well as many other novel actuators, It also covers microprocessor control of these actuators, Mechatronics, Tactile sensors, Proximity and range sensors, Force and torque sensors, Uses of sensors in robotics.

Unit 5	**ROBOT PROGRAMMING, SYSTEMS AND APPLICATIONS** Robot languages, Method of robots programming, Lead through programming methods, A robot programs as a path in space, Motion interpolation, WAIT, SIGNAL and DELAY commands, Branching capabilities and limitation of lead through methods and robotic applications. Basic principles of fuzzy logic and its applications inmicroprocessor control and robotics.

C. RECOMMENDED STUDYMATERIAL:

S.No	Title of the Book	Author
1.	Robotics Control Sensing, Vision and Intelligence	McGraw Hill Gonzalez, R. C., Fu, K. S. and Lee, C.S.G.
2.	Robotics for Engineers	McGraw Hill Koren,Y
3.	Introduction to Robotics, Analysis, Systems, Applications,	Dorling Kingsley, Dorling Kingsley Niku, S.B
4.	Programming robot controllers	McGraw Hill Predko, M

Important Web Links:

1. https://nptel.ac.in/courses/112/105/112105249/
2. https://nptel.ac.in/courses/112/101/112101099/
3. https://nptel.ac.in/courses/112/101/112101098/
4. https://swayam.gov.in/nd1_noc20_me03
5. https://www.youtube.com/watch?v=DaWMvEY3Qgc

J. COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO3110.1	2	-	-	-	-	2	-	-	-	-	-	-
CO3110.2	2	-	-	-	-	2	2	-	-	-	-	-
CO3110.3	2	-	-	-	-	2	2	-	-	-	-	-
CO3110.4	2	-	-	-	-	1	-	-	-	-	-	-
CO3110.5	2	-	-	-	-	2	2	-	-	-	-	-

K. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO3110.1	2	-	-	-	2
CO3110.2	2	-	-	-	2
CO3110.3	2		1	-	2
CO3110.4	2	-	-	-	2
CO3110.5	1	-	-	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability / Skill Development / Entrepreneur

Code: MULEEE3111	Digital India Implementation	3 Credits [LTP: 3-1-0]

COURSE OVERVIEW AND OBJECTIVES: The Digital India programme aims to provide broadband highways, universal access to mobile connectivity, public internet access programme, e-governance: Reforming government through technology, eKranti - Electronic delivery of services, Information for all, Electronics manufacturing: Target net zero imports, IT for jobs and early harvest programmes
COURSE OUTCOME:
At the end of the course students will be able to:

CO3111.1. Understand concepts and objectives digital India and digital infrastructure.

CO3111.2 Understand the pillars of the digital India.

CO31111.3 Understand the concept of new digital services and platforms for implementations purpose.

CO3111.4 Understand the various digital facilities to empower citizen.

CO3111.5 Apply the digital India initiative for training objective.

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	Digital India Initiative	8
2.	Focus Area	8
3.	Implementation	9
4.	Facilities To Digitally Empower Citizen	7
5.	Training	8

B. DETAILEDSYLLABUS

Unit	Unit Details
1.	**Digital India Initiative**
	Concept, aims and objectives, opportunities, inclusive growth in areas of electronic services, products, manufacturing and job opportunities, centered on three keyareas– Digital Infrastructure as a Utility to Every Citizen, Governance & Services on Demand and Digital Empowerment of Citizens.
2.	**Focus Area**
	The Government of India specifically targets nine 'Pillars of the Digital India' as follows: Broadband Highway, Universal Access to Mobile connectivity, Public Internet Access Programme, E-Governance, reforming Government through Technology, E- Kranti, electronic delivery of services, Information for All, Electronics Manufacturing, IT for Jobs
3.	**Implementation**
	New digital services, MyGov.in is a platform to share inputs and ideas on matters of policy and governance, UMANG (Unified Mobile Application for New-age Governance) ,AADHAR, Digi- Locker, BharatBill Payment System, PAN, EPFO services, PMKVY services, Indian railway tickets bookings, birth certificates, e-District, e-Panchayat, e-Sign framework, Swachh Bharat Mission(SBM) Mobile app, e-Hospital application, Digital attendance.
4.	**Facilities To Digitally Empower Citizen**
	Digital locker facility, eliminating the use of physical documents and enables the sharing of verified electronic documents across government agencies, three key stakeholders of citizen, issuer and requester. BPO and job growth, government is planning to create 28,000 seats of bpos in various states and set up at least one common service center in each of the gram panchayats in the state. Easy access to a common services center (CSC), Shareable private space on a public cloud, Safe and secure Cyberspace, Universally accessible digital resources, Collaborative digital platforms for intergovernmental operations. E- Sampark vernacular email service: connect rural India with the

	digital India, the government of India impelled email services provider giants including Gmail, office and rediff to provide the email address in regional languages, anIndian-based company, data Xgen technologies pvt.ltd, has launched world‟s first free linguistic email address under the name „Data mail‟ which allows creating email ids in 8 Indian languages, English; and 3 foreign languages – Arabic, Russian and Chinese. Overthe period of time the email service in 22 languages will be offered by Data Xgen technologies.
5.	**Training**
	Pradhan Mantri Gramin, Digital Saksharta Abhiyan, PMG Disha, Ongoing awareness campaign,reception within country and the outside world, criticism and impact.

C. RECOMMENDED STUDY MATERIAL:

S.No	Book	Author	Publication
a. Reference Books			
1.	Digital India: Understanding Information, Communicationand Social Change	Pradip Ninan Thomas	SAGE
2.	Book on Digital India (Special Edition) by National e-governance mission, Government of India		
Important Web Links:			
1. https://economictimes.indiatimes.com/tech/internet/digital-india-15-salient-things-to-know-about-pm-narendra-modis-project/articleshow/47893380.cms			
2. https://en.wikipedia.org/wiki/Digital_India			
3. https://www.researchgate.net/publication/303643369_Digital_India_Objectives_Initiatives_and_Inherent_Challenges			
4. https://digitalindia.gov.in/content/programme-pillars			
5. https://www.civilserviceindia.com/subject/Essay/digital-india-or-green-india-discuss3.html			

D.COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO3111.1	2	-	-	-	-	2	-	-	-	-	-	-
CO3111.2	2	-	-	-	-	2	2	-	-	-	-	-
CO3111.3	2	-	-	-	-	2	2	-	-	-	-	-
CO3111.4	2	-	-	-	-	1	-	-	-	-	-	-
CO3111.5	2	-	-	-	-	2	2	-	-	-	-	-

E.COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO3111.1	2	-	-	-	2
CO3111.2	2	-	-	-	2
CO3111.3	2		1	-	2
CO3111.4	2	-	-	-	2
CO3111.5	1	-	-	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability / Skill Development / Entrepreneur

Code: MULECV3112	SMART CITY DESIGN	3 Credits [LTP: 3-1-0]

COURSE OVERVIEW AND OBJECTIVES:

The objective of the Smart Cities **Mission** is to promote cities that provide core infrastructure and give a decent quality of life to its citizens, a clean and sustainable environment and **application** of 'Smart' Solutions.

COURSE OUTCOME:

At the end of the course students will be able to:

C03112.1 Understand the concept of smart city and smart energy business concepts.

CO3112.2 Apply governance of smart city by various techniques like Augmented Reality for City Planning.

CO3112.3. Understand the concept and characteristics of Smart City Intelligent Buildings and Urban Spaces.

CO3112.4 Understand the environmental and economic impacts on buildings by Multi-objective optimization.

CO3112.5 Apply the energy management and Smart City Distributed Energy.

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	Smart City Introduction And Concept	7
2.	Smart City Governance	8
3.	Smart City Intelligent Buildings And Urban Spaces	7
4.	Multi Objective Optimization- Smart City	7
5.	Smart City Distributed Energy	8

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Smart City Introduction And Concept**
	Smart City: local but networked, distributed but integrated Smart City, City monitoringandoperationsystemsVisionofanopensmartcityinteroperability environment Road maps for research and innovation policy Smart energy business concepts for Energy Hub districts Identifying development trends in smart city technologies – VTT Trend generator Public procurement of innovation for smart city solutions.
2.	**Smart City Governance**
	Real-time decision support systems for city management, Boosting collaborative planning with visualisation technology, Virtual Model Facilitating Citizen Interaction, Mobile Augmented Reality for City Planning, Co-creating future smart cities - Visual and participative urban planning services Citizen-driven co- design for a smarter city Social media for citizen participation Gamification as an enabler of mutual learning in complex health care systemsDecision-makingsupport: A smart city perspective
3.	**Smart City Intelligent Buildings And Urban Spaces**
	Intelligent buildings and urban spaces in smart cities Intelligent urban spaces– automatic real-time responses to people behavior Occupancy in smart buildings of smart cities – case hospital smart lighting Mobile augmented reality for building maintenance Autonomous management system for buildings and districts
4.	**Multi Objective Optimization- Smart City**

	Multi-objective optimization for the minimization of environmental and economic impacts on buildings at district level Intelligent Street lights adapt to conditions City mills leading the positive change in recycling.
5.	**Smart City Distributed Energy**
	Distributed renewable energy and energy management Highlights from the Smart Grids and Energy Systems programme. Active distribution networks with full integration of demand and distributed resources Integration of variable power generation into urban energy systems Future district heating solutions for residential districts Smart metering cyber security ICT for neighborhoods‟ energy management Energy-Hub for residential and commercial districts and transport ICT-supported business in energy positive neighborhood‟s Renewable energy and energy efficiency in new districts – how to accelerate systemic change towards smart cities Internet of Energy: Electric Mobility with Smart Grids.

C. RECOMMENDED STUDY MATERIAL:

S.No	Book	Author	Publication
a. Reference Books			
1.	Building smart cities-Analytics, design building and thinking	Carol l. Stimmel	Auerbach Publications
2.	Smart City- Foundation, principles and application	Houbing Song	JOHN WILEY
3.	Smart city and urban development of India	N. Mani	New Century Publications
b. Important Web Links:			
1.	https://nptel.ac.in/courses/105/105/105105160/		
2.	https://nptel.ac.in/courses/124/107/124107007/		
3.	https://swayam.gov.in/nd1_noc20_ce43/preview		
4.	https://www.youtube.com/watch?v=8G8ewFxE_V8		
5.	http://www.digimat.in/nptel/courses/video/105105160/L41.html		

D.COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO3112.1	1	-	-	-	-	2	2	-	-	-	-	-
CO3112.2	2	-	-	1	1	1	1	-	-	-	-	-
CO3112.3	2	1	1	1	-	1	-	-	1	-	1	-
CO3112.4	2	-	-	1	-	1	-	-	1	-	-	1
CO3112.5	-	-	2	-	1	2	-	-	-	-	1	-

E.COs AND POs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO3112.1	3	1	1	1	1
CO3112.2	1	-	3	-	2
CO3112.3	2	2	-	2	1
CO3112.4	1	1	1	-	2
CO3112.5	1	1	3	2	-

Note: On the basis of mapping of COs with POs, this course is related to Skill Development / Entrepreneur

Code: MULEEE3113	Renewable Energy	3 Credits [LTP: 3-1-0]

COURSE OVERVIEW AND OBJECTIVES

The course should enable the students to : 1. Understand the various forms of conventional energy resources. 2. Learn the present energy scenario and the need for energy conservation 3. Explain the concept of various forms of renewable energy 4. Outline division aspects and utilization of renewable energy sources for both domestics and industrial application 5. Analyse the environmental aspects of renewable energy resources.

COURSE OUTCOME

The student would be able to

CO03113.1 Describe the environmental aspects of non-conventional energy resources. In Comparison with various conventional energy systems, their prospects and limitations

CO03113.2 Know the need of renewable energy resources, historical and latest developments.

CO03113.3 Describe the use of solar energy and the various components used in the energy production with respect to applications like - heating, cooling, desalination, power generation, drying, cooking etc

CO03113.4 Appreciate the need of Wind Energy and the various components used in energy generation and know the classifications.

CO03113.5 Understand the concept of Biomass energy resources and their classification, types of biogas Plants- applications

B. OUTLINE OF COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	CLASSIFICATION OF ENERGY	**9**
2	APPLICATIONS OF SOLAR ENERGY	**10**
3	BIO ENERGY SOURCES	**8**
4	WIND ENERGY & SMALL HYDRO POWER SYSTEMS	**10**
5	OCEAN & GEOTHERMAL ENERGY	**7**

C. Detailed Syllabus

Unit No.	Description
UNIT 1	**CLASSIFICATION OF ENERGY** Energy chain and common forms of usable energy- Present energy scenario-World energy status-Energy scenario in India - Introduction to renewable energy resources Introduction to Solar Energy-Energy from sun-Spectral distribution of Solar radiation- Instruments for measurement of solar radiation-Solar radiation data analysis
UNIT 2	**APPLICATIONS OF SOLAR ENERGY** Thermal applications -Introduction to Solar thermal collectors- Types - Principle of operation of different collectors - Flat plate- Evacuated tube collectors-Compound parabolic collectors-

	Solar air heaters - Solar dryers-solar cookers- solar stills - Solar ponds - concentrating collectors- line type - point type - Methods of Solar power generation - Power towers. Physics of solar cells - Cell and module Characteristics of cells and module - Performance parameters -BoS- PV System applications - Stand- alone- Grid connected systems
UNIT 3	**BIO ENERGY SOURCES** Energy through various processes - Energy through fermentation - Gasification - various types of gasifiers -Pyrolysis - Fixed bed and fast Pyrolysis - Bio energy through digestion - Types of Digesters- Factors affecting the yield of products
UNIT 4	**WIND ENERGY & SMALL HYDRO POWER SYSTEMS** Resource assessment - types of wind turbines - selection of components - blade materials - Power regulation - various methods of control - wind farms - site selection - off shore wind farms - Solar Wind Hybrid energy systems. Introduction - types - system components, discharge curve and estimation of power potential- Turbines for SHP
UNIT 5	**OCEAN & GEOTHERMAL ENERGY** Power generation through OTEC systems - various types - Energy through waves and tides - Energy generation through geothermal systems - types

D. COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO3113.1	3	2	1	1	-	1	-	-	-	-	-	-
CO3113.2	3	2	3	-	1	-	-	-	-	-	-	-
CO3113.3	2	2	3	1	1	-	-	-	-	-	-	-
CO3113.4	1	3	-	2	2	1	-	-	-	-	-	-
CO3113.5	1	1	2	3	1	-	-	-	-	-	-	-

E. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO3113.1	3	2	-	-	2
CO3113.2	-	3	2	-	1
CO3113.3	2	3	-	1	-
CO3113.4	1	3	-	2	-
CO3113.5	-	3	2	-	2

Note: On the basis of mapping of COs with POs, this course is related to Employability / Skill Development

Code: MCMCCV3402	Dissertation Part-I	Credits [LTP:-0-0-12]

The Project can be carried out in the Institution/Industry/Research laboratory or any other competent institutions.

	POORNIMA UNIVERSITY, JAIPUR								
	Faculty of Engineering and Technology								
Name of Program:	**M.Tech. in Construction Technology and Management** **Duration: 2 Years** **Total Credits: 80**								
	Teaching Scheme for Batch 2023-25								
	Semester-IV								
Course Code	**Name of Course**	**Teaching Scheme**				**Marks Distribution**			**Credits**
		Lecture (L)	**Tutorial (T)**	**Practical**	**SH**	**IE**	**ESE**	**Total**	
A.		**Major (Core Courses)**							
A.1	**Theory**								
-	-	-	-	-	-	-	-	-	-
A.2	**Practical**								
-	-	-	-	-	-	-	-	-	-
B.		**Minor Stream Courses/ Department Electives/*Core Elective***							
B.1	**Theory**								
-	-	-	-	-	-	-	-	-	-
B.2	**Practical**								
-	-	-	-	-	-	-	-	-	-
C		**Multidisciplinary Courses**							
-	-	-	-	-	-	-	-	-	-
D		**Ability Enhancement Courses (AEC)**							
-	-	-							
E		**Skill Enhancement Courses (SEC)**							
-	-	-	-	-	-	-	-	-	-
F		**Value Added Courses (VAC)**							
	-	-	-	-	-	-	-	-	-
G		**Summer Internship / Research Project / Dissertation**							
MCMCCV4401	Dissertation Part - II	-	-	30		250	250	500	15
Total		0	0	30					**15**
Total Teaching Hours		**30**							

Code: MCMCCV4401	Dissertation Part-II	15 Credits [LTP:-0-0-

The Project can be carried out in the Institution/Industry/Research laboratory or any other competen