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 AND TECHNOLOGY

M.TECH ENERGY & ENVIRONMENTAL ENGINEERING

SCHEME & SYLLABUS

BOOKLET

Batch 2025-2027

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: Year: Batch:

Faculty of:

Your Dreams Our Goal

POORNIMA UNIVERSITY

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Vision

Our vision is to create knowledge based society with scientific temper, team spirit and dignity of labour to face global competitive challenges.

Mission

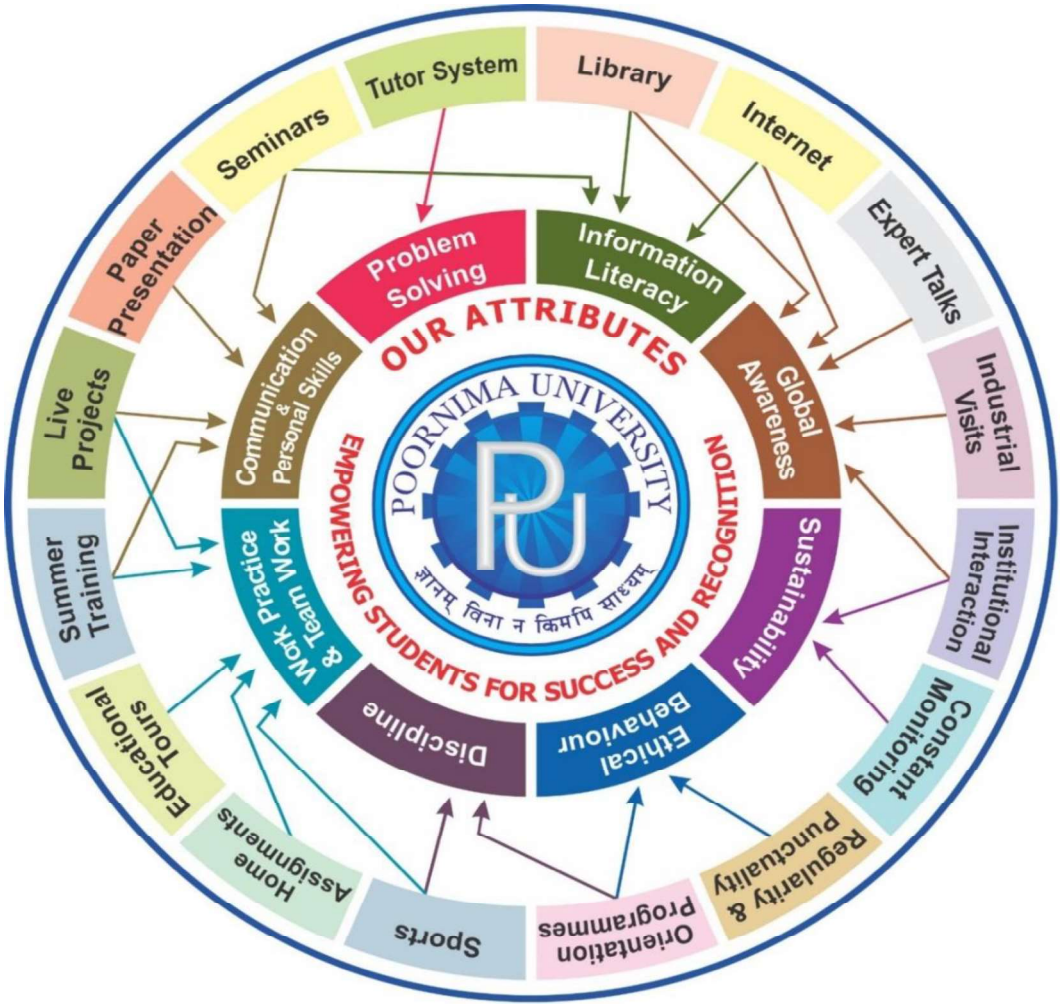
Our mission is to evolve and develop skill based systems for effective delivery of knowledge so as to equip young professionals with dedication and commitment to excellence in all spheres of life.

Quality Policy

To provide quality education through faculty development, updating of facilities and continual improvement for meeting norms laid down by the government, keeping the stakeholders satisfied. Poornima University has forged industrial alliances with Top MNC's worldwide which assures high educational standards, up to- date and forward-thinking curricula, and professional relevance. At Poornima University you will have a distinct advantage through exposure to the corporate standard environment through industry sponsored infrastructure and expert faculty. The University involves global industry leaders in many ways.

Knowledge Wheel

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



About Program and Program Outcomes (PO):

Title of the Program: Masters of Technology

Nature of the Program: M.Tech is a full time two-year program.

Program Outcomes (POs):

Graduates will be able to:

PO1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. 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.

PO3. 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.

PO4. 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.

PO5. 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.

PO6. 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.

PO7. 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.

PO8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. 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.

PO11. 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.

PO12. 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.

Program Specific Outcomes (PSOs):

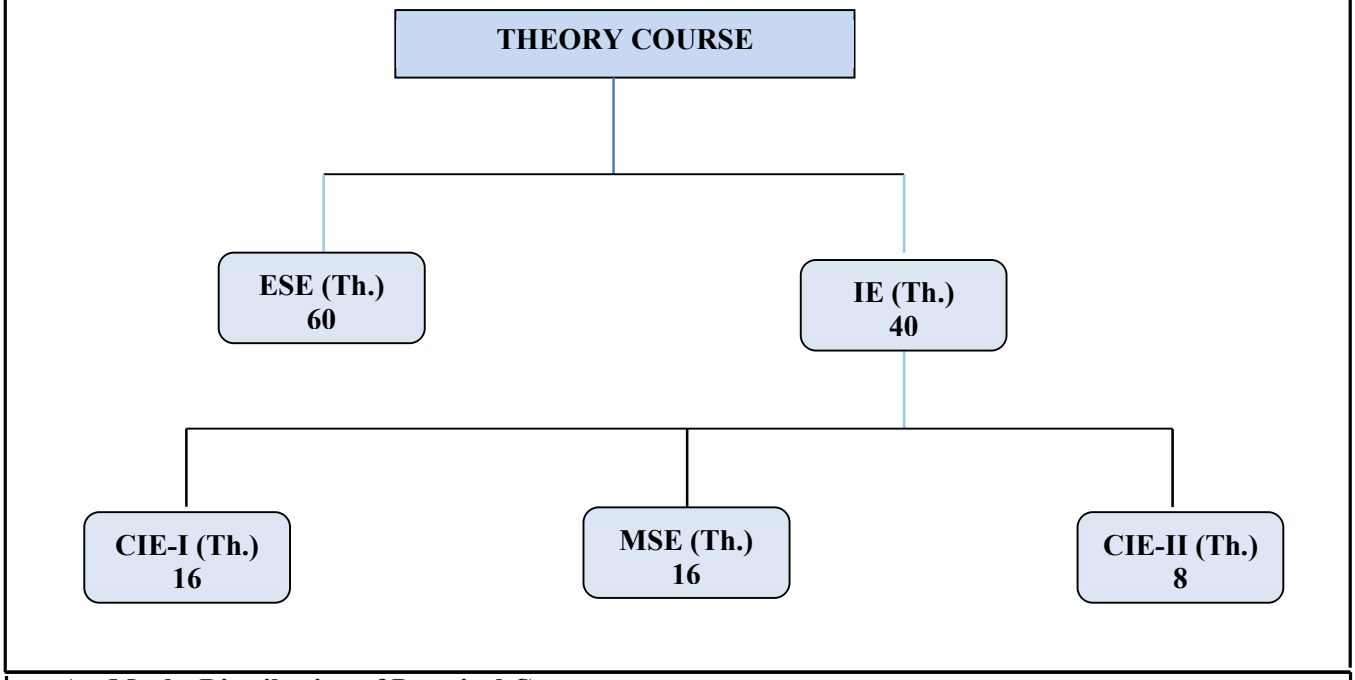
PSO1: Capability to manage large infrastructure projects ensuring safe and cost-effective execution of projects having knowledge of fast track construction and project management.

PSO2: Ability to use building software packages to calculate safe loads and stresses for designing structural members to ensure safety and serviceability.

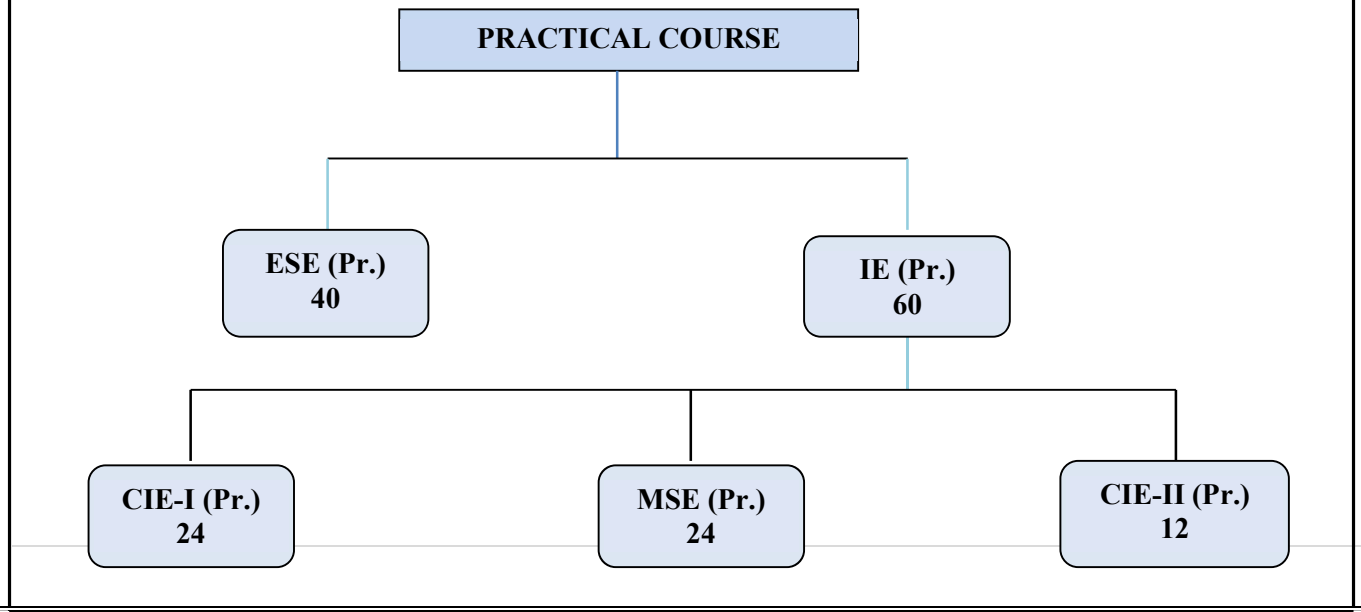
PSO3: Ability to provide innovative solutions for traffic safety and efficiency through intelligent transportation systems, and mitigate the environmental impact of construction by adopting green building concepts.

Examination System :

Marks Distribution of Theory Course:



A. **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., FIRE Dept. (BBA, B. Com., MBA)	-	45%	50%
3	MBA, MCA, M.Des., M.Tech., M.Plan, MHA, MPH	-	40%	40%
4	B. Tech., B. Des., BVA, BCA, B.Sc., BBA, B.Com., B.A. & any other program	-	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:

Table-A
Applicable for B.Arch., FIRE Courses
(BBA, B.Com, MBA), & PhD. Course Work

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

Table-B
Applicable for All Courses except Table-A

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

*** Not applicable for master programs**

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 2025-27)

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-NPTEL.

1. Introduction of MOOCs: SWAYAM-NPTEL

About SWAYAM-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) MOOCs as Credit Courses

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

- Credit and Non-credit SWAYAM-NPTEL 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.
- As Open Elective (for batches entered till 2022) / Multidisciplinary Courses (for batches admitted from 2023-24 onwards): Open Elective (for batches entered till 2022) courses were available at University level in offline mode till 2022-23 for which relevant booklets were published. From session 2023-24, Multidisciplinary Courses are introduces in lieu of open elective courses as per NEP 2020. These courses carries 02 credits. These category/type of courses (similar/different) are available as MOOC courses on SWAYAM-NPTEL platform which are being introduced from session 2023-24 onwards for all the students. The respective Deans / HODs shall provide all the information to all the students pertaining to MOOCs as per details given below:
    1. Deans / HODs shall prepare a list of up to 10 appropriate MOOC courses (From NPTEL Only) of Minimum 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.
    2. 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.
    3. The tutor of the class shall monitor the progress (assignments, feedback, any problem etc.) on weekly basis and report to Head/Dean and provide the academic support to students as per requirement.

(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.
- The method of assessments of MOOC such as assignments and examination are completely associated with that particular MOOC and no internal exam (IE component) 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.
- The center of examination for MOOCs will be finalized by SWAYAM-NPTEL. All the responsibility related to registration for MOOCs, timely submission of assignments, examinations etc. will be borne by the students only.
- NPTEL will award a certificate to all the students passing the examination.
- 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.

- An ESE Exam of each said MOOC course will also be conducted by the University as per University norms.
- The award of marks/grading will be computed as given below:

Award of marks/grading	Remarks
1. 20% weightage taken from MOOC Certificate +80% weightage taken from ESE Exam of Poornima University **OR** 2. 100% of weightage taken from MOOC Certificate Note: The Higher Marks/Grades of the above two will be considered	The Certificate of MOOC to be Submitted as per date notified by COE, Poornima University

- Any student who would not be able to clear/pass the said course, will be required to appear as a back exam candidate of the University as per PU norms. Students who have not passed the MOOC exam are required to register and participate in the next semester for either the same subject or a similar subject (Ensuring at least 60% of the syllabus matches with the back subject and also approved by respective Dean) offered through NPTEL.
- 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.
- There will be no provision of re-evaluation of MOOC.

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:

Ability Enhancement Courses	Annexure-1
Value Added Course Booklet	Annexure-2

	POORNIMA UNIVERSITY, JAIPUR								
	Faculty of Engineering and Technology								
Name of Program:	**M.Tech. in Energy and Environment** **Duration: 2 Years** **Total Credits: 81**								
	Teaching Scheme for Batch 2025-27								
	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**								
MEECCV1101	Energy and Environmental Policies	3	-	-	-	40	60	100	3
MEECCV1102	Wind and Hydro Energy Systems	3	-	-	-	40	60	100	3
MEECCV1103	Waste to Energy	3	-	-	-	40	60	100	3
A.2	**Practical**								
MEECCV1201	Energy & Environment Lab-I	-	-	2		60	40	100	1
B.		**Minor Stream Courses/ Department Electives I and II**							
B.1	**Theory**								
MEEECV1101	Energy, Environment and Climate Change	3	-	-	-	40	60	100	3
MEEECV1102	Hydrology and Hygrometry			-	-	40	60	100	
MEEECV1103	Solar Energy Technologies			-	-	40	60	100	
MEEECV1104	Environmental Remote Sensing	3	-	-	-	40	60	100	3
MEEECV1105	Wind Energy Technology					40	60	100	
MEEECV1106	Energy in Built Environment			-	-	40	60	100	
MEEECV1107	Advanced Statistical Methods								
B.2	**Practical**								
	-	-	-	-	-	-	-	-	-
C		**Multidisciplinary Courses**							
MULEBX1109	Research Methodology	3	-	-	-	40	60	100	3
D		**Ability Enhancement Courses (AEC)**							
MUACHM1201	Communication Skill - I	-	-	2		60	40	100	1
E		**Skill Enhancement Courses (SEC)**							
MULCSE1201	Skill Enhancement Technical Course	-	-	4	-	60	40	100	2
F		**Value Added Courses (VAC)**							
	-	-	-	-	-	-	-	-	-
G		**Summer Internship / Research Project / Dissertation**							
MEECCV1401	Seminar-I	-	-	4	-	60	40	100	2
Total		18	-	12					**24**
Total Teaching Hours		**30**							

	POORNIMA UNIVERSITY, JAIPUR								
	Faculty of Engineering and Technology								
Name of Program:	**M.Tech. in Energy and Environment** **Duration: 2 Years** **Total Credits: 81**								
	Teaching Scheme for Batch 2025-27								
	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**								
MEECCV2101	Physicochemical, Biological Principles and Processes	3	-	-		40	60	100	3
MEECCV2102	Environmental Quality Monitoring	3	-	-		40	60	100	3
MEECCV2103	Energy Audit	3	-	-		40	60	100	3
A.2	**Practical**								
MEECCV2201	Energy & Environment Lab-II	-	-	2		60	40	100	1
B.		**Minor Stream Courses/ Department Electives I and II**							
B.1	**Theory**								
MEEECV2101	Biomass Energy Systems	3	-	-	-	40	60	100	3
MEEECV2102	Remote Sensing and GIS Applications			-	-	40	60	100	
MEEECV2103	Management and Modeling of Environmental Systems			-	-	40	60	100	
MEEECV2104	New and Renewable Energy Sources and Technologies	3	-	-	-	40	60	100	3
MEEECV2105	Groundwater Contamination and Remediation			-	-	40	60	100	
MEEECV2106	Environmental Impact Assessment			-	-	40	60	100	
B.2	**Practical**								
	-	-	-	-	-	-	-	-	-
C		**Multidisciplinary Courses**							
	MOOC Course - I	3	-	-	-	-	-	-	3
D		**Ability Enhancement Courses (AEC)**							
MUACHM2207	Communication Skill - II	-	-	2		60	40	100	1
E		**Skill Enhancement Courses (SEC)**							
MULCSE2201	Skill Enhancement Technical Course-II			4		60	40	100	2
MULCCV2202	Review/Research Paper-I			2		60	40	100	1
F		**Value Added Courses (VAC)**							
	-	-	-	-	-	-	-	-	-
G		**Summer Internship / Research Project / Dissertation**							
MEECCV2401	Seminar-II	-	-	2	-	60	40	100	1
Total		18	-	12					**24**
Total Teaching Hours		**30**							

	POORNIMA UNIVERSITY, JAIPUR								
	Facult of Engineering and Technology								
Name of Program:	**M.Tech. in Energy and Environment Duration: 2 Years Total Credits: 81**								
	Teaching Scheme for Batch 2025-27								
	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**								
A.2	**Practical**								
MEECCV3401	Review/Research Paper-II	0	0	2		60	40	100	1
MEECCV3402	Industrial Technical Seminar	0	0	4		60	40	100	2
B.		**Minor Stream Courses/ Department Electives/*Open Elective***							
B.1	**Theory**								
C		**Multidisciplinary Courses**							
MCMEMC3121 MSTEMC3121	MOOC Course - II	3	-	-	-	-	-	-	3
D		**Ability Enhancement Courses (AEC)**							
E		**Skill Enhancement Courses (SEC)**							
-	-	-	-	-	-	-	-	-	-
F		**Value Added Courses (VAC)**							
G		**Summer Internship / Research Project / Dissertation**							
MEECCV3403	Internship	-	-	12	-	40	60	100	6
MEECCV3404	Dissertation Part - I	-	-	12	-	60	40	100	6
Total		3	0	30					**18**
Total Teaching Hours		**33**							

	POORNIMA UNIVERSITY, JAIPUR								
	Faculty of Engineering and Technology								
Name of Program:	**M.Tech. in Energy and Environment** **Duration: 2 Years** **Total Credits: 81**								
	Teaching Scheme for Batch 2025-27								
	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**							
MEECCV4401	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 Energy and Environment** **Duration: 2 Years** **Total Credits: 81**								
	Teaching Scheme for Batch 2025-27								
	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**								
MEECCV1101	Energy and Environmental Policies	3	-	-	-	40	60	100	3
MEECCV1102	Wind and Hydro Energy Systems	3	-	-	-	40	60	100	3
MEECCV1103	Waste to Energy	3	-	-	-	40	60	100	3
A.2	**Practical**								
MEECCV1201	Energy & Environment Lab-I	-	-	2		60	40	100	1
B.		**Minor Stream Courses/ Department Electives I and II**							
B.1	**Theory**								
MEEECV1101	Energy, Environment and Climate Change	3	-	-	-	40	60	100	3
MEEECV1102	Hydrology and Hygrometry			-	-	40	60	100	
MEEECV1103	Solar Energy Technologies			-	-	40	60	100	
MEEECV1104	Environmental Remote Sensing	3	-	-	-	40	60	100	3
MEEECV1105	Wind Energy Technology					40	60	100	
MEEECV1106	Energy in Built Environment			-	-	40	60	100	
MEEECV1107	Advanced Statistical Methods								
B.2	**Practical**								
	-	-	-	-	-	-	-	-	-
C		**Multidisciplinary Courses**							
MULEBX1109	Research Methodology	3	-	-	-	40	60	100	3
D		**Ability Enhancement Courses (AEC)**							
MUACHM1201	Communication Skill - I	-	-	2		60	40	100	1
E		**Skill Enhancement Courses (SEC)**							
MULCSE1201	Skill Enhancement Technical Course	-	-	4	-	60	40	100	2
F		**Value Added Courses (VAC)**							
	-	-	-	-	-	-	-	-	-
G		**Summer Internship / Research Project / Dissertation**							
MEECCV1401	Seminar-I	-	-	4	-	60	40	100	2
Total		18	-	12					**24**
Total Teaching Hours		**30**							

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 designsystem 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 insocietal 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 anddesign 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: **MEECCV1101**	**Energy and Environmental Policies**	**3 Credits [LTP: 3-0-0]**

COURSE OVERVIEW AND OBJECTIVES: This is a middle level course in energy and environment which will focus on use of various area. The course has been designed in a way that the energy required by various area in future courses like environment, fluid mechanics, geotechnical engineering etc. In this course specific applications/case studies related to energy and environment shall be focused.

COURSE OUTCOMES:

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

CO No.	Description
CO1	To understand the energy carriers, energy technologies, energy challenges
CO2	To able to know the geopolitics national and international energy and and environment policy.
CO3	To understand the relationships between energy, risk, societal safety, sustainable development and energy economics.
CO4	Apply the fundamental concepts of funding agencies for various project.
CO5	Analyze of various policy tool in respective area.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Energy codes and policies	**9**
2.	International scenario	**9**
3.	Financial tools	**10**
4.	Funding agencies	**10**
5.	Policy Tools	**10**

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Energy codes and policies**
	Introduction to Energy codes and policies: Energy Conservation act, Electricity Act, Solar policy, Hydro policy, Biomass policy.
2.	**International scenario**
	International scenario: world energy outlook, international protocols for energy and Environment ,governing and nodal national/international agencies and their role.
3.	**Financial tools**
	Financial tools: incentives and subsidies, calculation of required subsidy for penetration, concept of shadow price Concept of micro-financing for RE.
4.	**Funding agencies**
	For RE projects in India, application development for RE funding Tariff policies,.
5.	**Policy Tools**
	Use of Demand Side Management as a policy tool.

C. RECOMMENDED STUDY MATERIAL:

Sr. No	Reference Book	Author	Edition	Publications
1.	Energy Economics, Concepts, Issues,	SC Bhattacharyya	Latest	Springer Science & Business Media

	Markets and Governance			
2.	Understanding Energy and Energy Policy	TF Braun & MG Lisa	Latest	Zed Books
3.	Financial evaluation of renewable energy technologies	Kandpal, Tara Chandra, and Hari Prakash Garg	Latest	Mac Millam India Limited
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
CO1	1	1	-	3	-	1	-	-	-	-	1	-
CO2	1	3	-	2	1	-	-	-	-	-	-	-
CO3	1	-	-	3	1	-	-	-	-	-	1	-
CO4	1	1	3	-	-	-	1	-	-	-	1	-
CO5	1	1	3	-	1	1	-	-	-	-	-	1

E. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	2	3	1	-
CO2	-	2	2	-	3
CO3	1	1	-	3	2
CO4	1	3	-	2	-
CO5	1	3	-	2	-

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

Code: MEECCV1102	Wind and Hydro Energy Systems	3 Credits [LTP: 3-0-0]

COURSE OVERVIEW AND OBJECTIVES:

This subject deals with various types of wind energy and their applications, working principles of windenergy, Components of a wind energy converter, Working principles of Hydropower, Hydraulic turbines

COURSE OUTCOMES

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

CO	Description
CO1	To understand basic of wind and hydro energy systems and resource assessment techniques
CO2	To create understanding and design aspects of wind/hydro plant, components, operation and control
CO3	To create understanding on wind/hydro power generation, grid integration and environmental impacts
CO4	Apply various working principles of Hydropower.
CO5	Evaluate of hydraulic turbines.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Wind Energy Basics	7
2.	Working principles of wind energy	10
3.	Components of a wind energy converter	10
4.	Working principles of Hydropower	10
5.	Hydraulic turbines	8

B. DETAILED SYLLABUS

Unit	Unit Details
1.	Wind Energy Basics
	Wind Energy Basics: Status, Advantages and disadvantages of wind energy systems, Advantages and disadvantages, Types of wind energy converters, local Effects on wind, site selection: roughness length, wind shear, Wind Speed Variability, Obstacles to wind flow
2.	Working principles of wind energy
	Working principles of wind energy: Energy content in wind, Energy Conversion at the Blade, Wind variations: Weibull distribution
3.	Components of a wind energy converter
	Rotor Blades, Gearboxes, Synchronous or Asynchronous Generators, Towers, Miscellaneous components, Turbine Selection Operation and Control of Wind Energy Converters: grid requirements, Issue of Noise and Its Control, Power Curve and Capacity Factor, Pitch control, Stall Control, Yaw Control Hydropower basics: Water Cycle in Nature, Classification of Hydropower Plants, Status of Hydropower Worldwide, Advantages and Disadvantages of Hydropower, Operational Terminology, Legal Requirements.
4.	Working principles of Hydropower
	Working principles: Locating a Hydropower Plant, Basics of Fluid Mechanics for hydropower, single and multiple reservoir system, cascaded power plants Important Parts of Hydropower Station: Turbine, Electric Generator, Transformer and Power House, Structural parts: Dam and Spillway, Surge Chambers, Stilling

	Basins, Penstock and Spiral Casing, Tailrace, Pressure Pipes, Caverns, auxiliary parts
5.	Hydraulic turbines:
	Hydraulic turbines: Classification of Hydraulic Turbines, Theory of Hydro Turbines: Francis, Kaplan, Pelton turbines, efficiency and selection of turbine

C. RECOMMENDED STUDY MATERIAL:

S . No	Reference Book	Author	Edition	Publisher
1.	Wind Energy Conversion Systems	Freris L.L	Latest	Prentice Hall
2.	Wind Turbine Technology: Fundamental Concepts of Wind Turbine Engineering, ,	Spera D.A	Latest	Prentice Hall,;
3.	"Hand book of Hydroelectric Engineering", Nem Chand and Brothers8 Clemen, D.M., "Hydro Plant Electrical Systems",	Brown, G.	Latest	HCI Publication
4.	Wind Energy for the Rest of Us: A Comprehensive Guide to Wind Power and Howto Use it,	Paul Gipe,	Latest	Chelsea Green Publishing Co
5.	Hydro-electric Engineering Practice", Vol. I, II & III,	Brown, G	Latest	CBS Publication
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
CO1	1	1	1	-	-	2	1	-	-	-	-	1
CO2	1	1	2	1	1	-	1	-	-	-	-	-
CO3	1	1	3	1	1	-	-	-	1	-	-	-
CO4	1	1	3	-	-	-	1	-	1	1	1	-
CO5	1	1	3	-	1	1	-	-	-	-	-	1

E. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	-	-	1
CO2	1	3	-	2	1
CO3	3	1	1	1	-
CO4	3	2	2	-	-
CO5	3	2	-	-	2

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

Code: MEECCV1103	Waste to Energy	3 Credits [LTP: 3-0-0]

COURSE OVERVIEW AND OBJECTIVES:

This subject deals with various types of Waste and techniques to convert waste into energy.

COURSE OUTCOMES

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

CO	Description
CO1	**Understand** the classification of various types of waste and explain the working principles of energy conversion devices such as incinerators, gasifiers, and digesters.
CO2	**Explain** the process of biomass pyrolysis, its types, and **evaluate** the production and applications of charcoal, pyrolytic oils, and gases.
CO3	**Analyze** the design and operation of different types of gasifiers and assess their applications in thermal and electrical energy generation.
CO4	**Describe** various biomass combustion systems including stoves and combustors, and interpret their design and operational features.
CO5	**Evaluate** the properties and technologies of biogas production and discuss various biomass conversion processes and the bioenergy program in India.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Introduction to Energy from Waste	7
2.	Bio-Mass Pyrolysis	11
3.	Bio-Mass Gasification	11
4.	Bio-Mass Combustion	10
5.	Biogas: Properties of biogas	9

B. DETAILED SYLLABUS

Unit	Unit Details
1.	Introduction to Energy from Waste
	Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digesters.
2.	Bio-Mass Pyrolysis
	Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.
3.	Bio-Mass Gasification
	Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.
4.	Bio-Mass Combustion
	Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

5.	Biogas: Properties of biogas
	Biogas plant technology and status - Bioenergy system, Design and constructional features, Biomass resources and their classification, Biomass conversion processes, Thermo chemical conversion, Direct combustion, biomass gasification, pyrolysis and liquefaction, biochemical conversion, anaerobic digestion, Types of biogas Plants, Applications –Alcohol production from biomass, Bio diesel production, Urban waste to energy conversion.

C. RECOMMENDED STUDY MATERIAL:

S . No	Reference Book	Author	Edition	Publisher
1.	**Waste-to-Energy: Recent Developments and Future Perspectives towards Circular Economy**	Abd El-Fatah Abomohra	Latest	Springer
2.	**Waste to Energy Conversion Technology**	Marco J. Castaldi	Latest	Woodhead Publishing Series
3.	**Waste-to-Energy: Technologies and Project Implementation**	Marc J. Rogoff	Latest	Springer
4.	**Advances in Waste-to-Energy Technologies**	Rajeev Singh	Latest	CRC Press
Websites				
https://elearn.nptel.ac.in/shop/nptel/waste-to-energy-conversion/?v=c86ee0d9d7ed https://archive.nptel.ac.in/courses/103/107/103107125/ https://onlinecourses.nptel.ac.in/noc20_ch16/preview https://nptel.ac.in/courses/103107125				

D. COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	-	-	2	1	-	-	-	-	1
CO2	1	1	2	1	1	-	1	-	-	-	-	-
CO3	1	1	3	1	1	-	-	-	1	-	-	-
CO4	1	1	3	-	-	-	1	-	1	1	1	-
CO5	1	1	3	-	1	1	-	-	-	-	-	1

E. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	-	-	1
CO2	1	3	-	2	1
CO3	3	1	1	1	-
CO4	3	2	2	-	-
CO5	3	2	-	-	2

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

Code: MEECCV1201	Energy & Environment Lab-I	1 Credits [LTP: 0-0-2]

COURSE OVERVIEWAND OBJECTIVES:

This subject deals with the various types of Solar water heating, solar cooking and Solar concentrator, PV module characterization and Inverter performance analysis. This subject will make the students capable to understand the concept of Solar water heating and how they affect the environment.

COURSE OUTCOMES

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

CO	Description
CO1	Evaluate of Solar water heating
CO2	Analyze the solar cooking and Solar concentrator
CO3	Analyze of PV module characterization and Inverter performance analysis
CO4	Analyze of Wind energy convertor and Biomass for energy
CO5	Analyze the Solar passive concepts and thermal comfort.

A. DETAILED SYLLABUS

Unit	Unit Details
1.	**Name of Experiments**
	1. Solar water heating 2. Solar cooking 3. Solar concentrator 4. PV module characterization 5. Inverter performance analysis 6. Wind energy convertor 7. Biomass for energy 8. Solar passive concepts and thermal comfort .

B. COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2		1	-	-	-	-	-	-	-	-
CO2	2	2	1	2	-	-	-	-	-	-	-	-
CO3	2	3	-	1	-	-	-	-	-	-	-	-
CO4	2	-	3	-	1	-	-	-	-	-	-	-
CO5	2	2	2	1	-	-	-	-	-	-	-	-

C. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	-	2	-	1
CO2	2	3	-	1	-
CO3	1	2	3	1	-
CO4	-	2	2	-	3
CO5	1	1	-	3	2

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

Department Elective-I

Code: MEEECV1101	Energy, Environment and Climate Change	3 Credit [LTP: 3-0-0]

COURSE OBJECTIVE: The Earth's Energy Budget, Environment and the processes leading to climate change. 2. The inter-relatedness of the Terrestrial Energy-Environment-Climate System. 3. The perturbing effects of anthropogenic activities on this system. 4. A meaningful climate change quantification and hencethe means of ameliorating adverse climate change impacts

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

CO	Description
CO1	Understand the terrestrial eco-system comprising of 3 principal components: Energy, Environment and Climate Change
CO2	Comprehend a global picture of the inter-relatedness of the Energy-Environment-Climate system.
CO3	Assess as qualified professionals, the perturbing effects of human activities on the earth's climate
CO4	Predict emerging climate change trends globally as well as within the Indian Subcontinent
CO5	Understand environmental impacts on a local, regional and global scale.

A. **OUTLINE OF THE COURSE**

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	Introduction	**7**
2	Global Atmospheric Issues	**11**
3	Energy Balance	**11**
4	Atmospheric Chemistry and Climate	**10**
5	Environmental Variability	**9**

B. **DETAILED SYLLABUS**

Unit	Details of Unit
1.	Introduction
	Overview on the Earth's energy requirement vis-à-vis Climate Change. Origins of the terrestrial atmosphere. Earth's early atmosphere. Introduction to Climate. Layers of the atmosphere,
2.	Global Atmospheric Issues
	Composition of the present day atmosphere. Introduction to Atmospheric chemistry, Green House Gases, and the O3 depletion problem. Post Industrial Revolution Scenario
3.	Energy Balance
	Earth –Atmosphere System. Solar and Terrestrial Radiation. Absorption of Radiation by gases. Energy balance. Solar variability and the Earth's Energy Balance
4.	Atmospheric Chemistry and Climate
	The Global Temperature Record. Possible effects of Global Warming. – Indian Context. Atmospheric Chemistry and Climate Change. Atmospheric Aerosol and Cloud Effects on Climate.
5.	Environmental Variability

	Natural (volcanoes, forest fires) and Anthropogenic (Antarctic Ozone Hole, Global Warming). Green House Gas theory. Effects of urbanization, Landscape changes, Influence of Irrigation, Desertification and Deforestation

VIRTUAL LABS:

- https://www.youtube.com/watch?v=-7hrElZrul4
- https://www.youtube.com/watch?v=cmR9cfWJRUU

COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	2	-	2	-	-	-	-	-	-	2
CO2	2	-	2	-	2	-	-	-	-	-	-	2
CO3	2	-	2	-	2	-	-	-	-	-	-	2
CO4	1	-	2	-	2	-	-	-	-	-	-	2
CO5	1	-	-	-	-	1	-	-	-	-	-	-

COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	-	1	-	-
CO2	2	2	-	3	-
CO3	1	3	-	2	1
CO4	3	1	1	1	-
CO5	3	2	2	-	-

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

Code: MEEECV1102	Hydrology and Hygrometry	3 Credits [LTP: 3-0-0]

COURSE OVERVIEW AND OBJECTIVES:

To provide knowledge to students to accessible, aesthetics, cost effective, functional/operational, historic preservation, productive, secure/safe and sustainable and their inter relationships must be understood, evaluated and appropriately applied.

COURSE OUTCOMES:

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

CO	Description
CO1	Compute the various hydrological phenomenon.
CO2	Analyze of various type of hydrograph and black-box type & physical based models.
CO3	Examine the various statistical method
CO4	Computation of various types of flow generation from the catchment.
CO5	Demonstrate the flood and draught method.

A. OUTLINE OF THE COURSE

Unit	Title of the unit	Time Required for the Unit (Hours)
1	Introduction	8
2	Hydrograph	6
3	Statistical Methods	8
4	Flow Generation	6
5	Floods and Droughts	8

B. DETAILED SYLLABUS

Unit	Unit Details
1	**Introduction**
	Introduction: Historical background, Hydrological cycle, forms of precipitation, its Arial and time variation, missing records, hydrological abstraction, runoff
2	**Hydrograph**
	Hydrograph analysis, unit hydrograph, IUH, Nash and Clarke models. Rainfall runoff models, black-box type and physical based models.
3	**Statistical Methods**
	Statistical Methods: Correlation coefficient, curve fitting, regression analysis, multiple regression. Various distribution and their use in hydrology, plotting positions, frequency factors, extreme value theory. Generation of random numbers and synthetic data when persistence is absent
4	**Flow Generation**
	Introduction: Flow Generation: Stochastic processes, their classification, time series and its components, correlogram, autoregressive processes. Synthetic generation of yearly and monthly flows in hydrology.
5	**Floods and Droughts**
	Floods and Droughts: Flood estimation by various methods, design for various hydraulic structures, flood forecasting, droughts. grid and ribbed floors.

A. RECOMMENDED STUDY MATERIAL

S. No	Book	Author	Edition	Publication
1	Engineering hydrology	K. Subramaniam	Latest	Laxmi Publication
Websites				
https://www.bdcnetwork.com/building-types https://en.wikipedia.org/wiki/Building_design https://nptel.ac.in/courses/105106177/				

B. COs AND POs MAPPING

COs and LOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	1	-	-	-	-	-	-	-	1
CO2	3	1	-	1	-	-	-	-	-	-	-	1
CO3	3	2	-	1	-	-	-	-	-	-	-	1
CO4	3	1	2	1	-	-	-	-	-	-	-	1
CO5	3	-	-	1	1	-	-	-	-	-	-	1

C. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	-	-	2	-
CO2	3	-	-	2	-
CO3	3	-	-	2	-
CO4	3	-	-	2	1
CO5	3	1	-	-	1

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

Code: MEEECV1103	Solar Energy Technologies	Credits 3 [LTP: 3-0-0]

COURSE OVERVIEW AND OBJECTIVES:

1. To understand the fundamentals of solar energy conversion technologies.
2. To obtain knowledge on the energy utilization techniques employed for various solar thermal energy devices
3. To know the limitations involved on the conversion efficiency of different solar energy devices
4. To apply knowledge on how to assess the performance of solar thermal and solar photovoltaic systemsusing fundamentals of heat transfer and optical properties.

COURSE OUTCOMES

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

CO	Description
CO1	Estimate and assess the solar thermal radiation input for the solar thermal collectors and panels.
CO2	Understand the working of solar water heater based on heat transfer analysis
CO3	Identify various parameters that influences the performance of devices/processes
CO4	Understand the fundamentals of solar air heater based on heat transfer analysis and basics of concentrating collectors
CO5	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.	Introduction	8
2.	Heat transfer	6
3.	Performance analysis	6
4.	Solar air heaters	8
5.	PV cells	8

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction**
	Solar radiation relations: Radiation on horizontal and tilted surfaces, Extraterrestrial radiation, Estimation of clear sky radiation, Total radiation on fixed sloped surfaces
2.	**Heat transfer**
	Heat transfer aspects in solar thermal, Radiation absorbed by a solar collector, Theory of Flat Plate Collectors.
3.	**Performance analysis**
	Flat Plate Collectors, Mean fluid and plate temperature calculation, Collector performance, numerical simulation
4.	**Solar air heaters**
	Theory of solar air heaters, Basics of concentrating collectors.
5.	**PV cells**

	Characteristics of PV cells and modules, Performance parameters, PV system configurations

C. RECOMMENDED STUDY MATERIAL:

S. No.	Reference Book	Author	Edition	Edition
1.	Solar Engineering of Thermal Process,3rd Edition	John A. Duffie and William A. Beckman	Latest	John Wiley & Sons
2.	Solar Electricity, 2nd Edition,	Tomas Markvart	Latest	John Wiley & Sons..
3.	Solar Electricity: Practical Guide to Designing and Installing Small Photovoltaic Systems,	Simon Roberts	Latest	Prentice-Hall
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
CO1	3	-	-	2	1	-	-	-	-	-	-	-
CO2	3	-	-	-	2	-	-	-	-	-	-	-
CO3	3	-	-	-	1	-	-	-	-	-	-	1
CO4	3	-	-	-	-	1	-	-	-	-	-	-
CO5	2	-	1	-	2	-	-	-	-	-	-	-

E. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	-	-	1	3
CO2	2	-	-	1	3
CO3	2	-	-	1	3
CO4	3	-	-	2	1
CO5	3	-	-	2	1

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

Department Elective-II

MEEECV1104	Environmental Remote Sensing	3 Credits [LTP: 3-0-0]

COURSE OVERVIEW AND OBJECTIVES:

This is the course work which gives the knowledge of Spectral Characteristics of various earth features,Global Positioning System (GPS). Applications of Remote Sensing for Environmental studies.

COURSE OUTCOMES

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

CO	Description
CO1	Analyze of various imageries
CO2	Analyze of various Photographic images
CO3	Analyze of Techniques of photo-interpretation.
CO4	Analyze of Machine processing of remotely sensed data
CO5	Analyze of Flood Zoning and Damage

A. OUTLINE OF THE COURSE

Unit	Title of the unit	Time Required for the Unit (Hours)
1	Imageries	8
2	Data Collection	6
3	Remotely sensed data	8
4	Application of RS	6
5	Flood Zoning	8

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Imageries**
	Definition of terms, Space and Airborne imageries, Characteristics of Photographic images, Color, Tone and texture, Techniques of photo-interpretation.
2.	**Data Collection**
	Ground truth collection and verification, Principles of remote sensing, Spectral Characteristics of various earth features. The Multi-concept, Remote Sensing through Visible and other Spectral Regions.
3.	**Remotely sensed data**
	Different methods of remotely sensed data interpretation, Machine processing of remotely sensed data, Geographical Information System (GIS), Global Positioning System (GPS).
4.	**Application of RS**
	Applications of Remote Sensing for Environmental studies, Land use and land cover analysis, Water resources management,
5.	**Flood Zoning**
	Flood Zoning and Damage Estimation, Pollution Studies, Survey and Management of Natural Resource.

D.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/				

E. COs AND POs MAPPING

COs and LOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	2	-	1	1	1	-	-	-	-	1
CO2	2	-	3	2	-	-	-	-	-	-	-	-
CO3	-	1	1	-	2	2	-	-	-	-	-	-
CO4	2	2	3	-	-	-	-	-	-	-	-	-
CO5	-	-	3	-	2	2	-	-	-	-	-	-

D. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3		-	-	2
CO2	-	-	2	2	2
CO3	2		2	-	1
CO4	2		-	2	-
CO5	-		2	-	2

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

Code: MEEECV1105	Wind Energy Technology	3 Credits [LTP: 3-0-0]

COURSE OVERVIEW AND OBJECTIVES:

1. To understand the processes of generation of wind, its potential and energy extraction
2. To identify and estimate wind resource potential of an area.
3. To understand the aerodynamic principles of turbine blade design.
4. To understand the functioning of wind electric generators and the operation wind forms

COURSE OUTCOMES

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

CO	Description
CO1	Assess the wind energy resources potential and site selection techniques.
CO2	Understand the basics of the wind resources, wind energy distribution, and utilization of wind energy
CO3	Identify various parameters that influences the performance of devices / processes using Aerodynamic techniques.
CO4	Study the basics of wind energy conversion systems and its configurations.
CO5	Examine the site preference for wind farm and analysis of environmental impacts.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Introduction	6
2.	Basics of Wind Resource Assessment	8
3.	Aerodynamics	8
4.	Wind Farm Design and Health (Condition) Monitoring	6
5.	Wind Energy Conversion Systems	8

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction**
	Historical Perspectives on Wind Turbines, Indian Energy Scenario, Global Energy Scenario, Introduction to Indian Wind Industry, Wind Energy potential of India and Global Wind Installations.
2.	**Basics of Wind Resource Assessment**
	Introduction, Application and Historical background, Merits and Limitations, Nature and Origin of Wind, Wind Energy Quantum, Variables in Wind Energy Conversion Systems, Wind Power Density, Power in a Wind Stream, Wind Turbine Efficiency, Power of a Wind Turbine, Forces on the Blade of a Propeller, Wind Velocities and Height from Ground,

3.	**Aerodynamics**
	Forces from wind, Lift and drag forces - Airfoils, 1-D Momentum theory, Ideal horizontal axis wind turbine with wake rotation, Blade element theory -General rotor blade shape performance prediction.
4.	**Wind Farm Design and Health (Condition) Monitoring**
	Planning of wind farm, Site selection, Micros ting, Grid Integration, Power evacuation, Wind Farm Feasibility Studies, Preparation of DPR, Environmental Impacts.
5.	**Wind Energy Conversion Systems**
	Types, Components of Modern Wind Turbine (HAWT and VAWT), Fixed and Variable Speed operations, Power Control (Passive stall, Active pitch, Passive pitch and Active stall), Electrical aspects of wind turbine, Safety of wind turbines.

C. RECOMMENDED STUDY MATERIAL:

S.No	Reference Book	Author	Edition	Publisher
1.	Wind Turbine Technology	A. R. Jha	Latest	by CRC Press,
2.	Wind Energy Handbook 2nd	Tony Burton , Nick Jenkins, David Sharpe , Ervin Bossanyi	Latest	Wiley; 2 edition.
3.	Small Wind Turbines, Analysis, Design, and Application	David Wood	Latest	Verlag London
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
CO1	2	1	2	-	1	-	1	-	-	-	-	1
CO2	1	1	2	-	1	-	-	-	-	-	-	-
CO3	1	-	3	-	1	-	-	-	-	-	-	1
CO4	2	-	3	-	1	-	-	-	-	-	-	-
CO5	2	1	2	-	1	-	-	-	-	-	-	1

E. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	-	2	2	-
CO2	2	-	1	3	1
CO3	1	-	3	1	-
CO4	2	-	3	-	-
CO5	2	-	1	3	1

Code: MEEECV1106	Energy in Built Environment	3 Credits [LTP: 3-0-0]

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
CO1	Understand the various energy use and energy processes involved for building comfort.
CO2	Infer the knowledge on using proper passive techniques to achieve amicable light energy in building
CO3	Understand the interaction of various external parameters influencing the thermal performance in building envelopes through the walls.
CO4	Choose proper methodology for energy audit in order to conserve energy in buildings.
CO5	Select the energy conservation measures for proper ventilation in buildings.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	Introduction	6
2	Solar energy and day-lighting	8
3	Thermal performance	8
4	Energy requirements in buildings	6
5	Energy Audit	8

B. DETAILED SYLLABUS

Unit	Unit Details
1	**Introduction**
	Indoor activities and environmental control - Internal and external factors on energy use - Characteristics of energy use and its management -Macro aspect of energy use in dwellings and its implications - Thermal comfort - Ventilation and air quality - Air-conditioning requirement - Visual perception - Illumination requirement - Auditory requirement.
2	**Solar energy and day-lighting**
	The sun-earth relationship - Climate, wind, solar radiation and temperature - Sun shading and solar radiation on surfaces - Energy impact on the shape and orientation of buildings – Lighting and daylighting: Characteristics and estimation, methods of day-lighting - Architectural considerations for day-lighting.
3	**Thermal performance**

	Standards for thermal performance of building envelope - Evaluation of the overall thermal transfer.
4	**Energy requirements in buildings**
	Thermal gain and net heat gain - End-use energy requirements - Status of energy use in buildings - Estimation of energy use in a building.
5	**Energy Audit**
	Energy audit and energy targeting - Technological options for energy management - Natural and forced ventilation – Indoor environment and air quality - Airflow and air pressure on buildings - Flow due to stack effect.

C. RECOMMENDED STUDY MATERIAL:

S.No	Reference Book	Author	Edition	Publisher
1	Heating and Cooling of Buildings: Design for Efficiency	Syed R. Qasim, Edward M. Motley and Guang Zhu	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
CO1	2	1	2	-	1	-	1	-	-	-	-	1
CO2	1	1	2	-	1	-	-	-	-	-	-	-
CO3	1	-	3	-	1	-	-	-	-	-	-	1
CO4	2	-	3	-	1	-	-	-	-	-	-	-
CO5	2	1	2	-	1	-	-	-	-	-	-	1

E. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	-	2	2	-
CO2	2	-	1	3	1
CO3	1	-	3	1	-
CO4	2	-	3	-	-
CO5	2	-	1	3	1

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

Code: MEECCV1107	Advanced Statistical Methods	3 Credits [LTP: 3-0-0]

COURSE OVERVIEW AND OBJECTIVES: To provide students with a framework that will help them choose the appropriate descriptive statistics in various data analysis situations. 2. To analyse distributions and relationships of real-time data. 3. To apply estimation and testing methods to make inference and modelling techniques for decision making using various techniques including multivariate analysis.

COURSE OUTCOMES

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

CO	Description
CO1	Understand the concept of correlation and regression model and able to interpret the effect of variables, regression coefficients, coefficient of determination.
CO2	Make appropriate decisions using inferential statistical tools that are central to experimental research.
CO3	Understand the statistical forecasting methods and model fitting by graphical interpretation of time series data.
CO4	Construct standard experimental designs and describe what statistical models can be estimated using the data.
CO5	Demonstrate R programming for statistical data

i. OUTLINE OF THE COURSE

Unit	Title of the unit	Time Required for the Unit (Hours)
1	Basic Statistical Tools for Analysis:	6
2	Statistical inference	8
3	Modelling and Forecasting Methods:	8
4	Design of Experiments:	8
5	Contemporary Issues	6

ii. DETAILED SYLLABUS

Unit	Unit Details
1	**Basic Statistical Tools for Analysis**
	Summary Statistics, Correlation and Regression, Concept of R2 and Adjusted R2 and Partial and Multiple Correlation, Fitting of simple and Multiple Linear regression, Explanation and Assumptions of Regression Diagnostics.
2	**Statistical inference**
	Basic Concepts, Normal distribution-Area properties, Steps in tests of significance –large sample tests-Z tests for Means and Proportions, Small sample tests –t-test for Means, F test for Equality of Variances, Chi-square test for independence of Attributes
3	**Modelling and Forecasting Methods**
	Introduction: Concept of Linear and Non Liner Forecasting model , Concepts of Trend, Exponential Smoothing, Linear and Compound Growth model, Fitting of Logistic curve and

	their Applications, Moving Averages, Forecasting accuracy tests. Probability models for time series: Concepts of AR, ARMA and ARIMA models.
4	**Design of Experiments:**
	Analysis of variance – one and two way classifications – Principle of design of experiments, CRD – RBD – LSD, Concepts of and factorial experiments.
5	**Contemporary Issues**
	Industry Expert Lecture

iii. RECOMMENDED STUDY MATERIAL

Sr. No.	Book	Author	Publication
1	The Elements of Statistical Learning: Data Mining, Inference, and Prediction.	Trevor Hastie and Robert Tibshirani	Springer Series
2	Introduction to Probability and Statistics: Principles and Applications for Engineering and the Computing Sciences.	J. Susan Milton and Jesse Arnold,	McGraw Hill education
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/			

iv. COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	-	-	1	-	-	-	-	-	-	-
CO2	3	1	2	1	-	-	-	-	-	-	-	-
CO3	1	-	3	2	1	-	-	-	-	-	-	-
CO4	-	2	-	2	3	-	-	-	-	-	-	-
CO5	2	-	2	3	-	-	-	-	-	-	-	-

v. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	-	2	-	2
CO2	1	3	-	2	1
CO3	2	1	3	1	-
CO4	-	2	-	3	2
CO5	2	-	2	-	3

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

Code: MULEBX1109	Research Methodology	3 Credits [LTP:3-0-0]

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

COURSE OUTCOME

The student will be able to:
CO1 To be able to distinguish a purpose statement, a research question or hypothesis, and a research objective.
CO2 To be able to define the meaning of a variable, and to be able to identify independent, dependent,and mediating variables
CO3 To be able to distinguish between categorical and continuous measures
CO4 To be able to design a good quantitative purpose statement and good quantitative researchquestions and hypotheses
CO5 To understand the link between quantitative research questions and data collection and how research questions are operationalized in educational practice.

A. OUTLINE OF COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	General	9
2.	Connections	10
3.	Towers	8
4.	Plastic Analysis	9
5.	Industrial Building	8

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Overview of Research Methodology** Introduction, Mathematical tools for analysis, Research problems in management, Types ofresearch, 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 blockdesign, 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
CO1	3	2	1	1	-	-	-	-	-	-	-	-
CO2	-	2	3	-	2	-	-	-	-	-	-	-
CO3	2	1	3	-	1	-	-	-	-	-	-	-
CO4	2	3	-	2	-	-	-	-	-	-	-	-
CO5	1	1	2	3	-	-	-	-	-	-	-	-

E. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	-	1
CO2	2	-	3	2	-
CO3	1	-	3	1	2
CO4	-	2	2	-	3
CO5	2	1	-	3	1

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

Code: MUACHM1201	Communication Skills-I	1 Credits [LTP: 0-0-2]

COURSE OUTCOME

CO1: To present themselves in an effective manner and know about their short-term and long-term goals.

CO2 To works in a team by managing time properly and focus on personal grooming, etiquettes and body language.

CO3 To demonstrate their abilities by improving skills of LSRW (Listening /Speaking/Reading/Writing).

CO4 To present different viewpoints or ways of thinking about a situation, expand their abilities to resolve situations and get experience within the given context

CO5 To 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: MEECCV1401	SEMINAR-I	4 Credits [LTP: 0-0-4]

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, 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 Energy and Environment** **Duration: 2 Years** **Total Credits: 81**								
	Teaching Scheme for Batch 2025-27								
	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**								
MEECCV2101	Physicochemical, Biological Principles and Processes	3	-	-		40	60	100	3
MEECCV2102	Environmental Quality Monitoring	3	-	-		40	60	100	3
MEECCV2103	Energy Audit	3	-	-		40	60	100	3
A.2	**Practical**								
MEECCV2201	Energy & Environment Lab-II	-	-	2		60	40	100	1
B.		**Minor Stream Courses/ Department Electives I and II**							
B.1	**Theory**								
MEEECV2101	Biomass Energy Systems	3	-	-	-	40	60	100	3
MEEECV2102	Remote Sensing and GIS Applications			-	-	40	60	100	
MEEECV2103	Management and Modeling of Environmental Systems			-	-	40	60	100	
MEEECV2104	New and Renewable Energy Sources and Technologies	3	-	-	-	40	60	100	3
MEEECV2105	Groundwater Contamination and Remediation			-	-	40	60	100	
MEEECV2106	Environmental Impact Assessment			-	-	40	60	100	
B.2	**Practical**								
	-	-	-	-	-	-	-	-	-
C		**Multidisciplinary Courses**							
	MOOC Course - I	3	-	-	-	-	-	-	3
D		**Ability Enhancement Courses (AEC)**							
MUACHM2207	Communication Skill - II	-	-	2		60	40	100	1
E		**Skill Enhancement Courses (SEC)**							
MULCSE2201	Skill Enhancement Technical Course-II			4		60	40	100	2
MULCCV2202	Review/Research Paper-I			2		60	40	100	1
F		**Value Added Courses (VAC)**							
	-	-	-	-	-	-	-	-	-
G		**Summer Internship / Research Project / Dissertation**							
MEECCV2401	Seminar-II	-	-	2	-	60	40	100	1
Total		18	-	12					**24**
Total Teaching Hours		**30**							

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: MEECCV2101 Physicochemical, Biological Principles and Processes 3 Credits [LTP: 3-0-0]

COURSE OVERVIEW AND OBJECTIVES:

1.To study about the solid- liquid- gas interactions

2. To understand about process kinetics

3. To deal with themicrobial applications in environmental engineering.

COURSE OUTCOMES

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

CO	Description
CO1	Understand the significance of water in the environment
CO2	Relate the mass transfer and transport of impurities in the system.
CO3	Understand the chemical kinetics and isotherm model
CO4	Infer the significance of ecosystem and biodiversity
CO5	Appraise the biochemistry and enzyme kinetics.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Resource management and chemistry	**9**
2.	Chemical kinetics and isotherm models	**10**
3.	Fundamental of ecosystem and biodiversity	**9**
4.	Biochemistry of wastewater treatment	**12**
5.	Principles of biological processes	**8**

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Resource management and chemistry**
	Water resources management, Water management plan, Water Chemistry – Fundamentals, Solid-Liquid-Gas interactions.
2.	**Chemical kinetics and isotherm models**
	Fundamental concepts of chemical kinetics, Kinetics of complex systems, Kinetic reaction in gas, liquid and solid states, Non – isothermal methods in kinetics, Chemical equilibrium – Rate laws and rate constant.
3.	**Fundamental of ecosystem and biodiversity**
	Ecosystems; Fundamental processes – Ecological flow, tradeoff and biodiversity, Ecological hyper cycles, Ecosystem services in carbon dynamics/ carbon sequestration, biodiversity, land – surface energy balance.
4.	Biochemistry of wastewater treatment
	Biochemistry – Fundamentals, Enzymes – Enzyme kinetics, immobilization techniques, industrial application of enzymes.
5.	Principles of biological processes
	Cells – Fundamentals, Cell cultivation, Cell kinetics and fermenter design Genetic engineering. Bioconcentration – Bioaccumulation, biomagnification, bioassay, biomonitoring, bioleaching

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
CO1	1	2	2	-	1	-	1	-	-	-	-	-
CO2	1	1	2	-	1	-	-	-	1	-	-	1
CO3	3	-	-	2	1	-	-	-	-	1	-	-
CO4	-	3	-	1	-	-	-	-	-	-	-	-
CO5	1	-	1	3	-	-	-	-	-	-	-	1

E. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	-	3	-	-
CO2	1	3	-	1	1
CO3	2	-	3	-	-
CO4	2	3	-	1	-
CO5	-	-	-	2	3

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

Code: MEECCV2102	Environmental Quality Monitoring	3 Credits [LTP: 3-0-0]

COURSE OVERVIEW AND OBJECTIVES:

1. To provide an overall understanding of the environment
2. To Understand the sampling techniques
3. To Analyze the physicochemical and microbial qualities of water and wastewater
4. To Know the sampling and analysis of water, air and soil
5. To understand the standard methodologies for sampling and analysis of samples
6. To learn the working principles of various instruments used in environmental analysis.

COURSE OUTCOMES

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

CO	Description
CO1	Understand the sampling techniques.
CO2	Analyze the physicochemical and microbial qualities of water and wastewater.
CO3	Perform the sampling and analysis of water, air and soil.
CO4	Analyze particulates and chemical air pollutant
CO5	Understand the standard methodologies for sampling and analysis of samples.

OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	General Sampling and Analytical Techniques	10
2.	General Sampling and Analytical Techniques	8
3.	Biological Methods and Microbiology	7
4.	Air Pollution Measurements	5
5.	Spectroscopic methods	6

DETAILED SYLLABUS

Unit	Unit Details
1.	General Sampling and Analytical Techniques
	General principles for collection of representative sample, frequency of sampling, validation, interpretation and analysis of data, various statistical techniques, quality control, assessment and management.
2.	General Sampling and Analytical Techniques
	Gravimetric methods for water and wastewater, determination of various physicochemical parameters, working principles of electrodes, different types of electrodes.
3.	Biological Methods and Microbiology
	Biochemical oxygen demand (BOD), MPN test for microbial pollution, plate counts; confirmatory tests for various microbiological agents.
4.	Air Pollution Measurements
	Sampling techniques for air pollution measurements; analysis of particulates and common chemical air pollutants, analysis of oxides of nitrogen, oxides of sulphur, carbon monoxide, hydrocarbon and poly aromatic hydro carbons.
5.	Spectroscopic methods

	Principles, techniques and applications of spectrophotometry, fluorimetry, nephelometry and turbidimetry, Atomic Absorption Spectrometry, Atomic Emission Spectrometry, Inducted Coupled Plasma (ICP) – TOC Analyzer.

RECOMMENDED STUDY MATERIAL:

S. No.	Reference Book	Author	Edition	Publisher
1.	Environmental Chemistry,	Stanley E. Manahan	Latest	CRC Press.
2.	Environmental Microbiology	Maier, R.M., I.L. Pepper and C.P. Gerba	Latest	Academic Press, NewYork
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/				

COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	-	-	3	-	-	-	-	-	1	-
CO2	1	1	-	-	3	-	-	-	-	-	1	-
CO3	1	-	-	-	3	-	-	-	1	-	1	-
CO4	1	1	-	-	3	-	-	-	-	-	1	-
CO5	1	1	-	-	3	-	-	-	1	-	1	-

COs AND POs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	3	-	2	-
CO2	1	3	-	2	-
CO3	1	3	-	2	-
CO4	1	3	-	2	-
CO5	1	3	-	2	-

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

Code: MEECCV2103	Energy Audit	3 Credits [LTP: 3-0-0]

COURSE OVERVIEW AND OBJECTIVES:

1. To provide an overall understanding of the Energy Audits
2. To Understand the Audit techniques
3. To Analyze the Energy scenario in India
4. To Know the Global Environmental Concerns

COURSE OUTCOMES

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

CO	Description
CO1	Describe the global and national energy scenario and energy resource trends.
CO2	Apply principles of energy management and perform basic energy audits.
CO3	Develop effective energy action plans based on audit findings.
CO4	Analyse energy consumption data to monitor and set performance targets.
CO5	Evaluate global environmental issues related to energy use and sustainability.

OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	**Energy Scenario**	10
2.	**Energy Scenario: Energy Management & Audit**	8
3.	**Energy Action Planning**	7
4.	**Energy Monitoring and Targeting**	5
5.	**Global Environmental Concerns**	6

DETAILED SYLLABUS

Unit	Unit Details
1.	**Energy Scenario**
	Existing energy scenario in India, Energy Needs of Growing Economy, Long Term Energy Scenario, Energy Conservation and its Importance, Energy Strategy for the Future, Energy Conservation Act-2001 and its Features.
2.	**Energy Scenario: Energy Management & Audit**
	Definition, Energy audit- need, Types of energy audit, Energy management (audit) approach-understanding energy costs, Bench marking, Energy performance, matching energy use to requirement, Maximizing system efficiencies, Energy audit instruments
3.	**Energy Action Planning**
	Roles and responsibilities of energy manager, Accountability, Motivating-motivation of employees: Information system designing, barriers, Strategies, Marketing and communicating-training and planning.
4.	**Energy Monitoring and Targeting**
	Defining monitoring & targeting, Elements of monitoring & targeting, Data and information-analysis, Techniques -energy consumption, Production, Cumulative (CUSUM).
5.	**Global Environmental Concerns**

	United Nations Framework Convention on Climate Change (UNFCC), Kyoto Protocol, Conference of Parties (COP), Clean Development, Mechanism (CDM), Prototype Carbon Fund (PCF), Sustainable Development.

RECOMMENDED STUDY MATERIAL:

S. No.	Reference Book	Author	Edition	Publisher
1.	Encyclopedia of Energy	TMH	Latest	McGraw Hill Publication
2.	Energy management handbook	Wayne C. Turner	Latest	John Wiley and Sons
3	Guide to Energy	Cape Hart	Latest	Turner and Kennedy
Websites:				
https://onlinecourses.nptel.ac.in/noc25_ar10/preview https://onlinecourses.swayam2.ac.in/nou23_es05/preview https://onlinecourses.swayam2.ac.in/ntr25_ed50/preview https://onlinecourses.nptel.ac.in/noc23_me122/preview				

COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	-	-	3	-	-	-	-	-	1	-
CO2	1	1	-	-	3	-	-	-	-	-	1	-
CO3	1	-	-	-	3	-	-	-	1	-	1	-
CO4	1	1	-	-	3	-	-	-	-	-	1	-
CO5	1	1	-	-	3	-	-	-	1	-	1	-

COs AND POs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	3	-	2	-
CO2	1	3	-	2	-
CO3	1	3	-	2	-
CO4	1	3	-	2	-
CO5	1	3	-	2	-

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

Code: MEECCV2201	Energy & Environment Lab-II	1 Credits [LTP: 0-0-2]

Details of Syllabus as per theory

COURSE OUTCOMES

A. COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	-	-	-	-	-	-	-	-	-	-
CO2	1	2	2	-	-	-	-	-	-	-	-	-
CO3	2	-	2	2	-	-	-	-	-	-	-	-
CO4	1	-	1	2	-	-	-	-	-	-	-	-
CO5	1	2	1	1	-	-	-	-	-	-	-	-

B. COs AND POs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	-	1	-	-
CO2	2	2	-	3	-
CO3	-	2	-	2	-
CO4	2	-	-	2	-
CO5	-	2	2	-	-

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

Department Elective-I

Code: MEEECV2101	BIOMASS ENERGY SYSTEMS	3 Credits [LTP: 3-0-0]

COURSE OVERVIEW AND OBJECTIVES:

The fundamental principles of this course include Biomass: Thermochemical Conversion: Direct combustion, incineration, pyrolysis. Biomass gasifies fluid flow, Biological Conversion, Chemical Conversion.

COURSE OUTCOMES

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

CO	Description
CO1	To enable students for analyzing and describing the nature and principles of bioenergy systems
CO2	To develop, designs and distinguish the bioenergy systems and learn technical analysis.
CO3	To create understanding to critically evaluate the environmental benefits and consequences of bioenergy production.
CO4	Analyze the various chemical conversion.
CO5	Analyze of co-firing and co-generation.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Biomass	**8**
2.	Thermochemical Conversion	**8**
3.	Biological Conversion:	**6**
4.	Chemical Conversion	**6**
5.	Co-firing and co-generation	**8**

B. DETAILED SYLLABUS

Unit	Unit Details
1.	Biomass
	Biomass: Biomass resources, types, production, classification and characterization; Techniques for biomass assessment. Concept of Waste segregation, management and treatment.
2.	Thermochemical Conversion
	Thermochemical Conversion: Direct combustion, incineration, pyrolysis. Biomass gasifiers; types of gasifiers, Sizing selection and design of gasifiers. Biomass stoves, improved chulha and designs. Biomass fired boilers and types; Biomass pyrolysis – types, manufacture of charcoal, manufacture of pyrolytic oils and gases; Design and operation of pyrolysis units. Plastic waste management, plastic pyrolysis type of technologies.
3.	Biological Conversion
	Biological Conversion: Biodegradation substrate; Anaerobic digestion, process parameters of bio methanation; chemical kinetics and biomethanation process, biogas plant types, biogas plant design, biogas purification and utilisation; environmental and social impacts; bioconversion of substrates into bioethanol. Concept of Biorefinery and Circular Economy

4.	Chemical Conversion
	Chemical Conversion: Biodiesel and biohydrogen production, Fischer-Tropsch diesel hydrolysis and hydrogenation; solvent extraction of hydrocarbons; solvolysis of wood; biocrude; catalytic distillation
5.	Co-firing and co-generation
	Co-firing and co-generation, Biomass integrated gasification/combined cycles systems, Energy Plantation/crops, food security and environmental impacts of biomass conversion to energy; energy from waste.

C. RECOMMENDED STUDY MATERIAL:

S. No	Reference Book	Author	Edition	
1.	Introduction to biomass energy conversion	Capareda S,	22nd edition (2017)	CRS Press
2.	Thermo-chemical Processing of Biomass: Conversion into Fuels, Chemicals and Power	Brown RC and Stevens C	Latest	Wiley and Sons
3.	Introduction to Bioenergy (Energy and the Environment),	Vaughn C. Nelson, Kenneth L. Starcher	Tenth edition (2018)	CRS Press
4.	Bioenergy: Principles and Applications	Yebo Li and Samir Kumar Khanal,	Eighth edition	Wiley-Blackwell
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
CO1	2	1	2	-	1	-	-	-	-	-	-	1
CO2	1	2	2	-	1	-	1	-	-	-	-	-
CO3	1	1	2	-	1	-	-	-	1	-	-	1
CO4	1	-	2	-	2	-	-	1	-	-	-	1
CO5	1	1	2	-	1	-	-	-	1	-	-	1

E. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	-	2	3	-	1
CO2	3	1	-	2	-
CO3	1	3	-	1	1
CO4	2	-	1	-	3
CO5	3	2	1	-	1

Code: MEEECV1104	Remote Sensing and GIS applications	3 Credits [LTP: 3-0-0]

COURSE OVERVIEW AND OBJECTIVES:

1. To understand the basic concepts of remote sensing.
2. To learn basic concepts of Geo-graphical Information Systems (GIS).
3. To know various applications of Remote Sensing and GIS applications in Civil Engineering
4. To know the importance of decision-making system.
5. To understand the importance of Remote Sensing and GIS in Disaster Mitigation and Management.
6. To understand the importance of digital elevation model (DEM) in various water resources engineeringapplications.

COURSE OUTCOMES

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

CO	Description
CO1	Infer the Indian remote sensing satellites and their platforms.
CO2	Present available GIS and Remote Sensing software like ARC GIS, QGIS and ERDAS Imagine
CO3	Develop the Digital Elevation Model (DEM).
CO4	Analyze the land use and land cover to develop NDVI and EVI.
CO5	Understand the Importance of GIS and Remote Sensing in Environmental Management

B. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Basic concepts of Remote sensing	**6**
2.	Sensors and Scanning Systems in Remote Sensing	**6**
3.	Image Classification	**6**
4.	Basic concepts of GIS	**6**
5.	Spatial Analysis tools	**6**

C. DETAILED SYLLABUS

Unit	Unit Details
1.	**Basic concepts of Remote sensing**
	Introduction to Remote Sensing, Electromagnetic Spectram 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.

D. RECOMMENDED STUDY MATERIAL:

S. No	Reference Book	Author	Edition	Publication/Edition
1.	Elements of Photogrammetry with Application in GIS,	Paul Wolf, Bon DeWitt and Benjamin Wilkinson	Latest	McGraw-Hill Education; 4th Edition
2.	Remote Sensing and Image Interpretation,	ThomosLillesand, Ralph W. Kiefer and Jonathan Chripman	Latest	Wiley Publisher
3.	Principles of Geographical Information Systems	Peter A. Burrough, Rachael A. McDonnell and Christopher D. Lloyd	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				

E. COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	-	-	-	1	-	-	-	-	1
CO2	2	1	2	-	1	-	-	-	-	-	-	2
CO3	-	3	-	2	-	-	-	-	-	1	-	-
CO4	1	1	-	2	1	-	-	-	-	1	-	-
CO5	-	1	-	2	1	-	-	-	-	1	-	1

F. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	1	1	2	2
CO2	2	1	1	2	1
CO3	3	2	-	1	-
CO4	1	1	3	1	-
CO5	-	-	-	2	3

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

Code: MEEECV2103 Management and Modeling of Environmental Systems 3 Credits [LTP: 3-0-0]

COURSE OVERVIEW AND OBJECTIVES:

This is the course work which gives the knowledge of Human-environment relationship, Environmental andnatural resources economics, Numerical/mathematical modelling of environmental systems.

COURSE OUTCOMES

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

CO	Description
CO1	To design energy systems for engineering applications and model their performance
CO2	To analyze energy systems under design and off-design operating conditions
CO3	To optimize the performance of different energy systems
CO4	Analyze of planning and management of environmental system.
CO5	Analyze the large-scale system.

A. OUTLINE OF THE COURSE

Unit	Title of the unit	Time Required for the Unit (Hours)
1	Human	**8**
2	Environmental and natural resources economics	**6**
3	Numerical/mathematical modelling of environmental systems	**8**
4	Planning and management of environmental systems	**6**
5	Large scale systems	**8**

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Human**
	Human-environment relationship, normative criteria, descriptive and prescriptive models, limits of growth.
2.	**Environmental and natural resources economics**
	Environmental and natural resources economics, pollution control policy, growth in a finite environment; Environmental protection laws.
3.	**Numerical/mathematical modelling of environmental systems**
	Numerical/mathematical modelling of environmental systems, subsystems, and pollutant transport processes.
4.	**Planning and management of environmental systems**
	Planning and management of environmental systems: optimization techniques, stochastic modelling, statistical inferences.
5.	**Large scale systems**
	Large scale systems; Optimal monitoring network design, identification of sources; Risk reliability and uncertainty in environmental systems; Topics in groundwater and surface water quality management.

C. RECOMMENDED STUDY MATERIAL:

S. No	Title of the Book	Author	Edition	Publisher
1.	Modeling the Environment: An Introduction To System Dynamics Modeling Of Environmental Systems.	Andrew Ford,	Latest	Island Press
2.	Concepts of Environmental Management for Sustainable Development	M. C. Das	Latest	I K International Publishing House Pvt. Ltd
Websites				
https://nptel.ac.in/courses/120108005/ https://nptel.ac.in/courses/105/106/105106056/ https://nptel.ac.in/courses/105105160/				

D. COs AND POs MAPPING

COs and LOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	2	-	1	1	1	-	-	-	-	1
CO2	2	-	3	2	-	-	-	-	-	-	-	-
CO3	-	1	1	-	2	2	-	-	-	-	-	-
CO4	2	2	3	-	-	-	-	-	-	-	-	-
CO5	-	-	3	-	2	2	-	-	-	-	-	-

E. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3		-	-	2
CO2	-	-	2	2	2
CO3	2		2	-	1
CO4	2		-	2	-
CO5	-		2	-	2

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

Code: MEEECV2104 New and Renewable Energy Sources and Technologies 3 Credits [LTP: 3-0-0]

COURSE OVERVIEW AND OBJECTIVES:

This is the course work which gives the knowledge of Energy Consumption in various sectors, Performance Estimation of Wind turbines, Mini and Micro Hydel Projects.

COURSE OUTCOMES

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

CO	Description
CO1	Analyze of Energy Consumption in various sectors
CO2	Analyze of Performance Estimation of Wind turbines
CO3	Design of Mini and Micro Hydel Projects
CO4	Analyze of Applications of Geothermal Energy, Environmental Issues.
CO5	Analyze of Wind-Hydel systems, Gasifier DG- Wind systems

A. OUTLINE OF THE COURSE

Unit	Title of the unit	Time Required for the Unit (Hours)
1	World Energy Scenario	**8**
2	Wind Energy	**6**
3	Small Scale Hydroelectric (Mini & Micro Hydel)	**8**
4	Geothermal Energy	**6**
5	Hybrid systems	**8**

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**World Energy Scenario**
	Use and their availability and overall energy demand. Energy Consumption in various sectors and its changing pattern, exponential increase in energy consumption and projected future demands. Sustainable Development, Role of Renewable Energy sources in Sustainable development, Energy Consumption and its impact on environmental climatic change. Indian Energy Scenario: Commercial and non-commercial forms of energy, Fossil fuels, Renewable sources including Bio-fuels in India, their utilization pattern in the past, present and future projections of consumption pattern, Sector wise energy consumption.
2.	**Wind Energy**
	Wind potential in India and world, basic principle of wind energy Conservation characteristics of wind power, Extractable wind power, Site selection, wind data analysis and predictions, Use of statistical tools, Different types of Wind Machines Electricity generating stand alone systems & grid connected systems, Performance Estimation of Wind turbines, Aerodynamic construction of rotor blades, Wind Farms, wind mills & their applications, Cost economics, case studies.

3.	**Small Scale Hydroelectric (Mini & Micro Hydel)**
	Classification of Small Hydro Power Stations, Components of a Hydroelectric Scheme, Civil Works Design Considerations for Mini and Micro Hydel Projects, Turbines and Generators for Small Scale Hydro Electric, Protection, Control and Management of Equipment's, Advantages and Limitations of Small Scale Hydro-Electric, Hybrid Systems, Hydraulic Ram and its Applications.
4.	**Geothermal Energy**
	Potential Sites, Estimations of Geothermal Power, Nature of Geothermal Sites, Hot-Dry Rocks Resources, Magma Resources, Systems for Energy Generation, Applications of Geothermal Energy, Environmental Issues. Basic Theory of OTEC, Potential and application of Technologies, Basic Theory of Wave Energy, Potential and Technologies, Basic Theory of Tidal Energy, Potential and Technologies
5.	**Hybrid systems**
	Wind-PV systems, Wind-DG systems, Wind-Hydel systems, Gasifier DG- Wind systems

C. RECOMMENDED STUDY MATERIAL:

S. No	Title of the Book	Author	Edition	Publisher
1.	Renewable energy resources	Twidell & AW. Wier	Latest	FN Spon
2.	Renewable conversion technology,	N.K. Bansal., M. Kleeman & M. Mielee	Latest	Tata McGraw Hill, New Delhi
Websites				
https://nptel.ac.in/courses/120108005/ https://nptel.ac.in/courses/105/106/105106056/ https://nptel.ac.in/courses/105105160/				

D. COs AND POs MAPPING

COs and LOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	2	-	1	1	1	-	-	-	-	1
CO2	2	-	3	2	-	-	-	-	-	-	-	-
CO3	-	1	1	-	2	2	-	-	-	-	-	-
CO4	2	2	3	-	-	-	-	-	-	-	-	-
CO5	-	-	3	-	2	2	-	-	-	-	-	-

E. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3		-	-	2
CO2	-	-	2	2	2
CO3	2		2	-	1
CO4	2		-	2	-
CO5	-		2	-	2

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

Code: MEEECV2105	Groundwater Contamination and Remediation	3 Credits [LTP: 3-0-0]

COURSE OVERVIEW AND OBJECTIVES:

This is the course work which gives the knowledge of hydrological processes in various sectors, Performance Estimation of hydrological cycle.

COURSE OUTCOMES

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

CO	Description
CO1	Analyze of hydrological cycle
CO2	Analyze of Data collection Methods
CO3	Analyze of Groundwater Remediation,
CO4	Analyze of Flow and transport in the Unsaturated Zone,
CO5	Analyze of water yield from catchments

A. OUTLINE OF THE COURSE

Unit	Title of the unit	Time Required for the Unit (Hours)
1	Hydrological cycle	8
2	Data collection Methods	6
3	Groundwater Remediation	8
4	Transport in the Unsaturated Zone	6
5	Water Harvesting	8

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Hydrological cycle**
	Introduction, hydrologic Cycle, Groundwater Contaminant and Transport Mechanism.
2.	**Data collection Methods**
	Data collection Methods: Introduction, Geological data acquisition and Hydrological data acquisition, acquisition of soil and groundwater quality data,
3.	**Groundwater Remediation**
	Groundwater Remediation, Sorption and other chemical reactions,
4.	**Transport in the Unsaturated Zone**
	Flow and transport in the Unsaturated Zone, Non-aqueous phase Liquids: Characterization, types, remediation at sites
5.	**Water Harvesting**
	Water Harvesting: Types of storage structures, water yield from catchments, runoff diversion, pond and reservoirs, earth embankments

C. .RECOMMENDED STUDY MATERIAL:

S. No	Title of the Book	Author	Edition	Publisher
1.	Ground water contamination (Transport and remediation)	Phlip.B.Bedient, Hanadi.S. Rifai & Charles	Latest	J.Newell Publishers: Prentice Hall.
Websites				
https://nptel.ac.in/courses/120108005/ https://nptel.ac.in/courses/105/106/105106056/ https://nptel.ac.in/courses/105105160/				

D. . COs AND POs MAPPING

COs and LOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	2	-	1	1	1	-	-	-	-	1
CO2	2	-	3	2	-	-	-	-	-	-	-	-
CO3	-	1	1	-	2	2	-	-	-	-	-	-
CO4	2	2	3	-	-	-	-	-	-	-	-	-
CO5	-	-	3	-	2	2	-	-	-	-	-	-

E. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3		-	-	2
CO2	-	-	2	2	2
CO3	2		2	-	1
CO4	2		-	2	-
CO5	-		2	-	2

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

MEEECV2106	ENVIRONMENTAL IMPACT ASSESSMENT	3 Credits [LTP: 3-0-0]

COURSE OVERVIEW AND OBJECTIVES:

To understand the concepts of EIA and also emphasis the role of engineers in EIA and Environmental impactfactors.

2. To know the legislations to be used for enforcement of environmental acts and the role of public participation

3. To discuss the methods to be used in EIA and legal systems related to environmental management systems (EMS) (EIA, Environmental Audit (EA), Life cycle Assessment (LCA)) for cleaner production and sustainable development.

4. To know the impacts occurred to physical environment by the projects

5. To know the impacts occurred to biological environment by the projects

6. To know the impacts occurred to human resources by the projects

7. To draft an EIA for specific projects and understanding the mitigation and monitoring methods

8. To get exposed to practical experience for drafting an EIA through consultant / Government.

COURSE OUTCOMES

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

CO	Description
CO1	Explain the philosophy and art of environmental management systems
CO2	Understand the role of government in approving the projects and the laws to be enforced
CO3	Apply the mechanism of EIA for Project Appraisal, Decision making and Implementation
CO4	Identify the methods in handling the data collected during the EIA processes
CO5	Understand the impacts that could occur for physical, biological and human resources by the project.

A. OUTLINE OF THE COURSE

Unit	Title of the unit	Time Required for the Unit (Hours)
1	General Sampling and Analytical Techniques	**8**
2	EIA Legislation	**6**
3	EIA Process and Methods	**8**
4	Prediction and Assessment of Impacts on Physical Environment	**6**
5	Prediction and Assessment of Impacts on Biological Environment	**8**

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**General Sampling and Analytical Techniques**
	EIA for Environmental Engineers–Environmental Impact Statement – Environmental Appraisal– Environmental Impact Factor
2.	**EIA Legislation**
	Criteria and Standards for Assessing Significant Impacts – Risk Assessment – Public Participation and Involvement
3.	**EIA Process and Methods**

	Criteria for the Selection of EIA Methodology – Screening – Scoping – Predictive Models for Impact Assessment – Mitigation, Monitoring, Auditing, Evaluation of Alternatives and Decision Making –Methods of Strategic Environmental Assessment. Environmental management plan.
4.	**Prediction and Assessment of Impacts on Physical Environment**
	Geology –Soils – Minerals – Climate – Water Resources – Water Quality – Air Quality – Noise.
5.	**Prediction and Assessment of Impacts on Biological Environment**
	Terrestrial Ecosystems – Wetland Ecosystems – Aquatic Ecosystems – Threatened and Endangered Species

C. .RECOMMENDED STUDY MATERIAL:

S. No	Title of the Book	Author	Edition	Publisher
1.	'Handbook of Environmental Impact Assessment- Volume 1 & 2'	Judith Petts	Latest	Blackwell Science
2.	'Environmental Impact Assessment: Theory and Practice	Peter Wathern, Routledge-T	Latest	Taylor & Francis Group
Websites				
https://nptel.ac.in/courses/120108005/ https://nptel.ac.in/courses/105/106/105106056/ https://nptel.ac.in/courses/105105160/				

D. COs AND POs MAPPING

COs and LOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	2	-	1	1	1	-	-	-	-	1
CO2	2	-	3	2	-	-	-	-	-	-	-	-
CO3	-	1	1	-	2	2	-	-	-	-	-	-
CO4	2	2	3	-	-	-	-	-	-	-	-	-
CO5	-	-	3	-	2	2	-	-	-	-	-	-

E. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3		-	-	2
CO2	-	-	2	2	2
CO3	2		2	-	1
CO4	2		-	2	-
CO5	-		2	-	2

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

Code: MUACHM2207	Communication Skill-II	1 Credits [LTP:2-0-0]

COURSE OUTCOMES

Students will be able:

- CO1: To present themselves in an effective manner and know about their short-term and long-term goals.
- CO2 To works in a team by managing time properly and focus on personal grooming, etiquettesand body language.
- CO3 To demonstrate their abilities by improving skills of LSRW (Listening /Speaking/Reading/Writing).
- CO4 To present different viewpoints or ways of thinking about a situation, expand their abilitiesto resolve situations and get experience within the given context
- CO5 To enhance their employability skills by working on the presentation of Résumé and giving impactful performance during Group Discussion.

DETAILED SYLLABUS

Unit	Unit Details
1	Self-Awareness, Self Esteem & Confidence
2	The Corporate Fit-Dressing and Grooming, Etiquette: Social etiquette, business etiquette – civic sense – social norms
3	Effective Management Skills Time & Stress Management: Act in time on commitment
4	Personal Grooming and Body language
5	**Time Management &Conflict Management**
6	**Planning & Prioritizing, Emotional Intelligence: Managing Emotions**
7	Oral Communication &Writing Skills: Extempore & Paper Presentations.
8	**Selling Self/Job Hunting Writing resume / Curriculum vitae**
9	Mock GD – Goal setting - Career planning
10	Mock interview or Interview skills

A. COs AND POs MAPPING

COs and LOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	1	-	-	-	-	-	-	-	1
CO2	3	1	-	1	-	-	-	-	-	-	-	1
CO3	3	2	-	1	-	-	-	-	-	-	-	1
CO4	3	1	2	1	-	-	-	-	-	-	-	1
CO5	3	-	-	1	1	-	-	-	-	-	-	1

B. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	-	-	2	-
CO2	3	-	-	2	-
CO3	3	-	-	2	-
CO4	3	-	-	2	1
CO5	3	1	-	-	1

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

Code: MULCCV2202	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:

CO1 To be able to distinguish a purpose statement, a research question or hypothesis, and a research objective.

CO2 To be able to define the meaning of a variable, and to be able to identify independent, dependent, and mediating variables

CO3 To be able to distinguish between categorical and continuous measures

CO4 To be able to design a good quantitative purpose statement and good quantitative research questions and hypotheses.

CO5 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.
2.	**Problem Identification & Formulation**
	Problem Identification & Formulation – Research Question – Investigation Question – Measurement Issues – Hypothesis
3.	**Research Design**
	Research Design: Concept and Importance in Research – Features of a good research design – Exploratory Research Design – concept, types and uses.
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.
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.
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,

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: MEECCV2401	SEMINAR-II	1 Credits [LTP:0-0-2]

A. DETAILED SYLLABUS

Unit	Contents
	Students grouped in two to three during Semester I, will now continue to download further the research papers in the area, analyze, allocate individually, the set of papers, **Literature survey** Overview- What is literature survey, Functions of literature survey, maintaining a notebook, developing a Bibliography Methods of data collection – Observation, survey, contact methods, experimental, determining sample design Searching for publications – Publication databases,search engines and patent databases, Find some/all of the references for a given paper, including thosethat are not on the web Online tools-google, Cite Seer, ACM Digital Library, IEEE, The on-line Computer Science bibliography, Survey papers, Finding material not on the web, Searching patents. **Publishing a paper** How to write scientific paper Structure of a conference and journal paper, how (and How Not) to write a Good Systems Paper: Abstract writing, chapter writing, discussion, conclusion, references, bibliography, and In-class discussion of technical writing examples, Poster papers, review papers, how to organize thesis Project report, How to write a research proposal? How research is funded? Research ethics – Legal issues, copyright, and plagiarism General advice about writing technical papers in English Tips for writing correct English Practice sessions on above will beconducted. Students will have to deliver seminar, prepare a report and a review paper based on analysis individually.

	POORNIMA UNIVERSITY, JAIPUR								
	Faculty of Engineering and Technology								
Name of Program:	**M.Tech. in Energy and Environment** **Duration: 2 Years** **Total Credits: 81**								
	Teaching Scheme for Batch 2025-27								
	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**								
A.2	**Practical**								
MEECCV3401	Review/Research Paper-II	0	0	2		60	40	100	1
MEECCV3402	Industrial Technical Seminar	0	0	4		60	40	100	2
B.		**Minor Stream Courses/ Department Electives/*Open Elective***							
B.1	**Theory**								
C		**Multidisciplinary Courses**							
MCMEMC3121 MSTEMC3121	MOOC Course - II	3	-	-	-	-	-	-	3
D		**Ability Enhancement Courses (AEC)**							
E		**Skill Enhancement Courses (SEC)**							
-	-	-	-	-	-	-	-	-	-
F		**Value Added Courses (VAC)**							
G		**Summer Internship / Research Project / Dissertation**							
MEECCV3403	Internship	-	-	12	-	40	60	100	6
MEECCV3404	Dissertation Part - I	-	-	12	-	60	40	100	6
Total		3	0	30					**18**
Total Teaching Hours		**33**							

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.

M. Tech. Structural Engineering Syllabus-Third Semester

Code: MEECCV3401	Review/Research Paper- II	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:

CO1 To be able to distinguish a purpose statement, a research question or hypothesis, and a research objective.

CO2 To be able to define the meaning of a variable, and to be able to identify independent, dependent, and mediating variables

CO3 To be able to distinguish between categorical and continuous measures

CO4 To be able to design a good quantitative purpose statement and good quantitative research questions and hypotheses.

CO5 To understand the link between quantitative research questions and data collection and how research questions are operationalized in educational practice.

C. DETAILED SYLLABUS

Unit	Contents
1.	**Foundations of Research**
	Characteristics of scientific method – Understanding the language of research – Concept, Construct, Definition, Variable. Research Process
2.	**Problem Identification & Formulation**
	Qualities of a good Hypothesis –Null Hypothesis & Alternative Hypothesis. Hypothesis Testing – Logic & Importance
3.	**Research Design**
	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**
	Bivariate analysis – Cross tabulations and Chi-square test including testing hypothesis of association.
6.	**Interpretation of Data and Paper Writing**
	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**
	Software for paper formatting like LaTeX/MS Office, Software for detection of Plagiarism

D. 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: MEECCV3402	Industrial Technical Seminar	2 Credits [LTP:0-0-4]

A. DETAILED SYLLABUS

Unit	Contents
	1. For the seminar every student will individually study a topic assigned to him/her and submit a report and shall deliver a short lecture / Seminar on the topic at the end of term. 2. Selection of topic should be done by students in consultation with the concerned guide a). The topic should be related to the branch but it should be an extended part of the branch (latest and advanced topic). b). The topic should be such that the student can gain the latest knowledge. Students should preferably refer to at least one research paper 3. Seminar topics should not be repeated in the department and registration of the same should be done on a first come first served basis. 4. Seminar report should be submitted in paper-bound copy prepared with computer typing a). The size of the report depends on the advancement of the topic. b). Students should preferably refer minimum of 5 reference books/magazines. c). Format of content i. Introduction. ii. Literature survey. iii. Theory 1) Implementation 2) Methodology 3) Application 4) Advantages, Disadvantages. iv. Future scope. v. Conclusion..

Code: MEECCV3404	Dissertation Part-I	6 Credits [LTP:-0-0-12]

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

	POORNIMA UNIVERSITY, JAIPUR								
	Faculty of Engineering and Technology								
Name of Program:	**M.Tech. in Energy and Environment** **Duration: 2 Years** **Total Credits: 81**								
	Teaching Scheme for Batch 2025-27								
	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**							
MEECCV4401	Dissertation Part - II	-	-	30		250	250	500	15
Total		0	0	30					**15**
Total Teaching Hours		**30**							

Code: MEECCV4401	Dissertation Part-II	15 Credits [LTP:-0-0-30]

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