GOVERNMENT COLLEGE OF ENGINEERING, JALGAON
Department of Mechanical Engineering
Scheme for Semester III B. Tech. (Mechanical Engineering with Multidisciplinary Minor) with effect from academic year 2023-24 (As per NEP 2020)

Course Code	Proposed Course Domain	Category	Teaching Scheme				Evaluation Scheme						Credit
							Theory			Practical		Total	
			L	T	P	Total	MSE	ISA	ESE	ICA	ESE		
ME201N	Strength of Materials	PCC	2	…	…	2	30	10	60	…	…	100	2
ME202N	Engg. Thermodynamics	PCC	3	…	…	3	30	10	60	…	…	100	3
ME203N	Fluid Mechanics and Fluid Power Engg	PCC	3	…	…	3	30	10	60	…	…	100	3
ME204N	Engg.Thermodynamics Lab	PCC	…	…	2	2	…	…	…	30	20	50	1
ME205N	Fluid Mechanics and Fluid Power Engg. Lab	PCC	…	…	2	2	…	…	…	30	20	50	1
ME206N	Community Engineering Project	CEP (ELC)	...	…	2	2	...	...	...	30	20	50	2
XXMYYYN	Multi Disciplinary Minor-I	MDM-I (MDC)	2	…	…	2	30	10	60	…	…	100	2
ME207N	Open Elective-I	OE-I	3	1	…	4	30	10	60	…	…	100	4
SH201N	Project and Financial Management	HSSM (EEMC)	2	…	…	2	30	10	60	…	…	100	2
SH203N	Environmental Science	VEC	2	…	…	2	30	20	…	…	…	50	2
Total			**17**	**1**	**6**	**24**	**210**	**80**	**360**	**90**	**60**	**800**	**22**

L : Lecture **P: Practical** **MSE: Mid Semester Examination**

ISA :Internal Sessional Assessment **ESE: End Semester Examination** **ICA : Internal Continuous Assessment**

Open Elective-I
X.Total Quality Management
Y. Reliability Engineering

ME201N STRENGTH OF MATERIALS

Teaching Scheme	**:** 02 L + 00 T; Total: 02 hours/week	**Credits**	**:** 02
Evaluation Scheme	**:** 10 ISA + 30 MSE + 60 ESE	**Total Marks**	**:** 100
ESE Duration	**:** 3 Hrs.		

COURSE DESCRIPTION: -

This course includes fundamentals of stress-strain and their relation, various forms of stresses, concept of Shear Force Diagram (SFD) and Bending Moment Diagram (BMD), simple bending & shear stresses in beam its stress distribution, basics for column & struts, principle stresses, strain energy.

DESIRABLEAWARENESS/SKILLS:

This course requires sound knowledge of mathematics, physics and engineering mechanics.

COURSE OUTCOMES: -

After completing the course, students will be able to

1) Apply concepts of stress and strain to solve the problems.

2) Compute Shear Force and Bending Moment for determinate beams.

3) Apply the knowledge of bending and shear concept to determine various stresses

4) Explain theory of column failure with different support conditions and develop numerical ability to solve numerical problems.

5) Apply knowledge of strain energy to solve numerical problems.

Relevance of Cos and Pos and strength of co-relation

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	-	3	3	3	-	3	-	-	-	-	-	-	-	3
2	-	3	2	2	-	2	-	-	-	-	-	-	-	-
3	-	2	3	3	-	3	-	-	-	-	-	3	-	-
4	-	3	2	3	-	2	-	-	-	-	3	-	-	-

1- Weakly correlated **2-Moderately correlated** **3-Strongly correlated**

COURSE CONTENT:-

Unit 1: Simple Stresses and Strains (8Hrs)

Introduction to properties of engineering materials stresses and Strains:-definition–stress, strain, Hooke's law, elastic limit, Stress-strain diagram for ductile and brittle material. stress system:- Uni-axial, Bi-axial and Tri-axial stresses, tensile & compressive stresses, shear stress, Principle of superposition, stresses and strains in composite bars. Bars of varying cross sections. Elastic constants: - modulus of elasticity, modulus of rigidity, bulk modulus, Poisson's ratio, relation between elastic constants, yield stress, ultimate stress, factor of safety, state of simple shear.

Unit 2: Shear Force and Bending Moment Diagrams for Beams (6Hrs)

Shear force and bending moment in determinate beams due to concentrated loads, uniformly distributed load (U.D.L.) uniformly varying load (U.V.L.) and couples, Relation between S.F. and B.M. Determination of position of point of contra flexure and maximum bending moment.

Unit 3: Bending Stresses in Beams (8Hrs)

Theory of simple bending, Assumptions, Flexural formula, Moment of resistance and Section modulus. Determination of bending stresses and bending stress distribution diagram for the beams with commonly used sections like rectangular, square, circular, symmetrical and unsymmetrical I, T- sections etc.

Shear Stresses in Beams: Shear stress in beams subjected to bending, Shear stress distribution formula, Maximum and average shear stress, Determination of shear stresses and shear stress distribution diagram for beams with commonly used sections like circular & symmetrical sections etc.

Unit4: Direct and Bending Stresses in Columns (8Hrs)

Direct and Bending stresses in column due to eccentric loading, Condition for no tension. **Columns and Struts: -** buckling load, types of end conditions for column, Euler's theory of column.

Principal Stresses and Strain Energy:-Principal planes and principal stresses, Maximum shear stress, principal planes, planes of maximum shear (2D cases only).

Strain Energy: - Strain energy, Proof resilience, Modulus of resilience, Strain energy in a uniform bar due to gradual load.

Text Books:

1. Strength of Materials, S.Ramamurtham & R.Narayanan, Dhanpat Rai PublishingCompany (P) Limited.
2. Strength of Materials, I.B.Prasad, Khanna publication.
3. Strength of Material, R.K.Bansal, Laxmi Publication.
4. Strength of Material, B.C.Punmia, Vol.IStandard publisher and distributors.
5. Strength of Material, R.K.Rajput.Chand Publication.

Reference Book:

1. Mechanics of Materials, Gere.JamesM. &S.Timoshenko, IndianReprint, CBS Publisher &Distributor, New Delhi.
2. Mechanics of Structure, Dr. H. J. Shah and S. B. Junnarkar, Charter Publication House,ANAND.
3. Mechanics of Materials, by Beer, Johnston and De Wolf, Tata McGraw Hill Publication,New Delhi.
4. Strength of Materials, Ferdinand BeerandJr., E.Russell Johnston, Tata McGraw Hill, NewDelhi.

ME202N ENGINEERING THERMODYNAMICS

Teaching Scheme : 03 L + 00 T; Total: 03 hours/week **Credits** : 03
Evaluation Scheme : 10 ISA + 30 MSE + 60 ESE **Total Marks** : 100
ESE Duration : 3 Hrs.

COURSE DESCRIPTION

The course aims at imparting knowledge of basic Thermodynamics. course includes concept of system, surrounding and boundary, cycle, processes, Zeroth law, First law and its application, limitation of first law, statement of Second law, Carnot cycle, Clausius theorem, Ideal gas processes with their presentation on P- V & T-S plane, and properties of steam.

DESIRABLE AWARENESS / SKILLS

Fundamental knowledge of Physics, Chemistry and Mathematics.

COURSE OUTCOMES

On the successful completion of this course; student shall be able to -

1. Apply basic laws of thermodynamics in analysis and design of thermodynamic cycles.
2. Elaborate different parameter of boiler performance and properties of steam.
3. Explain different types of condensers.
4. Analyze steam nozzle and diffusers.
5. Describe reciprocating and rotary compressors with performance calculations.

RELEVANCE OF COURSE OUTCOMES (COs) WITH POs AND PSOs (WITH STRENGTH OF CO-RELATION)

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2								1			1	1	
2	2	1		1	1								1	1	
3	2	3	3										1	1	
4	1	1		1	1								1	1	
5	1	1		1									1	1	

1-Weakly correlated **2 – Moderately correlated** **3 – Strongly correlated**

COURSE CONTENT

Laws of Thermodynamics
(8 Hrs)

Introduction of thermodynamics, Zeroth law of thermodynamics, macro and microscopic approach, state, process and thermodynamic cycles, First law of thermodynamics, Joules experiment, steady flow energy equation and its application to different devices. PMM I, concept of reversibility and irreversibility, thermal reservoir, heat engine & its efficiency,

refrigerator and heat pump, coefficient of performance, statements of Second law, PMM-II, Carnot cycle, Carnot theorem, entropy – introduction, entropy as property.

Properties of Steam and Boilers Thermodynamics
(8 Hrs)

Pure substance, phases of pure substances, sensible heat and latent heat of steam, use of steam table. Measurement of dryness fraction by using separating and throttling calorimeter, vapour processes sketch on p-v, t-s, h-s diagrams .classification and selection of boilers, modern boilers, boiler performance - equivalent evaporation, boiler efficiency, heat balance for a boiler, boiler draught.

Vapour Power Cycle and Steam Condenser
(8 Hrs)

Steam power plant layout, Rankine cycle, analysis of Rankine cycle for work ratio, efficiency, power output, specific steam consumption, condenser, classification of condenser, necessity of condenser, condenser efficiency, vacuum efficiency, air leakage and its effect on condenser
performance.

Steam Nozzle
(8 Hrs)

Types of nozzles and diffusers, one dimensional steady isentropic flow through nozzles and diffusers, critical pressure ratio, maximum discharge, choked flow, effect of variation in back pressure on nozzle characteristics, effect of friction and nozzle efficiency.

Air compressors:
(8 Hrs)

Reciprocating air compressor : introduction, use of compressed air, terminology used in compressor, classification of compressors ,construction and working of single stage compressor, thermodynamic analysis of reciprocating air compressor without clearance volume, isothermal efficiency, volumetric efficiency, actual indicator diagram. Rotary air compressor : introduction, classification of rotary compressors; construction, working and application of roots blower, construction, working and application of vane type compressor.

Text Books

1. Power Plant Engineering, P K Nag, 4th edition, Tata McGraw Hill, 2014.
2. Thermal Engineering, R. K. Rajput, 9th edition, Laxmi Publication New Delhi, 2013.
3. Engineering Thermodynamics, P. K. Nag, 5th edition, Tata McGraw Hill, 2013.

Reference Books

1. Fundamentals of classical thermodynamics, G J Van Wylen, Richard E Sonntag; 6 th edition, Wiley publication 2013.
2. Engineering thermodynamics, Y V C Rao, 4th edition, Universities Press 2008.

3. Engineering thermodynamics, J B Jones and R E Dugan, 2nd edition, PHI, publication 2009.
4. Basic Thermodynamics by Dr. Ganesan, 4th edition, Tata McGraw Hill,2018.
5. Thermodynamics: an Engineering Approach, Y. A. Cengel and M A Boles, 7th Edition Tata Mc Graw Hill, 2011.
6. Applied Thermodynamics for Engineering Technologists, T. D. Eastop and Mc Conkey, 5th edition, Pearson Education India, Reprint 2013.
7. Power Plant Technology, M. M. El-Wakil, 1st edition, Tata McGraw Hill, 2011.
8. Steam & Gas Turbines & Power Plant Engineering, R. Yadav, 7th edition, Central Publishing House, Allahabad, 2011.
9. Course in Thermal Engineering, C. P. Kothandaraman, Domkundwar, Domkundwar S, Dhanpat Rai & Company (P) Limited, reprint, 2016.

ME203N FLUID MECHANICS AND FLUID POWER ENGINEERING

Teaching Scheme : 03 L + 00 T; Total: 03 hours/week **Credits** : 03
Evaluation Scheme : 10 ISA + 30 MSE + 60 ESE **Total Marks** : 100
ESE Duration : 3 Hrs.

COURSE DESCRIPTION

The students learning this course will understand the basic concepts of hydrostatics, buoyancy and flotation, kinematics and dynamics of fluid motion.

DESIRABLE AWARENESS / SKILLS

Fundamental knowledge of mathematics and calculus.
Fundamental knowledge of physics and chemistry and thermodynamics.

COURSE OUTCOMES

On the successful completion of this course; student shall be able to -

1. Articulate the fundamental properties of fluid.
2. Understand the concept of hydrostatics, buoyancy and flotation for identification stability of bodies in submerged and floating conditions.
3. Distinguish various types of fluid flows and flow measuring devices.
4. Evaluate and major and minor losses associated with pipe flow in piping networks and apply the knowledge to minimize the losses in pipes.
5. Analyze the working of centrifugal and reciprocating pumps.

RELEVANCE OF COURSE OUTCOMES (COs) WITH POs AND PSOs (WITH STRENGTH OF CO-RELATION)

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-
2	3	1	1	-	-	-	-	-	-	-	-	-	2	-	-
3	3	2	3	-	-	-	-	-	-	-	-	-	2	-	-
4	3	1	2	-	-	-	-	-	-	-	-	-	2	-	-

1-Weakly correlated **2 – Moderately correlated** **3 – Strongly correlated**

COURSE CONTENT

Fundamentals of Fluid Mechanics
(8Hrs)

Fluid Properties Units and dimensions- Properties of fluids- mass density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapour pressure, surface tension and capillarity, concept of continuum, rheological diagram.

Hydrostatics , Buoyancy and Flotation
(8Hrs)

Pascal's law, hydrostatic law, total pressure and centre of pressure for vertical, horizontal inclined and curved surface, Manometers, buoyancy and flotation, concept of Metacentric height and equilibrium of floating and submerged bodies.

Fluid Kinematics & Fluid Dynamics
(8Hrs)

Eulerian and Langragian approach of fluid flow, types of flow, Continuity equation Velocity and Acceleration of fluid particles, Stream function and velocity potential function. stream, path and streak line , Equation of motion, Integration of Euler's equation as energy equation. Bernoulli's theorem, Application of Bernoulli's theorem such as venture-meter, orifice-meter, pitot tube, Derivation of momentum equation, Applications of momentum equation. (No numerical treatment on stream function and velocity potential function)

Flow through Pipes
(8Hrs)

HGL,TEL , Energy losses through pipe-major and minor losses, Darcy-Weisbach equation, pipes in series, pipes in parallel and concept of equivalent pipe, Moody's diagram, Siphons, transmission of power through pipes. Water hammer phenomenon.

Centrifugal and Reciprocating Pump
(8Hrs)

Introduction to main parts of centrifugal pump, working & construction of centrifugal pump, types of impellers, types of casings, priming. Work done on centrifugal pump, various heads and efficiencies of centrifugal pump, minimum starting speed of a centrifugal pump, multistage centrifugal pump, principles of similarity applied to centrifugal pump. Specific speed, NPSH, cavitations in pumps. Introduction to main parts of Reciprocating pump, construction & working of Reciprocating pump, classification of Reciprocating pump, slip of reciprocating pump, air vessels. (No numerical on Reciprocating pump)

Text books

1. Fluid Mechanics, Dr. R.K. Bansal- 9 th edition, Laxmi Publication (P) Ltd. New Delhi,2014.
2.Hydraulics and Fluid Mechanics, Modi P. N. and Seth S. M, 19th edition-Standard Book House, 2012.
3.Fluid Mechanics, Cengel and Cimbla, 3 rd edition, TATA McGraw-Hill,2019.
4.Fluid Mechanics, Frank M White, 7 th edition, TATA McGraw-Hill,2011.

Reference Books

1. Fluid Mechanics, Kundu, Cohen, Dowling-6 th edition- Elsevier India,2000.
2. Fluid Mechanics, Chaim Gutfinger, David Pnueli-1 st edition,Cambridge University press,1997.
3. Introduction to Fluid Mechanics, Edward Shaughnessy, Ira Katz James Schaffer-1st edition, OXFORD University Press,2003.

4. Fundamentals of Fluid Mechanics- Munson, Okiishi, Huebsch, Rothmayer 7th edition, John Wiley & Sons Inc, 2004.

ME204N ENGINEERING THERMODYNAMICS LAB

Teaching Scheme : 02 P; Total: 02 hours/week **Credits** : 01
Evaluation Scheme : 30 ICA + 20 ESE **Total Marks** : 50

COURSE DESCRIPTION

understanding of basic principles, working of different components of steam boiler and boiler mountings, boiler accessories, nozzles and diffusers, steam condensers, air compressors, apply knowledge of thermodynamics in various industries as required.

DESIRABLE AWARENESS / SKILLS

Concepts and theory of the course ME202N Engineering Thermodynamics

COURSE OUTCOMES

On successful completion of this course, students will be able to-

1. Describe various types of boilers with its mountings and accessories.
2. Explain construction and working of condensors.
3. Analyze the working of nozzles.

RELEVANCE OF COURSE OUTCOMES (COs) WITH POs AND PSOs (WITH STRENGTH OF CO-RELATION)

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	1		1	1								**1**	**1**	
2	2	1		1	1								**1**	**1**	
3	2	2	3		1								**1**	**1**	
4	1	2		1	1								**1**	**1**	
5	1	2			1								**1**	**1**	

1-Weakly correlated **2 – Moderately correlated** **3 – Strongly correlated**

COURSE CONTENT

Minimum six experiments and five assignments shall be performed to cover entire curriculum of
course. The list given below is just a guideline.

1. Demonstration of Babcock and Wilcox boiler.(using model)
2. Demonstration of Cochran and Lancashire boiler.(using model)
3. Demonstration of boiler and boiler mountings. (Using virtual lab)
4. Demonstration of boiler accessories .(Using virtual lab)
5. Visit to thermal power plant.
6. Demonstration of steam condensers .(Using virtual lab)
7. Demonstration of boiler draught.(Using virtual lab)
8. Demonstration of nozzles.(Using virtual lab)

Evaluation Methodology:

ICA – Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format.

ESE – Oral will be based on content of syllabus and practical.

ME205N FLUID MECHANICS AND FLUID POWER ENGINEERING LAB

Teaching Scheme	**:** 02 P; Total: 02 hours/week	**Credits**	**:** 01
Evaluation Scheme	**:** 30 ICA + 20 ESE	**Total Marks**	**:** 50

COURSE DESCRIPTION

This course deal with the practical exposure to application of Bernoulli's equations, metacentric height, flow through pipes.

DESIRABLE AWARENESS / SKILLS

Concepts and theory of the course ME203N Fluid Mechanics and Fluid Power Engg

COURSE OUTCOMES

On the successful completion of this course; student shall be able to

1. Identify the dynamic viscosity of fluid.
2. Compare various types of Manometers and identify their practical applications.
3. Examine the coefficient of discharge of venturimeter and orifice meter.
4. Evaluate major and minor losses associated in flow through pipes.
5. Verify the Bernoulli's theorem.

RELEVANCE OF COURSE OUTCOMES (COs) WITH POs AND PSOs (WITH STRENGTH OF CO-RELATION)

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	1	-	-	-	-	-	-	-	-	-	2	-	-
2	3	2	1	-	-	-	-	-	-	-	-	-	2	-	-
3	3	2	2	-	-	-	-	-	-	-	-	-	2	-	-
4	3	2	3	-	-	-	-	-	-	-	-	-	2	-	-

1-Weakly correlated **2 – Moderately correlated** **3 – Strongly correlated**

COURSE CONTENT

Minimum eight experiments shall be performed to cover entire curriculum of course ME203N.

The list of experiments provided below is just a guideline.

List of Experiments

1. Determination of viscosity of liquids and its variation with temperature.
2. Study of different manometers.
3. Determination of metacentric height of a floating body.
4. Determination of coefficient of discharge for Orifice meter.
5. Determination of coefficient of discharge for venturimeter.
6. Determination of minor losses due to pipe fittings.
7. Determination of Major losses through pipes.
8. Experiment on Reynolds apparatus.

9. Verification of Bernoulli's theorem.
10. Experiment on Centrifugal Pump.

Evaluation Methodology:

- **ICA –** It shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using the prescribed internal continuous assessment format.

- **ESE –** It shall be based on performance in one of the experiments performed by student in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners, out of which one examiner shall be external examiner.

ME206N COMMUNITY ENGINEERING PROJECT

Teaching Scheme	**:** 02 P; Total: 02 hours/week	**Credits**	**:** 02
Evaluation Scheme	**:** 30 ICA + 20 ESE	**Total Marks**	**:** 50

COURSE DESCRIPTION

Meets community needs by applying disciplinary knowledge and practice to real-world collaborative active learning opportunities found in community organizations or settings. Supports students in completing these kinds of projects. Provide students with the tools they need to become morally and socially conscious citizens through continuous critical self-reflection, teamwork, active listening, and discussion.

DESIRABLEAWARENESS/SKILLS

Knowledge of concepts, principles and techniques studied in all earlier courses.

COURSE OUTCOMES

On successful completion of this course students shall

1. In the context of their discipline, exhibit an applied understanding of critical and active citizenship, including social and ethical responsibility.
2. In the context of a community partnership, demonstrate your understanding of the concepts of respect, mutuality, reciprocity, and teamwork.
3. Exhibit the ability to critically reflect on their experiences through thoughtful writing.
4. Exhibit knowledge of the variety of participatory techniques suitable for cooperative partnership projects.

CONTENT:-

The Community Engineering Project shall be carried out in-house i.e. in the department's laboratories/centers by a Group 5 – 6 students. The project outline on the selected topic should be submitted to the course coordinator for approval within one week from the commencement of the term. - it may involve fabrication, design or investigation of a technical problem that may take design, experimental or analytical character or combine element of these areas. The project work shall involve sufficient work so that students get acquainted with different aspects of fabrication, design or analysis. Each student is required to maintain separate log book for documenting various activities carried under it.

Before the end of semester, student shall deliver a presentation and submit the project report (paper bound copy) in prescribed format.

- Student should preferably refer minimum five reference books/magazines/standard research papers

Format of report

1. Introduction

2. Literature survey

3. Theory(Implementation,Methodology,Applications,Advantages,Disadvantages.etc)

4. Conclusion

Assessment of Community Engineering Project

Name of the Project**:**
Name of the Guide:
Assessment Table:-

Sr. No.	Exam Seat No.	Name of Student	Community Project Selection & documentation	Presentation	Result	Total	Remark
1			10	10	10	30	

Evaluation Methodology:

- **ICA –** It shall support for regular performance of CEP and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student based on experiments/simulation/modeling etc. performed by group/team. The performance shall be assessed experiments/simulation/modeling etc. wise using the prescribed internal continuous assessment format.

- **ESE –** It shall be based on performance in experiments/simulation/modeling etc. performed by student in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners, out of which one examiner shall be external examiner.

ME207N- Open Elective-I
X. TOTAL QUALITY MANAGEMENT

Teaching Scheme : 03 L + 01 T; Total: 04 hours/week **Credits** : 04
Evaluation Scheme : 10 ISA + 30 MSE + 60 ESE **Total Marks** : 100
ESE Duration : 3 Hrs.

COURSE DESCRIPTION

The course describes in depth knowledge to students about customer satisfaction techniques , tools for quality improvement and Quality system standards.

DESIRABLE AWARENESS / SKILLS

Fundamental knowledge of Manufacturing.
Fundamental knowledge of Management.

COURSE OUTCOMES

On the successful completion of this course; student shall be able to -

1. Enumerate the salient contributions of Quality Gurus like Deming, Juran and Crosby.
2. Identify general barriers in implementing TQM.
3. Employ concepts like customer focus, employee focus and their involvement, continuous process improvement and Supplier Management.
4. Exemplify students on the basic and new seven management tools, Quality concepts like Six sigma, Failure mode effect analysis.
5. Coordinate industrial applications of Quality function deployment, taguchi quality concepts and TPM.
6. Develop exposure to students on various quality systems like ISO and its standards.

RELEVANCE OF COS /POS AND STRENGTH OF CO-RELATION:

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	1			1		3					1		1		1
CO 2		2												2	
CO 3			2		1										1
CO 4						1			1				1		
CO 5	1			3										1	
CO 6	1			2					1				1		

1-Weakly correlated 2–Moderately correlated 3–Strongly correlated

Introduction
(8Hrs)

Need for quality , Evolution of quality, Definitions of quality, Dimensions of product and service quality, Basic concepts of TQM, TQM Framework, Contributions of Deming, Juran and Crosby, Barriers to TQM Quality statements, Customer focus, Customer orientation , Customer satisfaction, Customer complaints, Customer retention, Costs of quality.

TQM Principles
(8Hrs)

Leadership ,Strategic quality planning, Quality Councils , Employee involvement , Motivation, Empowerment, Team and Teamwork, Quality circles Recognition and Reward, Performance appraisal ,Continuous process improvement , PDCA cycle, 5S, Kaizen ,Supplier partnership - Partnering, Supplier selection, Supplier Rating.

TQM Tools and Techniques I
(8Hrs)

The seven traditional tools of quality , New management tools, Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT ,Bench marking -Reason to bench mark, Bench marking process , FMEA : Stages, Types.

TQM Tools and Techniques II
(8Hrs)

Control Charts , Process Capability , Quality Function Development (QFD) - Taguchi quality loss function ,TPM : Concepts, improvement needs , Performance measures.

Quality Systems
(8Hrs)

Need for ISO 9000-ISO 9001-2008, Quality System, Elements, Documentation , Quality Auditing , QS9000-ISO14000, Concepts, Requirements and Benefits, TQM Implementation in manufacturing and service sectors.

TEXTBOOKS:

Dale H.Besterfiled, Total quality Management, Pearson Education Asia, Third Edition, Indian Reprint 2006.

REFERENCEBOOKS:

1. James R. Evans and William M. Lindsay , The Management and Control of Quality ,8th Edition, First Indian Edition, Cengage Learning, 2012.
2. Suganthi. L and Anand Samuel, Total Quality Management , Prentice Hall (India) Pvt. Ltd., 2006.
3. Janakiraman Band Gopal.R.K., Total Quality Management–Text and Case ,Prentice Hall (India) Pvt. Ltd., 2006.

ME207N- Open Elective-I
Y RELIABILITY ENGINEERING

Teaching Scheme : 03 L + 01 T; Total: 04 hours/week **Credits** : 04
Evaluation Scheme : 10 ISA + 30 MSE + 60 ESE **Total Marks** : 100
ESE Duration : 3 Hrs.

COURSE DESCRIPTION

Focuses on system level reliability modeling approaches. Engineering system reliability modeling and prediction; reliability of programmable devices and human reliability; reliability and risk management of engineering systems.

DESIRABLE AWARENESS / SKILLS

Knowledge of basic industrial engineering and their concepts

COURSE OUTCOMES

Students who pass the course will:

1. Acquire the basics of reliability engineering.
2. Comprehend the basic concepts and methods in maintenance management.
3. Understand the qualitative approaches in reliability engineering and gain the aptitude to apply these approaches.
4. Understand the quantitative approaches in reliability engineering and gain the aptitude to Apply these approaches

RELEVANCE OF COURSE OUTCOMES (COs) WITH POs AND PSOs (WITH STRENGTH OF CO-RELATION)

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	2	1		2								1	1	
2	2	3	2		1								1	1	
3	1	3	1		3								1	2	
4	2	2	1		2								1	2	

1-Weakly correlated **2 – Moderately correlated** **3 – Strongly correlated**

COURSE CONTENT

Chapter1 **(8Hrs)**

Reliability Engineering: Reliability function, failure rate, Mean time between failures (MTBF), Mean time to failure (MTTF), mortality curve, useful life availability, maintainability, system effectiveness. Introduction to probability distributions. Time to failure distributions: Exponential, normal, Gamma, Weibull; ranking of data, probability plotting techniques, Hazard plotting Concept of Bathtub Hazard Rate curve, Reliability

evaluation of two-state device networks-series, parallel, k-out-of-m systems; Standby redundant systems, Reliability evaluation of three-state device networks-series and parallel.

Chapter2 **(12Hrs)**

Reliability Determination and Prediction: Reliability Determination Methods: Network reduction technique, Path tracing technique, Decomposition technique, Delta-Star method. Advanced Reliability Evaluation Concepts: Supplementary variables technique, Interference theory, Human reliability, Common cause failures, Fault trees, Failure mode and effect analysis.

Chapter3 **(8Hrs)**

Reliability Prediction Models: Series and parallel systems - RBD approach - Standby systems - m/n configuration - Application of Baye's theorem - cut and tie set method - Markov analysis - FTA – Limitations

Chapter4 **(12Hrs)**

Reliability testing: Time acceleration factor, influence of acceleration factor in test planning, application to acceleration test, high temperature operating life acceleration model, temperature humidity bias acceleration model, temperature cycle acceleration model, vibration accelerator model, failure free accelerated test planning. Accelerated reliability growth.

Risk Assessment: Definition and measurement of risk - risk analysis techniques - risk reduction resources - industrial safety and risk assessment

Text Books

1. Introduction to Reliability Engineering, 3rd Edition , James Brenman , Wiley-Blackwell
2. Introduction to Reliability Engineering, E. E. Lewis , Wiley

Reference Books

1. B. Bhadury and S.K. Basu, “Terotechnology: Reliability Engineering and Maintenance Management”, Asian Books, New Delhi 2002.

2. A. K. Gupta, “Terotechnology & Reliability Engineering”, McMillan Co.

3. A. K. S. Jardine, “Maintenance, Replacement & Reliability”, HMSO, London.

4. C.Singh and C.S. Dhillon, “Engineering Relaibility-New Techniques and Applications”, John Wiley and Sons, Tata McGraw Hill Publishing Company Limited, New Delhi.

5. L.S.Srinath, “Concepts in Reliability Engineering” Affiliated East West Press.

6. K.C. Kapoor and L.R. Lubersome, “Reliability in Engineering Design” ,Willey

7. C. Singh and C.S. Dhillon, “Engineering Reliability New Techniques and Applications” John Wiley and Sons

SH201N : PROJECT AND FINANCE MANAGEMENT

Teaching Scheme: L: 02 T: 00 P: 00 **Credit:** 02
Evaluation Scheme:10 ISA+30 MSE +60ESE **Total marks:**100
MSE Duration: 1.5 Hrs. **ESE Duration:** 3.0 Hrs.

COURSE DESCRIPTION:

The course is intended to provide basic understanding of project and financial management to engineering students with the basic and fundamental concept of project and finance. This course introduces the student to selection, appraisal, organization and planning of the project management as well as project scheduling and resource management. Students will study fundamental concept, budget and budgetary control as well as leverage analysis and Working capital management.

COURSE OBJECTIVES:

The course is designed to achieve comprehensive learning outcomes across several key areas. Firstly, it introduces participants to the fundamental principles of project management, emphasizing techniques for project selection and appraisal to ensure alignment with organizational goals. Secondly, it covers project organization and planning strategies, including project scheduling and resource management techniques essential for efficient project execution. Additionally, the course delves into financial management principles, providing insights into leverage analysis and effective working capital management strategies to optimize financial resources within project environments. By integrating these topics, the course aims to equip participants with the knowledge and skills necessary to successfully manage projects while maintaining financial sustainability and achieving strategic objectives.

COURSE OUTCOMES:

On the successful completion of this course student will be able to

1. Apply the basic concept of project management
2. Demonstrate the ability to prepare projects and risk management
3. selection, appraisal, organization and planning of the project
4. assess the budget and budgetary control
5. analyze and evaluate the leverage and working capital management

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CO-RELATION

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	-	-	-	-	-	2	-	-	2	3	3	3			3
2	-	-	-	-	-	2	-	-	2	3	3	3			3
3	-	-	-	-	-	2	-	-	2	3	3	3			3
4	-	-	-	-	-	2	-	-	3	3	3	3			3
5						2	-	-	2	3	3	3			3

l- Weakly correlated 2-Moderatelycorrelated 3-Stronglycorrelated

CONTENTS:

Introduction to Project Management: What is a project? Evolution of project management, Importance of project management, Where is project management appropriate? Project Management Today—An Integrative Approach, Characteristics of projects, Characteristics of project management, Projects in contemporary organizations, Project lifecycle, Job conflict, Labour conflict, Material conflict.

Project Selection and Appraisal: Brain storming and concept evolution, The Strategic Management Process: An Overview, The Need for an Effective Project Portfolio Management System, A Portfolio Management System, Applying a Selection Model, Managing the Portfolio System, Types of appraisals, SWOT analysis, Cash flow analysis, Payback period, and Net present value.

Project Organization and Planning: Project manager, Cross-functional team, Dedicated project organization, Influence project organization, Matrix organization, Advantages and disadvantages of project organizations, Selection of project organization, Work Breakdown Structure (WBS), Integration of project organization and WBS, WBS and responsibility matrix, Risk Management Process, Contingency Planning

Project Scheduling and Resource Management: Gant chart, Milestone chart, Network techniques: PERT and CPM, AON and AOA representation, Three time estimates, Using probability distributions for time computation, Probability of project completion, Time scale version of network, Early start and late start schedules, Resource allocation, Resource loading and leveling, Constrained resource scheduling, Multi-project scheduling and resource allocation, Crashing a project.

Introduction to Financial Management: Finance and other discipline, nature and scope of financial management, Functions of financial management; Objectives of the firm, Sources of finance, long term sources, short term sources; Introduction and analysis of financial statement; Introduction& definition of **budget** and budgetary control, objectives, essential requirements, advantages and disadvantages, types of budgets- cash and flexible.

Leverage Analysis and Working Capital Management: Concepts, Operating leverage, Financial leverage, Combined leverage, Working capital management: Operating cycle, Determinants of working capital, Types of working capital, Importance of working capital, Components of working capital, measuring working capital requirements

Text books:

1. Project Planning and Management with CPM and PERT, Kundan Singh & Dr. M.L. Kansal, HP Hamilton Limited, 2021.
2. Project Management Planning and Control Techniques, Rory Burke, 4th Edition, Wiley India Pvt. Ltd, 2010.
3. Project Management, Planning and Control, Albert Lester, 5th edition, Butterworth-Heinemann, 2007
4. Fundamentals of Financial Management,D.ChandraBose,2nd edition,PHI,2010
5. Project Management: The Managerial Process, Erik Larson , Cliffor Gray, 6th edition,McGraw Hill Education, 2017
6. Project Management, Megha Jain, Sultan Chand&Sons,2020

Reference Book:

1. Projects: Planning, Analysis, Selection, Financing, Implementation,and Review, Prasanna Chandra., 10th edition, McGraw Hill Education, 2022
2. Project Management–The Complete Process(with Case Studies from Renewable Energy Sector), Vishwanath Murthy, Sultan Chand & Sons 2018
3. Project Management, Harvey Maylor, 5th edition, Pearson, 2021
4. Financial Accounting for Management, Paresh Shah, 3rd edition, Oxford University Press, 2019.
5. Financial Management Text, Problems and Cases, Khan& Jain, 8th edition, Tata McGraw Hill, 2018
6. Financial Management, Dr. P. C. Tulsian, 5th edition, S.Chand and company, 2017.
7. Financial Management, Ravi Kishore, 8th edition,Taxmann PublicationsPvt. Ltd, 2020

Evaluation Methodology:

MSE: The Mid-Semester Examination will cover 50% of the syllabus.

ESE: The End-Semester Examination will cover 75% of the remaining syllabus (excluding the MSE syllabus) and 25% of the MSE syllabus.

ISA: The Internal Sessional Assessment (ISA) will be based on any one or a combination of the following components:

1. Declared Test
2. Surprise Test
3. MCQ Test
4. Performance in Tutorials
5. Assignments/Tutorials/Punctuality/Attendance

Additionally, the Course Coordinator may select other components and will announce the method of evaluation at the beginning of the course.

SH203N: ENVIRONMENTAL SCIENCE

Teaching Scheme: L: 02 T: 00 P: 00 **Credits:** 02

Evaluation Scheme: 20 ISA+30 MSE **Total marks:**50

MSE Duration: 1.5 Hrs.

COURSE DESCRIPTION:

This course provides basic scientific knowledge and understanding of how our word works from an environmental perspective. Topics covered include energy resources, basic principles of ecosystem function; biodiversity and its conservation; human population growth; water, air and noise pollution; climate change and green chemistry.

DESIRABLE AWARENESS/SKILLS:

Basic knowledge of environment and importance of its protection

COURSE OBJECTIVES:

The course in Environmental Science is designed to achieve a comprehensive understanding of key environmental issues and principles. It begins by exploring the nature of the environment, including its components and interactions. The course then focuses on natural resources, highlighting their significance, sustainable management, and conservation strategies. Additionally, it delves into the structure and function of ecosystems, emphasizing their resilience and importance in maintaining ecological balance. Furthermore, the course addresses biodiversity and its conservation, emphasizing the preservation of species and habitats. It also covers environmental pollution and the principles of green chemistry, aiming to mitigate pollution and promote sustainable practices. Moreover, it examines social issues related to the environment, such as environmental justice, sustainable development, and the impacts of human activities on natural systems.Overall, the course aims to equip students with the knowledge, critical thinking skills, and practical insights necessary to understand and address contemporary environmental challenges effectively. Through a multidisciplinary approach, students will develop a holistic understanding of environmental science and its implications for sustainable development and human well-being.

COURSE OUTCOMES:

On the successful completion of this course, student shall be able to–

1. Demonstrate the primarily environmental problems.
2. Remember the concept of ecology, their structure and types, different components and their functions.
3. Understand abiotic and biotic factors and their relation to each other.
4. Apply various types of ecosystem, function, components of ecosystem and their stability.
5. Analyze the social issues and apply environmental acts.

RELEVANCE OF PROGRAM OUTCOMES (POS) AND STRENGTH OF CORELATION:

CO	PO											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	-	-	-	-	-	**2**	**2**	-	-	-	-	-
2	-	-	-	-	-	**2**	**2**	-	-	-	-	-
3	-	-	-	-	-	**2**	**2**	-	-	-	-	-
4	-	-	-	-	-	**2**	**2**	-	-	-	-	-
5	-	-	-	-	-	**2**	**2**	-	-	-	-	-

1- WeaklyCorrelated; 2 – Moderately Correlated; 3 - Strongly Correlated

COURSECONTENT:

Nature of Environment: Definition, scope and importance, multidisciplinary nature, need of public awareness.

Natural Resources:

Renewable and non-renewable resources: Natural resources and associated problems.
Forest resources: Use and over-exploitation, deforestation, case studies, timber extraction, mining, demand and their effects on forest and tribal people
Water resources: use and overutilization of surface and groundwater, floods, drought, conflicts over water, dams-benefits and problems
Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources
Food resources: world food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity
Energy resources: growing energy needs, renewable and non-renewable energy resources Land resources: land as a resource, land degradation, man induced landslides, soil erosion and desertification. Roll of individual in conservation of natural resources.

Ecosystem- Concept, structure and function of ecosystem, producers, consumers and decomposers, energy flow in ecosystem, ecological succession, food chain, food web and ecological pyramid, types of ecosystem-forest, grassland, desert and aquatic.
Biodiversity and Its Conservation- Introduction, definition, genetic, species and ecosystem diversity, biogeographical classification of India, India as mega diversity nation, hot spots of biodiversity, threats to biodiversity, habitat loss, poaching of wildlife, man wildlife conflicts, endangered and endemic species of India, conservation of biodiversity-In-situ and ex-situ conservation of biodiversity.

Environmental Pollution and Green Chemistry- Definition, causes, effects and control measures of –air pollution, water pollution, soil pollution, noise pollution, thermal pollution, nuclear hazards, role of individual in prevention of pollution, concept of green chemistry, principles of green chemistry.

Social Issues and the Environment-Water conservation, rain water harvesting, watershed management, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents, environmental protection act, air (prevention and control of pollution) act, water (prevention and control of pollution) act, wildlife protection act, forest conservation act.

TEXT BOOKS-

1. A Textbook of Environmental Studies for Undergraduate Courses, Erach Bharucha,4th edition, University Press, 2004.
2. A Textbook of Environmental Chemistry, O.D.TyagiandMMehta, 4th edition, Anmol publication, 2016.
3. A Text book of environmental studies for undergraduate courses, Dr.D.K. Asthana, Dr. Meera Asthana, 2nd edition, S. Chand publication, 2012.

REFERENCES-

1. Green Chemistry Environmental Friendly Alternatives, Rashmi sanghi, M.M. Shrivastawa, 3rd edition, Narosa publication, New Delhi, 2008.
2. Green Chemistry-Theory and Practice, Paul T Anastas and John C. Warner,1st Edition,Oxford University Press, 2000 V.K.
3. Environmental ChemistryA.K.De,3rdEdition,NewAgeInternationalPublishersLtd,

New Delhi, 2010.
4. New Trends in Green Chemistry, V.K. Ahluwalia, M.Kidwai,1st Edition, Springer publisher, 2004.
5. Environmental Studies,BennyJoseph,3rd Edition,TataMcGraw-Hill publication, 2017.

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