

SNJB's

Late Sau. Kantabai Bhavarlalji Jain

College of Engineering

(Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)

Shri Neminath Jain Brahmacharyashram (SNJB) (Jain Gurukul)

Neminagar, Chandwad - 423101, Dist. Nashik (MS, India).

Tele: (02556) 253750, Web: www.snjb.org, Email: principalcoe@snjb.org



ESTD - 1928

SNJB

**Curriculum Structure and Evaluation Scheme for M. Tech. in
Mechanical Engineering**

**To be implemented for 2025-27 Batch
(With Effect from Academic Year 2025-26)**

SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-27 Batch

Vision of the Institute

Transform young aspirant learners towards creativity and professionalism for societal growth through quality technical education.

Mission of the Institute

1. To transfer the suitable technology, particularly for rural development.
2. To enhance diverse career opportunities among students for building a nation.
3. To acquire the environment of learning to bridge the gap between industry and academics.
4. To share values, ideas, beliefs by encouraging faculties and students for welfare of society.

The vision of the Mechanical Engineering Department

To impart quality technical education in the field of Mechanical Engineering for the benefits of society

Mission of the Mechanical Engineering Department

1. To provide quality education among the students through the curriculum and industrial exposure.
2. To develop a learning environment leading to innovations, skill development and professional ethics through curricular and extracurricular activities for societal growth.

Program Outcomes (POs) for an engineering graduate:

1. An ability to independently carry out research /investigation and development work to solve practical problems.
2. An ability to write and present a substantial technical report/document.
3. Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program



SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-27 Batch

Table No.1: Abbreviations

Abbreviation	Meaning
ISE	Internal Semester Evaluation
SEE	Semester End Examination
VSEC	Vocational and Skill Enhancement Courses
VEC	Value Education Course
PCC	Program Core Courses
PEC	Program Elective Courses
ELC	Research Methodology
	Technical Communication
	Dissertation I
	Dissertation II
	Internship
CCC	Co-Curricular Courses
L	Lecture
PR	Practical
TH	Theory
TW	Term Work
OR	Oral
ME	Mechanical Engineering



SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-27 Batch

GENERAL COURSE STRUCTURE

A. Definition of Credit

Table No.2: Definition of Credit

1 Hour Lecture (L) per week	1 Credit
1 Hour Tutorial (T) per week	1 Credit
2 Hours Practical (P) per week	1 Credit

B. Range of Credits: (M.Tech. or Equivalent) in Tech. : Two-year Post Graduate program in Technology has about 80 credits, the total number of credits proposed for the two-year M.Tech. in **Mechanical Engineering** is kept as **80**.

Table No.3: Range of Credits

Course Category		Proposed Credits
Programme Core Course (PCC)	Program Courses	19
Programme Elective Course (PEC)		11
Vocational and Skill Enhancement Course (VSEC)	Skill Courses	4+4*
Value Education Course (VEC)	Humanities Social Science and Management (HSSM)	4+2*
Research Methodology(RM)	Experiential Learning Courses	2
Technical Communication		2
Dissertation I		16
Dissertation II		16
Internship		4
Co-curricular Courses(CCC)	Liberal Learning Courses	2
Total Credits		80

Note:* –Credits are not to be considered while calculating marks for the declaration of the final result (Pass/Fail)."



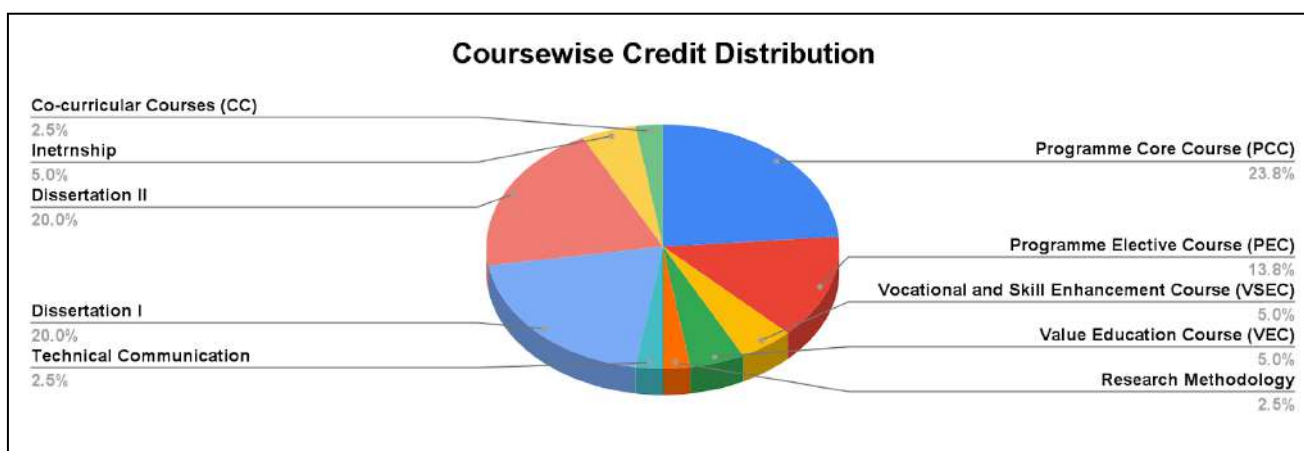
SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-27 Batch

Semester wise Credit Distribution Structure for Two Year M.Tech in Mechanical Engineering

Table No.4: Semester wise Credit Distribution Structure

Semester		I	II	III	IV	Total Credits
Program Core Course (PCC)	Program Course	13	6	-	-	19
Program Elective Course (PEC)		3	8	-	-	11
Vocational and Skill Enhancement Course (VSEC)	Skill Courses	2	2	2*	2*	4
Value Education Course (VEC)	Humanities Social Science and Management (HSSM)	1*	1*	4	-	4
Research Methodology	Experiential Learning Courses	2	-	-	-	2
Technical Communication		-	2	-	-	2
Dissertation I		-	-	16	-	16
Dissertation II		-	-	-	16	16
Internship		-	-	-	4	4
Co-curricular Courses (CCC)	Liberal Learning Courses	-	2	-	-	2
Total		20	20	20	20	80

Note:* –Credits are not to be considered while calculating marks for the declaration of the final result (Pass/Fail)."



AS

SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-27 Batch

In accordance with the NHEQF, the levels for the PG program are given in the given Table

Table No.5: Level for the PG Program

Level	Qualification Title	Credit Requirements	Semester	Year
6.5	1-Year PG after a 4-year UG	20	I	1
		20	II	1
7	2-Year PG after a 4-year UG such as B.E., B. Tech. etc.	20	III	2
		20	IV	2

TEACHING AND EVALUATION SCHEME FOR FIRST YEAR M-TECH

Semester – I

Sr. No	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme					
				Hours				Credits	Theory Course			Lab Course		Total Marks
				L	T	P	Total Hours		ISE	SEE	TH Marks	TW	PR/OR	
1	PCC	25-PCC-ME-5-01	Advanced Engineering Thermodynamics	4	-	-	4	4	40	60	100	-	-	100
2	PCC	25-PCC-ME-5-02	Machining and Forming Processes	3	-	-	3	3	40	60	100	-	-	100
3	PCC	25-PCC-ME-5-03	Advanced Vibrations and Acoustics	4	-	-	4	4	40	60	100	-	-	100
4	PCC	25-PCC-ME-5-04	Numerical Methods and Computational Techniques (Laboratory Practice-I)	-	-	4	4	2	-	-	-	50	50	100
5	PEC	25-PEC-ME-5-01	Programme Elective Course – I	3	-	-	3	3	40	60	100	-	-	100
6	VSEC	25-VSEC-ME-5-01	Instructional Design and Development	-	-	4	4	2	-	-	-	50	-	50
7	ELC	25-ELC-ME-5-01	Research Methodology	2	-	-	2	2	50	-	50	-	-	50
8	VEC	25-VEC-ME-5-01	Human Rights and Duties	1	-	-	1	1*	-	-	-	25*	-	25*
Total				17	-	8	25	20	210	240	450	100	50	600

Note: * - Credits not to be considered while Calculation of Marks for Declaration of Final Result (Pass/Fail)



SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-27 Batch

Table No.6: Program Elective Course – I

	Course Code-TH	Name of the Course- TH
A	25-PEC-ME-5-01A	Advanced Refrigeration
B	25-PEC-ME-5-01B	CAD- CAE
C	25-PEC-ME-5-01C	Surface Engineering
D	25-PEC-ME-5-01D	Manufacturing Automation

TEACHING AND EVALUATION SCHEME FOR FIRST-YEAR M-TECH

Semester – II

Sr. No	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme					
				Hours				Credits	Theory Course			Lab Course		Total Marks
				L	T	P	Total Hours		ISE	SEE	TH Marks	TW	PR/OR	
1	PCC	25-PCC-ME-5-05	Mechanical Design Analysis	4	-	-	4	4	40	60	100	-	-	100
2	PCC	25-PCC-ME-5-06	Computational Fluid Dynamics (Laboratory Practice-II)	-	-	4	4	2	-	-	-	50	50	100
3	PEC	25-PEC-ME-5-02	Program Elective Course – II	4	-	-	4	4	40	60	100	-	-	100
4	PEC	25-PEC-ME-5-03	Programme Elective Course – III	4	-	-	4	4	40	60	100	-	-	100
5	VSEC	25-VSEC-ME-5-02	Drone Technology	-	-	4	4	2	-	-	-	50	50	100
6	CCC	25-CCC-ME-5-01	Scientific studies of Mind, Matter and Consciousness	2	-	-	2	2	-	-	-	50	-	50
7	ELC	25-ELC-ME-5-02	Technical Communication	-	-	4	4	2	-	-	-	50	-	50
8	VEC	25-VEC-ME-5-02	Human rights of vulnerable and disadvantaged groups	1	-	-	1	1*	-	-	-	25*	-	25*
Total				15	-	12	27	20	120	180	300	200	100	600

Semester – II Note: * - Credits not to be considered while Calculation of Marks for Declaration of Final Result (Pass/Fail)



SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-27 Batch

Table No.7: Program Elective Course –II

	Course Code-TH	Name of the Course- TH
A	25-PEC-ME-5-02A	Advanced Heat Transfer
B	25-PEC-ME-5-02B	Stress Analysis
C	25-PEC-ME-5-02C	Advanced Optimization Techniques
D	25-PEC-ME-5-02D	Mechanical Behavior of Materials

Table No.8: Program Elective Course –III

	Course Code-TH	Name of the Course- TH
A	25-PEC-ME-5-03A	Design of Heat Exchangers
B	25-PEC-ME-5-03B	Tribology in Design
C	25-PEC-ME-5-03C	Soft Computing Techniques
D	25-PEC-ME-5-03D	World Class Manufacturing

Level 6.5 Exit Criteria:

Students who exit at the end of 1st year with the completion of 40 credits shall be awarded a Postgraduate Diploma.

Guidelines for Program Elective Course

Students may choose any course or NPTEL MOOCs course from the department's recommended list. The total credits earned through MOOCs must match the allocated credits for the respective elective. (One credit is awarded for each four-week MOOCs course).

* Online NPTEL MOOCs courses will be offered as per availability on the portal of NPTEL/SWAYAM



SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-27 Batch

TEACHING AND EVALUATION SCHEME FOR SECOND-YEAR M-TECH

Semester - III

Sr. No	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme					
				Hours				Credits	Theory Course			Lab Course		Total Marks
				L	T	P	Total Hours		ISE	SEE	TH Marks	TW	PR/OR	
1	ELC	24-ELC-ME-6-01	Dissertation I	-	-	26	26	16	-	-	-	150	150	300
2	VEC	24-VEC-ME-6-01	Cyber Security	3	-	2	5	4	50	-	50	25	25	100
3	VEC	24-VEC-ME-6-02	Introduction to Constitution	2	-	-	2	2*	-	-	-	50*	-	50*
4	VSEC	24-VSEC-ME-6-01	Skill Development-I	-	-	4	4	2*	-	-	-	50*	-	50*
Total				5	-	32	37	20	50	-	50	175	175	400

Note: * Credits not to be considered while Calculation of Marks for Declaration of Final Result (Pass/Fail)

Semester - IV

Sr. No	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme					
				Hours				Credits	Theory Course			Lab Course		Total Marks
				L	T	P	Total Hours		ISE	SEE	TH Marks	TW	PR/OR	
1	ELC	25-ELC-ME-6-02	Dissertation II	-	-	24	24	16	-	-	-	150	150	300
2	ELC	25-ELC-ME-6-03	Internship	-	-	8	8	4	-	-	-	100	-	100
3	VSEC	25-VSEC-ME-6-02	Skill Development-II	-	-	4	4	2*	-	-	-	50*	-	50*
Total				-	-	36	36	20	-	-	-	250	150	400

Note: * Credits not to be considered while Calculation of Marks for Declaration of Final Result (Pass/Fail)



SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-27 Batch

SEMESTER I



SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-27 Batch

25-PCC-ME-5-01 : Advanced Engineering Thermodynamics		
Teaching Scheme: Theory: 4 Hours/Week	Credit: 04	Examination Scheme: ISE : 40 Marks SEE : 60 Marks
Prerequisites Courses: Thermodynamics ,Heat Transfer, Refrigeration & Air Conditioning, Energy Engineering		
Course Objectives: <ul style="list-style-type: none"> ● To provide the sufficient knowledge of thermodynamics to apply in real engineering problems ● To familiarize the students about the thermodynamic relations and process and their use to analysis the given thermal application ● To understand the concept of application of thermodynamics such as refrigeration, Gas cycles etc. 		
Course Outcomes: After completion of the course, learners should be able to CO1: Review the laws of thermodynamics CO2: Explain the use of Maxwell's relations, Clapeyron equation and apply equations of state for real gasses and compare. CO3: Analysis of second law of thermodynamics for various processes. CO4: Analyze gas turbine cycles. CO5: Illustrate the ideal gas, real gas, its deviation with a compressibility chart.		
Course Contents		
Unit I	Review of laws of thermodynamics	8 Hours
First law of thermodynamics for a closed system undergoing a cycle and change of state, Limitation of first law of thermodynamics, Second Law of Thermodynamics cycle heat engine, refrigerator and heat pump, Kelvin- Planck and Clausius statements and their equivalence, Reversibility and Irreversibility, Carnot cycle, Carnot theorem, Absolute thermodynamic temperature scale.		
Unit II	Entropy	8 Hours
Entropy as a property of a system. entropy of pure substance., entropy change in a reversible and irreversible processes, increase of entropy principle, Introduction to Available and Unavailable energy: The Entropy Change of Ideal Gases, Reversible Steady-Flow Work, Entropy Change of a System, ΔS system, Mechanisms of Entropy Transfer during Heat and mass transfer, Entropy Generation for closed Systems and Control Volumes		
Unit III	Thermodynamic relations	8 Hours

SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-27 Batch

The Ideal-Gas Equation of State ,Other Equations of State:Van der Waals Equation of State Beattie-Bridgeman Equation of State,Benedict-Webb-Rubin Equation of State, Virial Equation of State,Maxwell's equation, joule- kelvin effect,clausius-clapeyron equation.		
Unit IV	Properties of Steam	8 Hours
<p>Properties of Steam: Dryness fraction, enthalpy, internal energy and entropy, steam table and Mollier chart, first law applied to steam processes.</p> <p>Vapour Power Cycles and Gas Power Cycles: Carnot vapour cycle, Rankine cycle, Ideal reheat, Rankine cycle, Introduction to cogeneration.Air standard assumptions, Otto cycle, Diesel cycle, dual cycle, Stirling cycle, Ericsson cycle, Atkinson cycle, Brayton cycle.</p>		
Unit V	Refrigeration Cycle	8 Hours
The Reversed Carnot Cycle, The Ideal Vapor-Compression Refrigeration Cycle,Actual Vapor-Compression Refrigeration Cycle, Selecting the Right Refrigerant, Innovative Vapor- Compression Refrigeration Systems, Multistage Compression Refrigeration Systems, Multipurpose Refrigeration Systems with a Single Compressor Liquefaction of Gases,Gas Refrigeration Cycles, Absorption Refrigeration Systems		
Unit VI	Fuels and Combustion	8 Hours
Types of fuels, calorific values of fuel and its determination, combustion equation for hydrocarbon fuel, determination of minimum air required for combustion and excess air supplied conversion of volumetric analysis to mass analysis, fuel gas analysis. Stoichiometric A/F ratio, lean and rich mixture, products of combustion, properties of engine fuels		
Learning Resources		
<p>Reference Books :</p> <p>R1. G. J. Van Wyle, R. E. Sonntag, “ Fundamental of Thermodynamics”, John Wiley & Sons, 5thedition, 1998.</p> <p>R2. M. J. Moran, H. N. Shaprio, “Fundamentals of Engineering Thermodynamics”, John Wiley and Sons,4thedition, 2004.</p>		

SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
 (An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
 Curriculum Structure and Evaluation Scheme
 To be implemented for 2025-27 Batch

25-PCC-ME-5-02: Machining and Forming Processes		
Teaching Scheme: Theory: 3Hours/Week	Credit: 03	Examination Scheme: ISE : 40 Marks SEE : 60 Marks
Prerequisites Courses: Manufacturing Processes,workshop Technology I,Machining Science and Technology,Engineering Materials		
Course Objectives: <ul style="list-style-type: none"> ● To provide the sufficient knowledge of machining and forming processes to apply in real engineering problems ● To familiarize the students about the fundamental principles of machining and forming ● Understand the importance of machining and forming process applied to industrial applications 		
Course Outcomes: After completion of the course, learners should be able to CO1: Classify conventional and non-conventional machining processes. CO2 Understanding mechanism of metal cutting, introduction to tool life,cutting fluids.. CO3: Describe the mechanism and mechanics of grinding processes,various non-conventional machining processes. CO4: Understanding Rolling, extrusion and wire drawing processes. CO5: Understanding Forging processes. CO6: Understanding Sheet metal working processes.		
Course Contents		
Unit I	Conventional Machining	6 Hours
Machine Tools and machining operation: Introduction, generating motions of machine tools, machines using single point tools, machines using multipoint tools, machines using abrasive wheels, summary of machine tool characteristics and machining equations		
Unit II	Metal Cutting	6 Hours
Mechanics of Metal Cutting: Introduction, terms and definitions, chip formation, forces acting on the cutting tool chip thickness, friction in metal cutting. Tool life and tool Wear: Introduction, Cutting Fluid and Surface roughness: application of cutting fluids		
Unit III	Grinding & Non-conventional Machining Processes	6 Hours
Grinding: Introduction, grinding wheel, effect of grinding conditions on wheel behavior, determination of the density of active grains. Non-conventional Machining Processes: Introduction, range of nonconventional machining processes, ultrasonic machining, water-jet machining, abrasive-jet machining, chemical machining, electrochemical machining		

SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
 (An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
 Curriculum Structure and Evaluation Scheme
 To be implemented for 2025-27 Batch

Unit IV	Rolling & Extrusion	8 Hours
<p>Rolling: Forces and Geometrical Relationships in rolling, Analysis of Rolling load and variables, Problems and Defects in rolled products, Theories of cold and hot rolling, Rolling mill control. Extrusion: Analysis of extrusion, Deformation, Lubrication and defects in extrusion, production of seamless pipe and tubing, drawing of rods, wires and tubes: Analysis of wire and tube drawing, residual stresses in rod, wire and tubes. Sheet metal forming: Forming limit criteria and Defects in formed components.</p>		
Unit V	Forging	6 Hours
<p>Forging in plain stain, calculations of forging loads in Closed die forging, residual stresses in forgings, Forging defects</p>		
Unit VI	Sheet Metal Processes	6 Hours
<p>Basic applications: shearing processes like blanking, piercing, and punching. Drawing processes like shallow and deep drawing of cylindrical and rectangular bodies forming and bending including estimation and control of spring back.</p>		
Learning Resources		
<p>Reference Books :</p> <p>R1. G. Boothroyd and W.A. Knight, <i>Fundamentals of Machining and Machine Tools</i>, 2nd Edition, Merrell Dekker, New York, 1989.</p> <p>R2. A. Ghosh and A.K. Mullick, <i>Manufacturing Science</i>, Affiliated East-West Press, 1985.</p>		



SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-27 Batch

25-PCC-ME-5-03 : Advanced Vibrations and Acoustics		
Teaching Scheme: Theory: 4 Hours/Week	Credit: 04	Examination Scheme: ISE : 40 Marks SEE : 60 Marks
Prerequisites Courses: ,Theory of Machines,Dynamics of Machinery,Solid Mechanics,Design of Machine Elements		
Course Objectives: <ul style="list-style-type: none"> ● To provide the sufficient knowledge of mechanical vibrations to apply in real engineering problems ● To familiarize the students about the fundamental principles of mechanical vibrations ● To understand the importance of vibrations in the background of wear and tear of the machine components, noise reductions and conditioning monitoring 		
Course Outcomes: After completion of the course, learners should be able to CO1: To develop in our students the ability to engage themselves to solve vibration problems. CO2: To be creative problem solvers whilst dealing with machinery involving periodic phenomena CO3: To integrate empirical analysis and add to the world of field expertise where possible CO4: To adapt to recent advances in knowledge		
Course Contents		
Unit I	Multi Degree Freedom System	8 Hours
Multi Degree Freedom System: Free Vibration equation of motion. Influence Coefficient i) Stiffness Coeff. (ii) Flexibility Coefficient. Generalized coordinates, and Coordinate couplings. Lagrange's Equations Matrix Method Eigen Values Eigen Vector problems. Model Analysis.Forced Vibrations of undamped system and modal analysis. Multi Degree System Numerical Methods: (i)Rayleigh's Method, (ii)Rayleigh-Ritz Method (iii) Holzer's Method (iv)Methods of Matrix iterations (v) Transfer Matrix Method, Impulse response and frequency response functions.		
Unit II	Continuous System:	8 Hours
Vibrations of String, Bars, Shaftsand beams, free and forced vibration of continuous systems.Transient vibrations: Response of a single degree of freedom system to step and any arbitrary excitation, convolution(Duhamel's) integral impulse response functions. Vibration Measurement: FFT analyzer, vibration exciters, Signals analysis. Time domain & Frequency domain analysis of signals. Experimental modal analysis, Machine Conditioning and Monitoring, Fault diagnosis. Example of Vibration tests- Industrial case studies		
Unit III	Vibration Control	6 Hours

SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-27 Batch

Balancing of rotating machine, In-situ balancing of rotors, control of natural frequency introduction of damping, vibration isolation & vibration absorbers.		
Unit IV	Random Vibration	6 Hours
Expected values auto and cross correlation function, Spectral density, response of linear systems, analysis of narrow band systems.		
Unit V	Non-Linear Vibrations	8 Hours
Systems with non-linear elastic properties, free vibrations of systems with non-linear elasticity and damping, phase-plane technique, Duffing's equation, Jump phenomenon, Limit cycle, Perturbation method.		
Unit VI	Noise and Its Measurement	8 Hours
Sound waves, governing equations, its propagation, Fundamentals of Noise, Decibel, Sound Intensity, Sound fields, reflection absorption and transmission. Noise measurement, Soundmeter, allowed exposure levels and time limit by B.I.S., Octave Band analysis of sound, Fundamentals of Noise control, source control, path control, enclosures, noise absorbers, noise control at receiver.		
Learning Resources		
Reference Books :		
<p>R1. Theory of Vibrations with Applications: W T Thomson, Pearson Publications.</p> <p>R2. Mechanical Vibrations: S S Rao Pearson Publications.</p> <p>R3. Principles of Vibration Control: Asok Kumar Mallik, Affiliated East- West Press.</p> <p>R4. Mechanical Vibrations: A H Church, John Wiley & Sons Inc.</p> <p>R5. Mechanical Vibration Analysis: Srinivasan, McGraw Hill.</p> <p>R6. Mechanical Vibrations: G K Groover.</p> <p>R7. Vibration and Noise for Engineers: Kewal Pujara, Dhanpat Rai & co.</p>		



SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
 (An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
 Curriculum Structure and Evaluation Scheme
 To be implemented for 2025-27 Batch

25-PCC-ME-5-04 : Numerical Methods and Computational Techniques		
Teaching Scheme: Practical: 4 Hours/Week	Credit: 02	Examination Scheme: TW : 50 Marks PR/OR :50 Marks
Prerequisites Courses: Numerical Methods and optimisation, Engineering Mathematics, C Language, Matlab		
Course Objectives : The course aims to provide the knowledge of computer programming to write the codes for the numerical methods learned in "Numerical Analysis" using PYTHON / C language / MATLAB.		
Course Outcomes: Upon successful completion of the course, students will be able to: CO1: Write computer programs to solve engineering problems with PYTHON / C language / MATLAB. CO2: Implement numerical methods in PYTHON / C language / MATLAB. CO3: Analyze the stability of the algorithm. CO4: Analyze and evaluate the accuracy of common numerical methods. CO5: Ability to use approximation algorithms in real world problems.		
Course Contents		
1	Module 1	6 hours
Gaussian elimination, Jacobi, Gauss Seidel methods.		
2	Module 2	6 hours
Bisection method, fixed point iteration scheme, Newton-Raphson method, secant method.		
3	Module 3	6 hours
Lagrange's interpolation formula, Newton's divided difference formula.		
4	Module 4	6 hours
Trapezoidal rule, Simpson's 1/3, 3/8-rules.		
5	Module 5	8 hours
Euler's method modified Euler's method, Runge-Kutta method, Milne's method, Adams-predictor-corrector method.		
Learning Resources		

SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-27 Batch

Reference Books :

- R1.** W. H. Press, B. P. Flannery, S. A. Teukolsky, W. T. Vetterling, "Numerical Recipes in C", Cambridge University Press, 1st edition, 1988.
- R2.** M. Pal, Numerical Analysis for Scientists and Engineers: Theory and C Programs, Narosa, 2008.



SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-27 Batch

25-PEC-ME-5-01A: Advanced Refrigeration		
Teaching Scheme: Theory: 3 Hours/Week	Credit: 03	Examination Scheme: ISE : 40 Marks SEE : 60 Marks
Prerequisites Courses: Engineering Thermodynamics, Heat Transfer, Refrigeration and Air conditioning		
Course Objectives: <ul style="list-style-type: none"> ● To vapor compression refrigeration and multi-stage vapor compression systems. ● To Study and identify various types of refrigerants and their properties ● To Illustrate Nomenclature, Refrigerants, alternative refrigerants ● Design and analyze vapor absorption system ● select refrigerant control techniques, and do piping designing for refrigeration plant 		
Course Outcomes: After completion of the course, learners should be able to CO1 : Formulate and solve vapor compression refrigeration and multi-stage vapor compression systems. CO2: Study and identify various types of refrigerants and their properties., such as zeotropic, azeotropic etc., CO3: Illustrate Nomenclature, Refrigerants, alternative refrigerants, CFC/HCFC phase-out regulations, action with lubricating oil, retrofitting, refrigerant blends, and effects on refrigeration components. CO4: Design and analyze vapor absorption system CO5: select refrigerant control techniques, and do piping designing for refrigeration plant		
Course Contents		
Unit I	Vapour Compression refrigeration	6 Hours
Vapour compression refrigeration, actual cycle, second law efficiency, multistage compression with intercooling, Multi-evaporator systems, Cascade systems.		
Unit II	Compressor	6 Hours
Performance characteristics and capacity control of reciprocating and centrifugal compressors, screw compressor and scroll compressor.		
Unit III	Evaporator & Condensers	6 Hours
Design, selection of evaporators, condensers, system balance, control systems, motor selection.		
Unit IV	Refrigerants	6 Hours

SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
 (An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
 Curriculum Structure and Evaluation Scheme
 To be implemented for 2025-27 Batch

History, Nomenclature, Refrigerants, alternative refrigerants, CFC/HCFC phase-out regulations, action with lubricating oil, retrofitting, refrigerant blends, effects on refrigeration components. Thermoelectric and nonconventional refrigeration systems, adiabatic de- magnetization		
Unit V	Vapor absorption refrigeration	8 Hours
Vapor absorption refrigeration, Li-Br and aqua ammonia system, calculation of mass flow rate and system performance, energy balance, controls, analysis of rectifier and analyzer, single effect and double effect systems, vapour transformer.		
Unit VI	Controls and Piping in Refrigeration system	8 Hours
Refrigeration controls, Expansion devices: design and selection, refrigeration system piping design		
Learning Resources		
Reference Books :		
<p>R1. Arora C. P., <i>Refrigeration and air-conditioning</i>, Tata McGraw Hill.</p> <p>R2. Gosney W. B., <i>Principles of refrigeration</i>, Cambridge University Press.</p> <p>R3. Dossat R. J., <i>Principles of Refrigeration</i>, Pearson Education</p> <p>R4. ASHRAE H. B. – Refrigeration</p>		



SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-27 Batch

25-PEC-ME-5-01B: CAD-CAE		
Teaching Scheme: Theory: 3 Hours/Week	Credit: 03	Examination Scheme: ISE : 40 Marks SEE : 60 Marks
Prerequisites Courses: Solid Modeling and Drafting, Computer Aided Engineering, Heat Transfer, Fluid Mechanics, Dynamics of Machinery, Numerical Methods and Optimisation.		
Course Objectives: <ul style="list-style-type: none"> ● To Demonstrate - Polynomial and spline interpolation, Bezier curves, B-splines to surfaces representation, patches and composite surfaces. ● To Design and create Solid model assembly of thermal and fluid engineering system in CAD software ● To Analyze simple Engineering problems by selecting appropriate Mesh generation. ● To Modeling and Meshing of Thermal and Fluid Flow equipment in CAD.. ● To Simulate and demonstrate Thermal and Fluid systems by using ANSYS, EES, MATLAB etc. ● To Understand and simulate computer aided manufacturing 		
Course Outcomes: After completion of the course, learners should be able to CO1: Demonstrate - Polynomial and spline interpolation, Bezier curves, B-splines to surfaces representation, patches and composite surfaces. CO2: Design and create Solid model assembly of thermal and fluid engineering systems in CAD software. CO3: Analyze simple Engineering problems by selecting appropriate Mesh generation. CO4: Modeling and Meshing of Thermal and Fluid Flow equipment in CAD. CO5: Simulate and demonstrate Thermal and Fluid systems by using ANSYS, EES, MATLAB etc. CO6: Understand and simulate computer aided manufacturing		
Course Contents		
Unit I	Solid Modeling	6 Hours
Overview of CAD Applications, Curves - Polynomial and spline interpolation, Bezier curves, B-splines, Introduction to surfaces representation, patches and composite surfaces. Solid Modeling: Representation of Solids, Topology, Wireframe, Boundary representation (B-Rep), CSG, Solid modeling operations.		
Unit II	Computer Graphics	6 Hours
Computer Graphics: Mathematical principles for 2D and 3D visualization, Matrix transformations, Modeling, viewing, projection and rendering, OpenGL graphics library, CAD data formats and exchange. Meshing – Mesh topology, Data structures, Introduction to Mesh generation algorithms, Surface meshes, Element types and quality criteria.		



SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
 (An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
 Curriculum Structure and Evaluation Scheme
 To be implemented for 2025-27 Batch

Unit III	Modeling and Meshing	6 Hours
Modeling and Meshing of Thermal and Fluid Flow equipment.		
Unit IV	Lab simulations for Thermal and Heat Transfer	6 Hours
Computer Aided Engineering: Lab simulations for Thermal and Heat Transfer, Computational Fluid Dynamics: Lab simulations for Fluid Flow.		
Unit V	lab simulation Thermal and Stress Analysis.	6 Hours
Computer Aided Engineering: Multi physics lab simulation for Thermal and Stress Analysis.		
Unit VI	lab simulation flow induced vibrations.	6 Hours
Computer Aided Engineering: Multiphysics lab simulation for flow induced vibrations.		
Learning Resources		
Reference Books :		
R1. Ibrahim Zeid and R Sivasubramanian, CAD/CAM: Theory and Practice, McGraw-Hill, Special Indian Edition, 2009 R2. Ibrahim Zeid, Mastering CAD / CAM, McGraw-Hill, 2nd Edition, 2006 R3. Micheal E. Mortenson, Geometric Modeling, Industrial Press, 3rd Edition, 2006 R4. Peter Shirley, Michael Ashikhmin and Steve Marschner, Fundamentals of materia Computer Graphics, A K Peters/CRC Press, 3rd Edition, 2009 R5. David Rogers and J.A. Adams, Mathematical Elements for Computer Graphics, McGraw- Hill, 2nd Edition, 2002		



SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-27 Batch

25-PEC-ME-5-01C: Surface Engineering		
Teaching Scheme: Theory: 3 Hours/Week	Credit: 03	Examination Scheme: ISE : 40 Marks SEE : 60 Marks
Prerequisites Courses: Material science and technology, composite materials, manufacturing technology		
Course Objectives: <ul style="list-style-type: none"> ● To provide the sufficient knowledge of thermodynamics to apply in real engineering problems ● To familiarize the students about the thermodynamic relations and process and their use to analysis the given thermal application ● To understand the concept of application of thermodynamics such as refrigeration, Gas cycles etc. 		
Course Outcomes: After completion of the course, learners should be able to CO1: Learn the importance and need of surface engineering. CO2: Describe various surface cleaning and modification techniques. CO3: Understand the concepts of surface integrity. CO4: Compare various surface coating technologies CO5: Select appropriate method of coating for a given application. CO6: Apply measurement techniques and carry out characterization of coated surfaces.		
Course Contents		
Unit I	Introduction	6 Hours
Definition, Significance, Role of surface Engineering in creating high performance product, Functional characteristics of a surface, Nature of surfaces: Deformed layer, Beilby layer, chemically reacted layer, Physisorbed layer, Chemisorbed layer; Classification of Surface Engineering Techniques		
Unit II	Surface Preparation Techniques	6 Hours
Factors affecting selection of cleaning process, Significance of surface preparation, Classification of cleaning processes, Chemical cleaning processes; Mechanical Processes; Substrate considerations, Surface contaminants or soils: Various types and their removal, Tests for cleanliness.		
Unit III	Surface Integrity	6 Hours
Definition, Importance, Surface alterations, Factors in Surface Integrity: Visual, Dimensional Residual stress, Tribological, Metallurgical; Measuring Surface Integrity effects: Minimum and Standard data set, Macroscopic and microscopic examination.		

SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
 (An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
 Curriculum Structure and Evaluation Scheme
 To be implemented for 2025-27 Batch

Unit IV	Surface Modification Techniques	6 Hours
<p>Classification, Thermal treatments: Laser and electron beam hardening, Mechanical treatments: Shot peening: Peening action, surface coverage and peening intensity, Types and sizes of media, Control of process variables, equipment; Ion Implantation: Basic Principle, Advantages and disadvantages, equipment.</p>		
Unit V	Surface Coating Techniques	6 Hours
<p>Thermal Spraying: Types and applications; Chemical Vapour Deposition: Principles, Reactions, Types and applications; Physical Vapour Deposition: Basic principle, Evaporation, Sputtering, Ion Plating, Applications; Electroplating: Principle of working and applications; Types of Coatings: Hard, Soft, Single layer, Multi-layer</p>		
Unit VI	Characterization of Coatings	6 Hours
<p>Physical characteristics and their measurements: Coating thickness, Surface Morphology and Microstructure. Mechanical properties and their Measurements: Hardness, Adhesion, Friction and Wear.</p>		
Learning Resources		
Reference Books :		
<p>R1. Budinski K. G.; Surface Engineering for Wear Resistance; Prentice Hall</p>		



SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-27 Batch

25-PEC-ME-5-01D: Manufacturing Automation		
Teaching Scheme: Theory: 3 Hours/Week	Credit: 03	Examination Scheme: ISE : 40 Marks SEE : 60 Marks
Prerequisites Courses: Hydraulics and Pneumatic, Fluid Mechanics, Mechatronics, Electronics and electrical Engineering, Robotics and Automation, Production technology, Manufacturing Process		
Course Objectives: <ul style="list-style-type: none"> ● To know about the Automation and types of Automations in the industries. ● To understand the different Automated flow lines in the Industries. ● To perform one or more processing and/or assembly operations on a starting raw material, part, or set of parts. ● To perform a sequence of automated or mechanized assembly operations Flexible manufacturing system (FMS)–a highly automated machine cell that produces part ● To know product families often consists of workstations comprising CNC machine tools. 		
Course Outcomes: After completion of the course, learners should be able to CO1: Students will Understand the process of automation and types CO2: Students will get Exposure to a workstation, which refers to the location in the factory where some well-defined task or operation is accomplished by an automated machine. CO3: Understand Worker-and-machine combination or a worker using hand tools CO4: Understand the Automated Material handling equipments and types CO5: Student gets Exposure on portable power tools.		
Course Contents		
Unit I	Automation in Manufacturing	6 Hours
Types and strategies of automation, pneumatic and hydraulic components circuits, Automation in machine tools, Mechanical Feeding and to changing and machine tool control transfer the automation.		
Unit II	Automated flow lines	8 Hours
Methods or work part transport transfer Mechanical buffer storage control function, design and fabrication consideration. Analysis of Automated flow lines: General terminology and analysis of transfer lines without and with buffer storage, partial automation, implementation of automated flow lines .		
Unit III	Assembly system and line balancing	6 Hours

SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
 (An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
 Curriculum Structure and Evaluation Scheme
 To be implemented for 2025-27 Batch

Assembly process and systems assembly line, line balancing methods, ways of improving line balance, flexible assembly lines.		
Unit IV	Automated material handling	6 Hours
Types of equipment, functions, analysis and design of material handling systems conveyor systems, automated guided vehicle systems.		
Unit V	Automated storage systems	6 Hours
Automated storage and retrieval systems; work in process storage, interfacing handling and storage with manufacturing.		
Unit VI	Fundamentals of Industrial controls	6 Hours
Review of control theory, logic controls, sensors and actuators, Data communication and LAN in manufacturing. Business process Re-engineering: Introduction to BPE logistics, ERP, Software configuration of BPE.		
Learning Resources		
Reference and Text Books :		
Reference Books : R1. Nick Dawkins - Automation and Controls R2. Tien-Chien Chang, Richard A. Wysk and Hsu-Pin Wang - Computer Aided Manufacturing, Pearson 2009 R3. Peter G. Martin and Gregory Hale - Automation Made Easy Text Books: T1. M.P.Groover 3e - Automation, Production Systems and Computer Integrated Manufacturing, PHI,2009. T2. Frank Lamb - Industrial Automation , Mc Graw Hill,2013 T3. W. Buekinsham – Automation.		



SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-27 Batch

25-VSEC-ME-5-01 : Instructional Design and Development			
Teaching Scheme: Practical: 4 Hours/Week		Credit: 02	Examination Scheme: TW : 50 Marks
Course Objectives: <ul style="list-style-type: none"> ● Learn about instructional design models and educational pedagogies. ● Use digital tools to apply reflective and experiential learning techniques. ● Utilize digital platforms to foster collaborative and interactive learning environments. ● Engage students in inquiry-based and integrative learning using digital tools. 			
Course Outcomes: After completion of the course, learners should be able to C01: Learn about the instructional design model and various pedagogical approaches used in education. C02: Apply reflective and experiential learning techniques using digital tools to enhance learning outcomes. C03: Utilize various digital platforms to foster collaborative and interactive learning environments. C04: Utilize various digital platforms to engage students through inquiry-based learning and integrative instructional models. C05: Demonstrate proficiency in integrating technology-enhanced instructional strategies.			
Course Contents			
Unit I	Introduction to Instructional Design	4 Hours	Book No.: T1, T2
Discipline of Instructional Design, ADDIE model of Instructional Design, Overview of Pedagogical Approaches, Students Learning Through Five Pedagogical Approaches In Education (R-2I-2C)			
Assignment: 1. Design a comprehensive lesson plan for the given scenario: A computer science instructor aims to improve student engagement and understanding of "Dynamic Programming" using the ADDIE model and integrating five pedagogical approaches.			
*Mapping of Course Outcomes		C01, C05	
Unit II	Reflection Approach	4 Hours	Book No.:T2
Introduction To Experiential Learning Cycle, Kolb's Experiential Learning Cycle, Benefits And Challenges Of Using The Reflective Pedagogical Approach Study of Reflective Tools and Techniques like Google Forms/Docs, Mentimeter: KWL (Know, Want to know and Learned) Method, Flashcard etc.			



SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-27 Batch

Assignment: Create a digital KWL chart using Google Docs to explore Renewable Energy Sources.			
1. Develop interactive flashcards to explore various aspects of global climate change, encouraging self-assessment and deeper reflection on its causes, impacts, and mitigation strategies.			
*Mapping of Course Outcomes		C01, C02, C05	
Unit III	Constructivist and Collaborative Approaches	4 Hours	Book No.: T2
Significance of Collaborative and Constructive approaches, Collaborative learning model: Personal Learning Networks, Peer Learning Networks, Types of constructivism, The Role of teachers in a constructivist classroom, Study of Collaborative and Constructivist and Tools like Copilot, WhiteBoard, Padlet, CodePen, Edpuzzle etc.			
Assignments:			
1. Explore sustainable rural development through collaborative reflections and idea sharing on the interactive board.			
2. Develop a collaborative coding project using an online collaborative platform to explore AI-assisted programming techniques.			
3. Create a collaborative brainstorming session using any White board tools to design a sustainable city plan, integrating urban development and environmental conservation strategies			
*Mapping of Course Outcomes		C01, C03, C05	
Unit IV	Inquiry-Based and Integrative Approaches	4 Hours	Book No.: T2
Definition and Theoretical Foundations of Inquiry-Based Learning, Phases of Inquiry-based learning, 7 E -Instructional model, Significance of Integrative Approach, The role of teacher in integrative approach, Challenges to Integrative Pedagogical Approach, Study of Tools for Inquiry-Based and Integrative Approaches like Kahoot, Edmodo, Slido, Socrative; Activity-Based Learning, Game Pedagogy, MindMeister etc.			
Assignments:			
1. Conduct a collaborative ideation session using an online interactive tool to generate innovative ideas for digital solutions addressing current societal challenges.			
2. Develop an online quiz(any inquiry based tool) to test knowledge of significant historical events, enhancing engagement and retention through gamified learning.			
3. Create and conduct an interactive poll to gather opinions on current global affairs, analyzing diverse perspectives and trends in real time.			
4. Develop an online quiz(any integrative tool) to evaluate comprehension of the Industrial Revolution, emphasizing technological innovations, economic changes, and social impacts.			
*Mapping of Course Outcomes		C01, C04, C05	

SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-27 Batch

Learning Resources

Text Books

T1. Abbie H. Brown, Timothy D. Green, "The Essentials of Instructional Design: Connecting Fundamental Principles with Process and Practice" 5th Edition, 978-1032518497

T2. A compilation of online presentations delivered during the webinar on "The Making of Teacher-Experts in the New Normal: Deepening the Understanding of Pedagogical Approaches" last 22 June 2022, "Pedagogical Approaches In Education, Theories, Practices, and Applications in the Classrooms" - [link](#)

Additional Resources: (Books, e-Resources)

<https://www.aihr.com/blog/addie-model/>

<https://www.skillshub.com/what-are-kolbs-learning-styles/>

<https://pdfs.semanticscholar.org/c3e2/36c0a1e16d9769b611be32f12bec92f48845.pdf>



SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-27 Batch

25-ELC-ME-5-01: Research Methodology		
Teaching Scheme: Theory: 2 Hours/Week	Credit: 02	Examination Scheme: ISE : 50 Marks
Prerequisites Courses: Technical Communication, Report Writing, Technical Project		
Course Objectives: <ul style="list-style-type: none"> ● To Understand the concept of research, paper writing, similarities, etc ● To familiarize the students about the statistical methods, data interpretation , error analysis ● To carry out analysis on the a published paper 		
Course Outcomes: After completion of the course, learners should be able to CO1: Understand and Describe importance of research CO2: Classify and select appropriate resources for Research.. CO3: Analyze the contents of literature and identify further scope. CO4: Formulate a Research Problem. CO5: Develop effective written and oral Presentation skills.		
Course Contents		
Unit I	Basic Concept in Research Methodology	6 Hours
Research Concepts – concepts – meaning – objectives – motivation. Types of research – descriptive research – conceptual research – theoretical research – applied research – experimental research.		
Unit II	Research process	6 Hours
Research process – Criteria for good research – Problems in Indian context. Formulation of Research Task – Literature Review – Importance & Methods – Sources – Quantification of Cause Effect Relations – Discussions– Field Study – Critical Analysis of Facts Generated		
Unit III	Research Proposals	6 Hours
Hypothetical proposals for future development and testing, selection of Research tasks. Applications of statistical methods in research		
Unit IV	Mathematical Modeling and Simulation	6 Hours
Mathematical modeling and simulation – Concepts of modeling – Classification of mathematical models – Modeling with – Ordinary differential equations – Difference equations – Partial differential equations – Graphs – Simulation – Process of formulation of model based on simulation		

SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-27 Batch

Unit V	Technical Writing and reporting of research	6 Hours
Interpretation and report writing – Techniques of interpretation – Precautions in interpretation- Significance of report writing – Different steps in report writing – Layout of research report – Mechanics of writing research report – Layout and format – Style of writing – Typing – References – Tables – Figures – Conclusion – Appendices.		
Learning Resources		
Reference Books :		
R1. “Research Methods”, Trochim, William M.K., 2/e, Biztantra, Dreamtech Press, New Delhi, ISBN: 81-7722-372-0, 2003 R2. “Applied Statistics & Probability for Engineers”, Montgomery, Douglas C. &Runger, George C., 3/e, Wiley India, 2007 R3. Business Research Methods – Donald Cooper & Pamela Schindler, TMGH, 9th edition		
MOOC Courses links :		
<ul style="list-style-type: none">● https://www.coursera.org/learn/research-methods● https://onlinecourses.swayam2.ac.in/cec20_hs17/preview		



SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-27 Batch

SEMESTER II



SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-27 Batch

25-PCC-ME-5-05 : Mechanical Design Analysis		
Teaching Scheme: Theory: 4 Hours/Week	Credit: 04	Examination Scheme: ISE : 40 Marks SEE : 60 Marks
Prerequisites Courses: Solid Mechanics, Theory of Machines, Design of Machine Elements		
Course Objectives: <ul style="list-style-type: none"> ● To provide the technical understanding the concepts of Mechanical design in the background of real engineering problems ● To familiarize the students about the importance of Mechanical design apply to industrial applications ● To understand the Analysis of design 		
Course Outcomes: After completion of the course, learners should be able to CO1: To Analyze variance, factorial design and regression and understand reliability theory, design and analysis of reliability. CO2: Ability to Analyze behavior of mechanical elements under fatigue and creep CO3: To Study optimization and its methods. CO4: To Study composite materials and its characteristics. CO5: To Design mechanical components for various materials and process		
Course Contents		
Unit I	Fundamentals of Failure	8 Hours
Failure Analysis, Limit design, Fundamentals of fracture mechanics. Fatigue designing for finite life, contact stresses and surface failures, oil films and their effects		
Unit II	Impact Dynamics	8 Hours
Impact: Energy methods, longitudinal stress waves in elastic media impact on beams, torsional impact on shafts and longitudinal impacts on helical springs.		
Unit III	Thermal Properties and Stresses	8 Hours
Effect of short term and long term properties of materials on design, creep and stress relaxation. Elementary analysis of thermal stresses, thermal fatigue		
Unit IV	Design with Composite Materials	8 Hours
Polymers and F.R.P. as materials form Mechanical components. Reliability based design: Definition normal exponential and Weibull distributions system reliability. Reliability based on strength.		

SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-27 Batch

Unit V	Optimum Design	8 Hours
Basis concepts, introduction to various techniques of optimization, optimum design of simple mechanical components.		
Unit VI	Design of Power Transmission Systems	8 Hours
Analysis and design of power transmission systems and elements such as: Spur, helical, bevel and worm gear drives, speed reducers and gearboxes, epicyclic gear drives, selection of ball and roller bearings.		
Learning Resources		
Reference Books :		
R1. Kenneth Edwards & Robert B. Makee, "Fundamentals of Mechanical Component Design", McGraw Hill International ed. 1991. R2. Joseph Edward Shigley & Charles R. Mischke, "Mechanical Engineering Design", Mc. Graw Hill (1989). R3. M. F. Spotts "Mechanical Design Analysis", Prentice Hall.		



25-PCC-ME-5-06 : Computational Fluid Dynamics (Laboratory Practice - II)		
Teaching Scheme: Practical: 4 Hours/Week	Credit: 02	Examination Scheme: TW : 50 Marks PR/OR : 50 Marks
Prerequisites Courses: Fluid Mechanics, Heat Transfer, Computer aided Engineering, Ansys		
Course Objectives: <ul style="list-style-type: none"> ● To develop skills in computational fluid dynamics to address engineering problems. ● To understand the basic structure and capabilities of current commercial CFD codes. ● To apply CFD codes in the design of fluid systems and components 		
Course Outcomes: After completion of the course, learners should be able to CO1: Demonstrate modeling of double pipe heat exchanger, simple exhaust system and airfoil using ANSYS Design Modeler (L3) CO2: Solve steady, unsteady state heat conduction in slabs and steady state heat conduction through fins (L3) CO3: Solve problems of laminar forced convection over flat plate, cylinder and through a pipe (L3) CO4: Solve problems of turbulent forced convection over flat plate, cylinder, airfoil and through a pipe/helical pipe (L3) CO5: Analyze heat transfer to a fluid by natural convection from a flat plate, radiation heat transfer between two parallel plates		
Course Contents		
Note: Any Ten of the following exercises are to be performed <ol style="list-style-type: none"> 1. Modelling a Mixing Elbow (2-D) by use GAMBIT to create the geometry for a mixing elbow and then generate a mesh. 2. Creating and Meshing Basic Geometry The model consists of an intersecting brick and elliptical cylinder. 3. Turbulent pipe flow by using Ansys Fluent. 4. Laminar pipe flow by using Ansys Fluent. 5. Flow over an airfoil by using Ansys Fluent. 6. Compressible flow in a nozzle by using Ansys Fluent. 7. Flat Plate Boundary Layer by using Ansys Fluent. 		
Learning Resources		
CFD Software: ANSYS References (weblinks) https://www.youtube.com/watch?v=ddINDCSn9Bs (Experiment no. 4) https://www.youtube.com/watch?v=KWPOnL_Of-0 (Experiment no. 5)		



25-PEC-ME-5-02A: Advanced Heat Transfer		
Teaching Scheme: Theory: 4 Hours/Week	Credit: 04	Examination Scheme: ISE : 40 Marks SEE : 60 Marks
Prerequisites Courses: Engineering Thermodynamics ,Heat Transfer,Fluid Mechanics		
Course Objectives: <ul style="list-style-type: none"> ● To provide the technical understanding the concepts of heat transfer and fluid mechanics ● To familiarize the students about the importance of heat transfer and fluid mechanics processes apply to industrial applications ● To understand the heat transfer and fluid mechanics applications apply to other domain of thermal engineering in general 		
Course Outcomes: After completion of the course, learners should be able to CO1: Analyze steady state and transient heat conduction problems of real life Thermal systems CO2: Analyze extended surface heat transfer problems and problems of phase change heat transfer like boiling and condensation CO3: Apply the basic principles of classical heat transfer in real engineering application CO4: Analyze the analytical and numerical solutions for heat transfer problems. CO5: Understand the basic concepts of turbulence and their impact on heat transfer CO6 : Analyze convective heat transfer in common geometries like tube, plate, cylinder		
Course Contents		
Unit I	Steady State and Transient Heat Conduction	8 Hours
Concept of continuum and definition of a fluid. Body and surface forces, stress tensor, Scalar and vector fields, Eulerian and Lagrangian approach.		
Unit II	Boiling and Condensation	8 Hours
Motion of fluid element - translation, rotation and vorticity; strain rate tensor, continuity equation, stream function and velocity potential. Transport theorems, constitutive equations.		
Unit III	Boundary Layer Theory	8 Hours
Derivation of Navier Stokes equations for compressible flow. flow over a flat plate, cylinders and spherical bodies, theory of hydrodynamic lubrication. Boundary layer: derivation, exact solutions, Non dimensionalisation of Boundary layer equation, Blasius (similarity solution).		

SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
 (An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
 Curriculum Structure and Evaluation Scheme
 To be implemented for 2025-27 Batch

Unit IV	Modes & Method of Heat Transfer	8 Hours
<p>Brief introduction to different modes of heat transfer: conduction: general heat conduction equation-initial and boundary conditions. Finite difference methods for conduction: 1d & 2d steady state and simple transient heat conduction problems-implicit and explicit methods.</p>		
Unit V	Transient heat conduction	8 Hours
<p>Transient heat conduction: lumped system analysis, Heisler charts, semi-infinite solid, use of shape factors in conduction, 2d transient heat conduction, product solutions.</p>		
Unit VI	Convection and Boiling:	8 Hours
<p>Convection and Boiling: Flow over a flat plate: Application of empirical relations to variation geometries for laminar and turbulent flows. hydrodynamic & thermal entry lengths;use of empirical correlations. Approximate analysis on laminar free convective heat transfer, combined free and forced convection. Boiling curve, correlations, assumptions & correlations of film condensation for different geometries</p>		
Learning Resources		
Reference and Text Books :		
<p>R1. F.M.White ,K.Muralidhar and Bishwas, Advance Engineering fluid mechanics, Alpha science International limited R2. Fox and McDonald, <i>Introduction to Fluid Mechanics</i>, J.H. Wiley and Sons. R3. YunusA.Cengal, <i>Heat and Mass Transfer – A practical Approach</i>, 3rd edition, Tata McGraw - Hill, 2007. T1. S. P.Sukhatme, <i>A Textbook on Heat Transfer</i></p>		

SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-27 Batch

25-PEC-ME-5-02B: Stress Analysis		
Teaching Scheme: Theory: 4 Hours/Week	Credit: 04	Examination Scheme: ISE : 40 Marks SEE : 60 Marks
Prerequisites Courses: Strength of Materials, Design of Machine Elements		
Course Objectives: <ol style="list-style-type: none"> 1. To understand and analysis stress and strain at a point in deformable solids. 2. To understand different approaches to obtain stresses, strains and deformations induced in the solids. 3. To solve thin section members for bending and torsion. 4 To evaluate stresses, deflection due to line or point contact in solids. 		
Course Outcomes: After completion of the course, learners should be able to CO1: Formulate and Analyze Stress Field equations such as equilibrium equations, compatibility and constitutive relationship CO2: Formulate and Analyze Stresses in pressurized cylinder and rotating disc. CO3: Apply Energy methods to evaluate stresses and strains. CO4: Analyze and Determine the Torsion and Bending of thin wall section CO5: Analyze and estimate contact stresses in conforming and non-conforming shapes. CO6: Understand experimental methods for stress evaluation estimate the same using resistance strain gauging technique and Photoelasticity technique.		
Course Contents		
Unit I	Theory of Elasticity	6 Hours
Analysis of Stresses and Analysis of Strain. Stress Tensor, Compatibility equations in two and three dimensions, Airy's stress functions in rectangular and Polar coordinate systems.		
Unit II	Pressurized Cylinders and Rotating Disks,	6 Hours
Governing equations, stress in thick walled cylinders under internal and external pressure, shrink fit compound cylinders, stresses in rotating flat solid disk, flat disk with central hole, disk of uniform strength.		
Unit III	Energy Methods	6 Hours
Energy method for analysis of stress, strain and deflection Theorem's - theorem of virtual work, The theorem of least work, Castiglioni's theorem.		
Unit IV	Thin wall Members:	6 Hours

SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
 (An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
 Curriculum Structure and Evaluation Scheme
 To be implemented for 2025-27 Batch

Torsion of thin walled members of the open cross section. Torsion of Multiply Connected Thin-Walled Sections Concept of shear center in symmetrical and unsymmetrical bending, Shear center for thin wall beam cross section, open section with one axis of symmetry.		
Unit V	Contact stresses	6 Hours
Geometry of contact surfaces, method of computing contact stresses and deflection of bodies in point contact, Stress for two bodies inline contact with load normal to contact area and load normal and tangent to contact area, For cases like - gear contacts, contacts between cam and follower, ball bearing contacts.		
Unit VI	Experimental stress analysis	6 Hours
Dimensional analysis, analysis techniques, strain gauges, types of strain gauges, materials, configuration, instrumentation, characteristics of strain gauge measurement, theory of photo-elasticity, elements of polariscope, simple and circular polariscope, fringes in dark and white field, isoclinic and isochromatic fringe patterns, evaluation of stresses from these fringe patterns.		
Learning Resources		
Reference Books :		
R1. Advanced Mechanics of Solids, L S Srinath, Tata McGrawHill		
R2. Advanced Strength of Materials, Vol.1, 2 - Timoshenko, CBS		
R3. Advanced Strength of Materials - Den Hartog		
R4. Experimental Stress Analysis - Dally & Riley		
Text Books:		
T1. Theory of Elasticity - Timoshenko and Goodier, McGrawHill		
T2. Advanced Strength and Applied Stress Analysis - Richard G. Budynas, McGrawHill		
T3. Advanced Mechanics of Materials - Boresi, Schmidt, Sidebottom, Willey		

SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-27 Batch

25-PEC-ME-5-02C: Advanced Optimization Techniques		
Teaching Scheme: Theory: 4 Hours/Week	Credit: 04	Examination Scheme: ISE : 40 Marks SEE : 60 Marks
Prerequisites Courses: Calculus, linear algebra, Engineering Mathematics, Numerical Methods and optimization		
Course Objectives: <ul style="list-style-type: none"> • Develop proficiency in mathematical methods and techniques • apply optimization techniques to solve both linear and non-linear programming problems • Understand and apply dynamic programming methods to solve complex industrial management problems • Develop the capability to simulate and analyze thermal engineering systems • comprehensive understanding of integer and stochastic programming 		
Course Outcomes: After completion of the course, learners should be able to CO1: Enables to acquire mathematical methods and apply in engineering disciplines. CO2: Apply methods of optimization to solve a linear, non-linear programming problem by various Methods CO3: Optimize engineering problem of nonlinear-programming with/without constraints, by using this technique. CO4: Use of dynamic programming problems in controlling industrial management. CO5: Simulate Thermal engineering system problem. CO6: Understand integer programming and stochastic programming to evaluate advanced optimization techniques.		
Course Contents		
Unit I	Single Variable Nonlinear Unconstrained Optimization	6 Hours
One dimensional Optimization methods, Unimodal function, elimination method, Fibonacci method, golden section method, interpolation methods- quadratic & cubic interpolation methods.		
Unit II	Multi Variable Nonlinear Unconstrained Optimization	6 Hours
Direct search method – Univariate Method – pattern search methods – Powell’s – Hook – Jeeves, Rosenbrock search methods – gradient methods, gradient of function, steepest decent method, Fletcher reeves method. Variable metric method.		
Unit III	Geometric & Dynamic Programming	6 Hours
Geometric Programming: Polynomials – arithmetic – geometric inequality – unconstrained G.P– constrained G.P Dynamic Programming: Multistage decision process, principles of optimality, examples, conversion of final problem to an initial value problem, application of dynamic programming, production inventory. Allocation, scheduling replacement.		

SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
 (An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
 Curriculum Structure and Evaluation Scheme
 To be implemented for 2025-27 Batch

Unit IV	Linear Programming & Simulation	6 Hours
<p>Linear Programming: Formulation – Sensitivity analysis. Change in the constraints, cost coefficients, coefficients of the constraints, addition and deletion of variable constraints.</p> <p>Simulation: Introduction – Types – Steps – application – inventory – queuing – thermal system.</p>		
Unit V	Integer & Stochastic Programming	6 Hours
<p>Integer Programming: Introduction – formulation – Gomory cutting plane algorithm – Zero or one algorithm, branch and bound method.</p> <p>Stochastic Programming: Basic concepts of probability theory, random variables – distributions – mean, variance, Correlation, co variance, joint probability distribution, stochastic linear, dynamic programming.</p>		
Learning Resources		
Reference Books :		
<p>R1. Optimization theory & Applications/ S.S Rao/ New Age International</p> <p>R2. Optimization Techniques theory and practice / M.C Joshi, K.M Moudgalya/ Narosa Publications.</p> <p>R3. Operation Research/H.A. Taha/TMH</p> <p>R4. Optimization in operations research/R. L.Rardin</p>		



25-PEC-ME-5-02D: Mechanical Behavior of Materials		
Teaching Scheme: Theory: 4 Hours/Week	Credit: 04	Examination Scheme: ISE : 40 Marks SEE : 60 Marks
Prerequisites Courses: Material Science and Engineering, Mechanics of Materials, Engineering Mechanics, Manufacturing Processes, Engineering Mathematics.		
Course Objectives: <ul style="list-style-type: none"> ● Understand Modern Materials: Gain knowledge of advanced materials like dual-phase alloys, HSLA, composites, and nano-materials. ● Analyze Stress-Strain Behavior: Learn to interpret stress-strain responses under various loading conditions using yield criteria and transformations. ● Master Material Testing: Develop skills in performing and analyzing uni-axial, biaxial tension, and bending tests, considering effects like temperature and the Bauschinger effect. ● Explore Work Hardening: Understand strain hardening and apply models for predicting material behavior under complex loading. ● Study Elastic-Plastic and Visco-Plastic Behavior: Learn about elastic-plastic deformation, residual stresses, and visco-elasticity through theoretical models. ● Apply Theoretical Models: Utilize models to predict material behavior under varying conditions, enhancing material selection and design decisions. 		
Course Outcomes: After completion of the course, learners should be able to CO1: Apply the mechanics of modern materials in recent engineering applications. CO2: Solve the basics problems of finding stresses and strains at a point under complex loading conditions CO3: Study material behavior under forms of loading other than uniaxial tension CO4: Identify and investigate engineering problems involving plastic deformation during strain hardening. CO5: Realize the plastic and elastic- plastic behavior of materials under different loading conditions CO6: Formulate the mathematical modelling of Visco-Elastic materials and apply to engineering materials for behavioural study		
Course Contents		
Unit I	Modern Materials in Design Engineering	6 Hours
Dual phase alloy, HSLA, lightweight non-ferrous alloy and their full range stress strain behavior subjected quasi-static and high strain rate loading, Composites and its orthotropic properties, Plastics, Smart materials, Nano-materials – types, applications and its properties		

SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-27 Batch

Unit II	Response of metals and alloys under applied loading	6 Hours
Stress, strain transformations, Mohr's circle, Isotropic elasticity, Anisotropic elasticity, Anisotropic thermal expansion, Octahedral shear stress, Yield criteria, Yield surface, Yield curve.		
Unit III	Tensile testing	6 Hours
Uni-axial and biaxial tension test, Full range stress-strain curves, True stress-strain curve, Bridgman correction, Temperature rise, Bauschinger effect, Combined bending and torsion test, Three points bend test, Elastic recovery		
Unit IV	Stress- Strain relations for work hardening materials	6 Hours
Experimental studies of plastic deformations under simple and complex loading, Strain hardening, Power law approximations, Isotropic, Kinematic and combined hardening models, Theory of plastic flow, Strain-rate and temperature dependence of flow stress		
Unit V	Plastic and Elastic-Plastic Behaviour	6 Hours
Deformation theory of plasticity, Thermo-plasticity, Behaviour of metals with initial deformations. Equations of Elastic-Plastic Equilibrium, Residual stresses and strains, Plastic-rigid body, Elastic-Plastic bending and torsion, Elastic-Plastic bodies under variable loading		
Unit VI	Elasto-Visco-Plasticity	6 Hours
Visco-elasticity, Rheological models, Maxwell model, Voigt model, Voigt-Maxwell model, Natural decay, Dependence of damping and elastic modulus on frequency, Thermo-Elastic effect, Low temperature and high temperature Visco-plastic deformation models, Rubber elasticity, Damping, yielding, effect of strain rate, Crazing.		
Learning Resources		
Reference Books :		
R1. Fundamentals of Materials Science and Engineering, William D. Callister, Jr., John Wiley & Sons, R2. Mechanical Metallurgy, George E. Dieter, McGraw Hill Book Company, 1988 R3. Theory of Plasticity, J. Chakrabarty, Elsevier, 2006 R4. Foundations of Theory of Plasticity, L. M. Kachanov, Dover Publications, 2004 R5. Plasticity for Structural Engineers, W.F. Chen, Da-Jian Han, Springer R6. Mechanical Behaviour of Materials, W.F.Hosford, Cambridge University Press, 2005		

SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-27 Batch

25-PEC-ME-5-03A: Design of Heat Exchangers		
Teaching Scheme: Theory: 4 Hours/Week	Credit: 04	Examination Scheme: ISE : 40 Marks SEE : 60 Marks
Prerequisites Courses: Engineering Thermodynamics, Heat Transfer, Solid Mechanics, Design of machine Element		
Course Objectives: <ul style="list-style-type: none"> ● Student should able to understand types of heat exchangers, working of heat exchangers ● Analysis and performance calculation of heat exchangers ● design of heat of exchangers for industrial applications 		
Course Outcomes: After completion of the course, learners should be able to CO1: Demonstrate and of heat exchanger design methodology, and design considerations CO2: Analyze performance of Heat exchanger by applying basic design theory. CO3: Design and conduct experiment on one from double pipe, shell and tube, tube fin, plate type and plate-fin heat exchanger. CO4: Demonstrate selection criteria of HEX and conduct an independent research to suggest suitable HEX. CO5: Model and illustrate heat exchanger based on I-law and irreversibility. CO6: Study and analyze losses in HEX, and upcoming advancements.		
Course Contents		
Unit I	Basic Introduction	6 Hours
Classification, overview of heat exchanger design methodology, Design specifications, thermo hydraulic design, and other considerations.		
Unit II	Basic Design Theory	6 Hours
LMTD method, ϵ -NTU method, P-NTU method, ψ -P method and P1- P2 method.		
Unit III	Heat Exchanger Design Procedures	6 Hours
Design of double pipe, shell and tube, tube fin, plate type and plate-fin heat exchanger.		
Unit IV	Selection of Heat Exchangers	6 Hours
selection criteria, general selection guidelines of shell and tube heat exchanger, plate type heat exchanger		
Unit V	Thermodynamic Modeling and Analysis	6 Hours



SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-27 Batch

modeling of heat exchanger based on I-law and Irreversibility.		
Unit VI	Header Design	6 Hours
Flow maldistribution, fouling and corrosion, advances in heat exchanger		
Learning Resources		
Reference Books :		
R1. S. Kakac, <i>Heat Exchangers – Thermal Hydraulic Fundamentals and Design</i> , Hemisphere, Mc Graw-Hill. R2. D. Q. Kern and A. D. Kraus; <i>Extended Surface Heat transfer</i> , McGraw-Hill. R3. W. M. Kays and A. C. London, <i>Compact Heat Exchangers</i> , McGraw-Hill.		



SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-27 Batch

4-PEC-ME-5-03B: Tribology in Design		
Teaching Scheme: Theory: 3Hours/Week	Credit: 03	Examination Scheme: ISE : 40 Marks SEE : 60 Marks
Prerequisites Courses: Fluid Mechanics, Engineering Metallurgy, Strength of Materials		
Course Objectives: <ul style="list-style-type: none"> ● To provide necessary concepts, knowledge and skills in Engineering Tribology with design aspect ● To impart friction, wear and lubrication theory and their appropriate use in design and maintenance of machine components ● To provide hands on training with design of bearing, friction ,wear test rig for laboratory purpose 		
Course Outcomes: After completion of the course, learners should be able to CO1: Apply theories of friction and wear to various practical situations by analyzing the physics of the process. CO2: Select materials and lubricants to suggest a tribological solution to a particular situation. CO3: Design a hydrodynamic bearing and measure the performance parameters using various bearing charts. CO4: Analyze the behavior of bearing in different lubrication regimes CO5: Determine the load carrying capacity in air lubricated bearing CO6: Understand the tribological aspects in different applications and understand the solution to avoid wear and friction.		
Course Contents		
Unit I	Friction and wear	6 Hours
Friction control and wear prevention, Boundary lubrication, Tribological properties of bearing materials and lubricants, Theories of friction and wear, Instabilities and stick-slip motion		
Unit II	Lubrication of bearings	6 Hours
Mechanics of fluid flow, Reynold's equation and its limitations, Idealized bearings, Infinitely long plane pivoted and fixed show sliders, Infinitely long and infinitely short (narrow) journal bearings, Lightly loaded infinitely long journal bearing (Petroff's solution), Finite bearings - hydrostatic, hydrodynamic and thrust oil bearings, Heat in bearings		
Unit III	Hydrostatic squeeze film	6 Hours
Circular and rectangular flat plates, variable and alternating loads, piston pin lubrication, application to journal bearings		
Unit IV	Elasto-hydrodynamic lubrication	6 Hours

SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
 (An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
 Curriculum Structure and Evaluation Scheme
 To be implemented for 2025-27 Batch

Pressure-viscosity term in Reynold's equation, hertz theory, Ertel-Grubin equation, lubrication of spheres		
Unit V	Air lubricated bearings	6 Hours
Tilting pad bearings, hydrostatic, hydrodynamic and thrust bearings with air lubrication		
Unit VI	Tribological aspects of Rolling motion	6 Hours
Mechanics of tire-road interaction, road grip and rolling resistance, tribological aspects of wheel on rail contact, tribological aspects of metal rolling, drawing and extrusion		
Learning Resources		
Reference Books :		
R1. Principles of Lubrication, Camaron, Longman's Green Co. Ltd. R2. The Design of Aerostatic Bearings – J. W. Powell R3. Theory Hydrodynamic Lubrication, Pinkush and Sterrolight R4. Principles of Lubrication, Camaron, Longman's Green Co. Ltd.		



SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-27 Batch

25-PEC-ME-5-03C: Soft Computing Techniques		
Teaching Scheme: Theory: 4 Hours/Week	Credit: 04	Examination Scheme: ISE : 40 Marks SEE : 60 Marks
Prerequisites Courses: Data Structures and Algorithms & Mathematics for Computer Science		
Course Objectives: <ul style="list-style-type: none"> ● Provide an understanding of the different paradigms of soft computing such as fuzzy logic, neural networks, and genetic algorithms. ● Explore the applications of fuzzy logic in control systems and decision making. ● Provide an in-depth understanding of artificial neural networks and deep learning. ● Explore the applications of evolutionary algorithms in optimization problems. ● Explain how different soft computing techniques can be integrated to solve complex problems. ● Provide an understanding of the latest research and developments in soft computing. 		
Course Outcomes: After completion of the course, learners should be able to CO1: Students will be able to differentiate between traditional computing and soft computing techniques. CO2: Students will learn to apply fuzzy logic to solve control system problems and make decisions under uncertainty. CO3: Students will gain a solid foundation in neural network architectures and learning algorithms. CO4: Students will learn to apply evolutionary algorithms to solve optimization problems effectively. CO5: Students will be able to design and implement hybrid systems combining fuzzy logic, neural networks, and genetic algorithms. CO6: Students will be able to apply advanced soft computing techniques to complex problems.		
Course Contents		
Unit I	Soft Computing Basic Introduction	8 Hours
Overview of Soft Computing: Definition, importance, and comparison with traditional hard computing methods. Components of Soft Computing: Key concepts of fuzzy logic, neural networks, genetic algorithms, and evolutionary computation techniques.		
Unit II	Fuzzy Logic	8 Hours
Fuzzy Sets and Systems: Understanding fuzzy sets, operations on fuzzy sets, and fuzzy relations. Fuzzy Logic Controllers: Design principles, implementation, and practical applications. Fuzzy Inference Systems: Mamdani and Sugeno models, defuzzification methods.		
Unit III	Artificial Neural Networks	8 Hours

SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-27 Batch

<p>Introduction to ANN: Basic concepts, models, and biological inspiration behind neural networks. Learning and Training: Methods of supervised, unsupervised, and reinforcement learning. Types of Neural Networks: Overview of feedforward, recurrent, convolutional, and deep neural networks.</p>		
Unit IV	Evolutionary Algorithms	8 Hours
<p>Introduction to Evolutionary Computation: Overview of genetic algorithms, evolution strategies, and genetic programming. Genetic Algorithms: Basic concepts including selection, crossover, mutation, and fitness functions. Advanced Algorithms: Concepts of differential evolution, particle swarm optimization, and ant colony optimization.</p>		
Unit V	Hybrid Systems	8 Hours
<p>Combining Techniques: Integration of neuro-fuzzy systems, genetic-neural systems, and fuzzy-genetic systems. Design and Implementation: Methodologies for combining soft computing techniques.</p>		
Unit VI	Advanced Topics in Soft Computing	8 Hours
<p>Deep Learning: Introduction, architectures, and frameworks of deep learning. Reinforcement Learning: Principles, Markov decision processes, and Q-learning. Recent Advances and Trends: Latest research, emerging technologies, and future directions in soft computing.</p>		
Learning Resources		
<p>Reference & Text Books : Text Books : T1. S. N. Sivanandam and S. N. Deepa, "Principles of Soft Computing," 3rd Edition, Wiley, 2018. T2. J.-S. R. Jang, C.-T. Sun, and E. Mizutani, "Neuro-Fuzzy and Soft Computing: A Computational Approach to Learning and Machine Intelligence," Prentice-Hall, 1997. T3. S. Haykin, "Neural Networks and Learning Machines," 3rd Edition, Pearson, 2008. Reference Books : R1. D. E. Goldberg, "Genetic Algorithms in Search, Optimization and Machine Learning," Addison-Wesley, 1989. R2. M. Mitchell, "An Introduction to Genetic Algorithms," MIT Press, 1998 Additional Resources: (Books, e-Resources) Introduction to Fuzzy Logic Neural Networks and Deep Learning Genetic Algorithms Overview MOOC Courses links : Neural Networks and Deep Learning</p>		



SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-27 Batch

25-PEC-ME-5-03D: World Class Manufacturing		
Teaching Scheme: Theory: 4 Hours/Week	Credit: 04	Examination Scheme: ISE : 40 Marks SEE : 60 Marks
Prerequisites Courses: Manufacturing Process, Production Management, Quality Management, Industrial Engineering,, Operation Management		
Course Objectives: <ul style="list-style-type: none"> ● Discover best practices adopted by industry in the sphere of WCM ● Examine the Barriers to using IT strategically and Strategic Planning Methodology for World Class Manufacturing. ● Develop communication strategies and tools for effective implementation of WCM practices. ● Implement the World Class Manufacturing Plan across an organization. 		
Course Outcomes: After completion of the course, learners should be able to CO1: Define challenges in world class manufacturing CO2: Study various world class manufacturing strategies. CO3: Understand total quality and employee involvement in manufacturing. CO4: Discuss different world class information systems for change management. CO5: Identify various methods and processes for WCM using brainstorming. CO6: Describe method to monitor performance in WCM.		
Course Contents		
Unit I	Historical Perspective	6 Hours
World class Excellent organizations – Models for manufacturing excellence – Business Excellence.		
Unit II	Benchmark, Bottlenecks and Best Practices	6 Hours
Concepts of benchmarking, bottleneck and best practices, Best performers – Gaining competitive edge through world class manufacturing – Value added manufacturing – eliminating waste – Toyota Production System – example		
Unit III	System & Tools for World Class Manufacturing	6 Hours
Improving Product & Process Design – Lean Production – SQC , FMS, Rapid Prototyping , Poka Yoke , 5-S , 3 M, use of IT ,JIT, Product Mix , Optimizing , Procurement & stores practices , Total Productive maintenance , Visual Control		
Unit IV	Human Resource Management in WCM	6 Hours

SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
 (An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
 Curriculum Structure and Evaluation Scheme
 To be implemented for 2025-27 Batch

Adding value to the organization – Organizational learning – techniques of removing Root cause of problems – People as problem solvers – New organizational structures . Associates – Facilitators – Teamsmanship – Motivation and reward in the age of continuous improvement.		
Unit V	Typical Characteristics of WCM Companies	6 Hours
Performance indicators – what is world class Performance – Six Sigma philosophy		
Unit VI	Indian Scenario	6 Hours
Leading Indian companies towards world class manufacturing – Task Ahead.		
Learning Resources		
Reference Books :		
R1. World Class Manufacturing - Strategic Perspective - B.S. Sahay ,KBC Saxena , Ashish Kumar (Mac Millan) R2. The Toyota Way - Jeffrey K.Liker – (Tata Macgraw Hill) R3. Operations Management for Competitive Advantage – Chase R4. Making Common Sense Common Practice – Moore R5. Managing Technology & Innovation for Competitive Advantage – Narayanan R6. Just In Time Manufacturing – M.G.Korgaonkar R7. Machine That Changed The World – Womack		

SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-27 Batch

25-VSEC-ME-5-02 : Drone Technology		
Teaching Scheme: Practical: 4 Hours/ Week	Credit: 02	Examination Scheme: TW : - 50 Marks OR : - 50 Marks
Prerequisites Courses: Basics of Electronics, physics, mathematics, Computer science, Communication system		
Course Objectives: <ul style="list-style-type: none"> ● Understand the basic principles and concepts of drone technology ● Learn the principles and practices of drones ● Explore the simulation tools, Drone Programming and firmware used in drone technology. ● Examine the diverse applications and use cases of drones in various sectors. 		
Course Outcomes: After completion of the course, learners should be able to CO1: Identify and Explain Drone Components and Systems CO2: Design and Assemble a Functional Drone CO3: execute programs on Simulation Tools and utilize the firmware. CO4: Analyze and Apply Drones in Industry-Specific Use Cases		
Course Contents		
Unit I	Fundamentals of Drone	7 Hours
Types of Drone, Main Components and secondary components of Drone, Applications of Drone, Identification of motor movements and motor sizes, Selection of components as per sizes, Propeller Direction, UAS and its Types, Drone Rules, Drone Zone-Permission Protocol.		
#Exemplar/Case Studies- Study of Assembly of drones using components.		
Unit II	Drone Design and Operations	7 Hours
Drone Design -pixhawk 2.4.8 Connection,,Yaw, Roll, Pitch, Throttle, Sensors in Drones (Gyroscopes, Accelerometers, GPS, etc.) , Communication Systems & Protocols, UAV Coordinate Frames and Their Importance. Flight Operation -Pre-Flight Planning (Weather, Airspace, Mission Objectives), Flight Path and Waypoint Planning,Flight Logs and Team Management,, Ground Testing and Calibration, Flight Testing Procedures		
#Exemplar/Case Studies: Study of Aero GCS Green		
Unit III	Communication and firmware Development	8 Hours

<p>Communication Protocols-Need and Importance, Drone Simulators-ArduPilot, Mission Planner, Implementing sensors in simulation, Drone Programming with Python-Dronekit Python installation,, Integrate Arduino with drone components, Android development, Firmware development</p>		
<p>#Exemplar/Case Studies : Study of Mission planner</p>		
Unit IV	Use Cases of Drones	8 Hours
<p>Drones in Agriculture, Surveying and Mapping, Data Collection and Image Analysis, Machine Learning and AI in Drone Data Analysis, Swarm Drones and Cooperative Behavior,</p>		
<p>#Exemplar/Case Studies</p>		<p>Study of Aerogcs Green</p>
<p>Assignments:</p> <ol style="list-style-type: none"> 1. Study of all Drone Components with specifications 2. Assembly of the Frame , Motor Mounting and Propeller Installation, ESC Wiring and Battery Placement, Initial Calibration of Sensors. 3. Calibration of Drone with Mission Planner. 4. Flight of drones to navigate through a set course autonomously. 5. Study of Integration of Arduino/Raspberry Pi with Drones 6. Spraying of Pesticides through agriculture Drone 7. Study of GEOAI Technology 8. Capture stunning aerial photos and videos. 9. Study of pickstork for image analysis 		
<p>Learning Resources</p>		
<p>Text Books</p>		
<p>T1. Tony Phan, Drone Builder's Guide: From Amateur to Professional, ISBN: 9781541016360 T2. Michael J. Singer, Drone Operations: A Comprehensive Guide for Commercial Drone Pilots , ISBN*: 9781733282100 T3. David McGriffy, Make: Drones: Teach an Arduino to Fly, ISBN: 9781680451715 T4. Joseph Howse, Programming Drones with Python: Build and Code Drones from Scratch, ISBN: 9781789346466 T5. K. R. Krishna, Drones in Agriculture, ISBN: 9781771886846 T6. Fergus Kennedy, Drone Photography & Video Masterclass, ISBN*: 9781781575383</p>		
<p>Reference Books :</p>		
<p>R1. John Baichtal, Building Your Own Drones: A Beginner's Guide to Drones, UAVs, and ROV, ISBN: 9780134000121 R2. Reg Austin, Unmanned Aircraft Systems: UAVS Design, Development and Deployment, ISBN*: 9781119964261 R3. David McGriffy, Make: Drones: Teach an Arduino to Fly, ISBN: 9781680451715 R4. Adam Juniper, Drones: The Complete Guide, ISBN*: 9781781575383 R5. P. Karthikeyan, Sathish Kumar, and V. Anbarasu, Drone Data Analytics in Aerial Computing, ISBN: 9780367332517</p>		

SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-27 Batch

Additional Resources: (Books, e-Resources)

- Drone Communities and Forums <https://diydrones.com/>
- <https://projecthub.arduino.cc/suhaspn007/autopilot-drone-d3fa9f>
- <https://www.youtube.com/playlist?list=PLgiealSjeVyx3t4N9GroE29SbVwhYrOtL>

MOOC Courses links :

- Robotics: Aerial Robotics (<https://www.coursera.org/learn/robotics-flight>)
- Drone Programming and AI (<https://www.udacity.com/course/flying-car-nanodegree--nd787>)



SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-27 Batch

25-CCC-ME-5-01 : Scientific Studies of Mind, Matter, and Consciousness		
Teaching Scheme: Theory: 3 Hours/Week	Credit: 02	Examination Scheme: TW : 50 Marks
Prerequisites Courses: Indian Knowledge System		
Companion Course: -NA		
Course Objectives: <ul style="list-style-type: none"> ● To introduce the core concepts of mind, matter, and consciousness from a scientific perspective. ● To explore the neuroscience of the mind and its relation to consciousness. ● To develop techniques for managing emotions and promoting mental well-being. ● To practice mindfulness and conscious decision-making. 		
Course Outcomes: After completion of the course, learners should be able to CO1: Understand core concepts of mind, matter, and consciousness. CO2: Identify the relation to neuroscience of mind and consciousness. CO3: Use strategies for emotional regulation and mental health. CO4: Assimilate mindfulness and philosophical insights to improve decision-making.		
Course Contents		
Unit I	Introduction to Neuroscience	07 Hours
Foundation of Neuroscience, Basic Concepts: Mind, matter, and consciousness definitions; Brain Anatomy: Major structures and their functions; Brain Waves: Types (Alpha, Beta, Delta, Theta, Gamma), Correlation with consciousness states (awake, sleep, meditation)		
#Exemplar/Case Studies: Meditation, Biofeedback : optimizing brain wave patterns.		
Unit II	Emotions and Thinking	07 Hours
Emotions and the Brain: Framework for Emotional Intelligence, Biological mechanisms (amygdala, prefrontal cortex), Emotional regulation Emotion Management Techniques: Mindfulness, Meditation, Cognitive Behavioral Therapy (CBT) Critical Thinking: Cognitive biases and logical fallacies, Decision Making: Rational vs. intuitive models.		
#Exemplar/Case Studies: Real-life scenarios and its influence on mind		
Unit III	Mindfulness Practices	09 Hours

SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-27 Batch

<p>Inner Circle Management : Prime and Non-prime Activity, Self Awareness and Self Care through Meditation, Five Core Concepts of Mindfulness: (a) present-focused awareness, (b) an accepting or open attitude, (c) a non-judging approach, (d) compassion for self and others, and (e) the energy of mindfulness, Benefits of Mindfulness, Mindfulness Techniques: Mindful Yoga, Scientific Evidence : Research findings on Neuroplasticity and Mindfulness</p>		
<p>#Exemplar/Case Studies: Success Routine Framework (21 Days : write a report), Practice any type of breathing exercise (Presentation : share the experience)</p>		
Unit IV	Sapta Jyothir Vikas and Wisdom of "SEE"	07 Hours
<p>Sapta Jyothir Vikas Philosophy: Rise of this philosophy in 21st Century, Core principles of Sapta Jyothir Vikas, Wisdom of "SEE" (Scientific/Social Perspective, Experience, Expertise): Definition, framework and components, Integration of Sapta Jyothir Vikas and SEE: Practical applications in decision-making.</p>		
#Exemplar/Case Studies		<p>Techniques for Advancing Consciousness: Mindfulness and meditation practices. Strategies for mental stability and conscious decision-making.</p>
*Mapping of Course Outcomes		CO3, CO4
Learning Resources		
Text Books		
<p>T1. Eran Asoulin, et al., "Introduction to Philosophy: Philosophy of Mind," Rebus Community, 2019, ISBN 13: 9781989014073 (https://open.umn.edu/opentextbooks/textbooks/776) T2. Yashraj Patil, "Harmony 360 - Advancing Humanity through the Wisdom of "SEE" and Saptajyotirvikas," Writer's Pocket, 2024, ISBN-13 : 978-93-6083-226-1 (https://amzn.in/d/OiuJ88O4) T3. Ann Swanson, "Science of Yoga," Dorling Kindersley Publication, 2019, ISBN-13: 9780241341230 (https://www.amazon.in/Science-Yoga-Understand-Physiology-Practice/dp/146547935X) T4. Casey Henley, "Foundations of Neuroscience", Michigan State University, 2021, ISBN 13: 9781626101098 (https://open.umn.edu/opentextbooks/textbooks/1005)</p>		
Reference Books :		
<p>R1. Simply the Brain (DK Simply Series), Dorling Kindersley Publication, 2022, ISBN-13: 978-0241515891 (https://amzn.in/d/O6Orexqx) R2. Rita Carter, "The Human Brain Book: An Illustrated Guide to Its Structure, Function, and Disorders," Dorling Kindersley Publication, 2019, ISBN-13: 978-0241302255 (https://amzn.in/d/OcfZ04LV) R3. Gaur Gopal Das, "Energize Your Mind: A Monk's Guide to Mindful Living" Sourcebooks, 2023, ISBN-13: 978-1728265377 (https://www.amazon.in/Energize-Your-Mind-Gaur-Gopal/dp/1728265371)</p>		

Additional Resources: (Books, e-Resources)

Buddha's Brain: Neuroplasticity and Meditation

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2944261/>

What is Cognitive Behavioral Therapy?

<https://www.apa.org/ptsd-guideline/patients-and-families/cognitive-behavioral>

Mindfulness by American Psychological Association

<https://www.apa.org/topics/mindfulness>

What Are The 7 Principles of Mindfulness?

<https://psychcentral.com/blog/non-judging-non-striving-and-the-pillars-of-mindfulness-practice>

MOOC Courses links :

- Swayam Course : **Psychiatry - An Overview and How the Brain Creates Mind**
https://onlinecourses.nptel.ac.in/noc21_hs34/preview
- Swayam Course : **Introduction to Brain & Behaviour**
https://onlinecourses.nptel.ac.in/noc20_hs33/preview

SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-27 Batch

25-ELC-ME-5-02 : Technical Communication		
Teaching Scheme: Theory: 4 Hours/Week	Credit: 02	Examination Scheme: TW : 50 Marks
Prerequisites Courses: Research Methodology		
Course Objectives: <ul style="list-style-type: none"> ● Identify research gaps and select an advanced topic that addresses these gaps. ● Analyze the latest technologies and methodologies in research to present creatively. ● Create high-quality technical documents and professional communication materials using enhanced writing skills. ● Evaluate complex engineering problems, formulate solutions, and apply critical thinking skills to develop and present comprehensive research plans. 		
Course Outcomes: After completion of the course, learners should be able to CO1: Critically analyze advanced topics of professional interest. CO2: Write high-quality technical documents and research papers. CO3: Deliver and present advanced research methodologies. CO4: Deliver professional technical presentations with confidence and clarity.		
Course Contents		
Unit I	Introduction and Topic Selection	8 Hours
Overview of seminar objectives and structure, Guidelines for selecting advanced research topics for dissertation, Conducting a comprehensive literature review, Advanced use of academic databases and citation management tools.		
#Exemplar/Case Studies: Select a research topic in consultation with the guide. Hands-on session on systematic literature search.		
Unit II	Writing Research Papers and Reports	8 Hours
Components and structure of high-quality research papers. Using LaTeX for professional report preparation.		
#Exemplar/Case Studies : Formatting and structuring research papers in LaTeX.		
Unit III	Professional Presentation Skills	8 Hours
Designing professional presentations, Techniques for engaging public speaking, Create and deliver a Detailed presentation on the selected research topic.		
#Exemplar/Case Studies Creating presentation using popular tools like Canva.		

SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-27 Batch

Unit IV	Seminar of Research Topic	6 Hours
Deliver seminar presentations on any topic of interest (30-35 minutes each). Submit research reports in LaTeX format on any topic presented.		
#Exemplar/Case Studies: Presenting a Dissertation/Thesis		
Learning Resources		
Text Books		
<p>T1. "Research Methodology- Methods and Techniques", Kothari C.K, New Age International, New Delhi,2004.</p> <p>T2. "Research Methodology- A Step-By-Step Guide for Beginners", Ranjit Kumar, Pearson Education, Delhi, ISBN: 81-317-0496-3, 2006.</p> <p>T3. "Research design: Qualitative, quantitative, and mixed methods approaches", Creswell, John W. , Sage publications, 2013.</p>		
Reference Books :		
<p>R1. "Research Methods", Trochim, William M.K., 2/e, Biztantra, Dreamtech Press, New Delhi, ISBN: 81-7722-372-0, 2003</p> <p>R2. "Applied Statistics & Probability for Engineers", Montgomery, Douglas C. &Runger, George C., 3/e, Wiley India, 2007</p> <p>R3. Business Research Methods – Donald Cooper & Pamela Schindler, TMGH, 9th edition</p>		
Additional Resources: (Books, e-Resources)		
<ol style="list-style-type: none"> 1. International Journal of Social Research Methodology . 2. The Postgraduate Research Handbook by Gina Wisker. 3. Research Methodology: Motivation for Research; Dr. S.N. Sridhara 		
MOOC Courses links :		
<ul style="list-style-type: none"> ● https://www.coursera.org/learn/research-methods ● https://onlinecourses.swayam2.ac.in/cec20_hs17/preview 		



SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
 (An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
 Curriculum Structure and Evaluation Scheme
 To be implemented for 2025-27 Batch

25-VEC-ME-5-01: Human Rights and Duties		
Teaching Scheme: Theory: 1 Hours/Week	Credit: 1	Examination Scheme: TW: 25 Marks
Prerequisites Courses: NA		
Companion Course: NA		
Course Objectives: <ul style="list-style-type: none"> ● To understand the fundamental concepts of human rights and duties, including human values such as dignity, liberty, equality, and justice ● To explore the interrelationship between rights and duties and analyze their significance in individual and group contexts ● To examine various legal instruments and understand their binding nature, including covenants, declarations, treaties, and protocols in the context of human rights. ● To analyze the role of the United Nations in promoting and protecting human rights through international charters and declarations, with a special focus on the Universal Declaration of Human Rights 		
Course Outcomes: After completion of the course, learners should be able to		
CO No	CO	BL
CO1	Explain the core concepts of human values and their relevance in human rights education.	2
CO2	Illustrate the relationship between rights and duties and demonstrate how they apply in personal and societal contexts.	3
CO3	Identify and interpret key legal instruments and their significance in enforcing human rights at national and international levels.	3
CO4	Analyze and evaluate the historical development and provisions of the Universal Declaration of Human Rights and its role in protecting civil, political, economic, social, and cultural rights.	4
Course Contents		
Unit I	Basic Concept	3 Hours
Human Values- Dignity , Liberty, Equality , Justice, Unity in Diversity, Ethics and Morals, Meaning and significance of Human Rights Education		
#Exemplar/Case Studies: Human Values in Action – The School Debate Incident		



SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-27 Batch

*Mapping of Course Outcomes		C01
Unit II	Perspectives of Rights and Duties	3 Hours
Rights: Inherent-Inalienable-Universal- Individual and Groups, Nature and concept of Duties, Interrelationship of Rights and Duties		
#Exemplar/Case Studies: The Village Water Supply Issue		
*Mapping of Course Outcomes		C02
Unit III	Introduction to Terminology of Various Legal Instruments	2 Hours
Meaning of Legal Instrument- Binding Nature, Types of Instruments: Covenant-Charter-Declaration-Treaty-Convention-Protocol- Executive Orders and Statutes		
#Exemplar/Case Studies: Protecting Wetlands – An International Agreement		
*Mapping of Course Outcomes		C03
Unit IV	United Nations And Human Rights	4 Hours
Brief History of Human Rights- International and National Perspectives, Provision of the charters of United Nations, Universal Declaration of Human Rights- Significance-Preamble, Civil and Political Rights-(Art. 1-21), Economic, Social and Cultural Rights-(Art.22-28), Duties and Limitations-(Art. 29), Final Provision (Art. 30)		
#Exemplar/Case Studies: Human Rights in Disaster Relief – The Cyclone Fani Incident		
*Mapping of Course Outcomes		C04
Learning Resources		
Text Books		
T1. Leah Levin: Human Rights (Questions and Answers) National Book Trust India, New Delhi, 1992 T2. Justice D.M. Dharmadhikari: Human Values and Human Rights: Universal Publications, New Delhi,2010		
Reference Books :		
R1.Daniel Fishlin & Marth Nandorfy: The concise guide to Global Human Rights; Oxford University Press; 2007		
Additional Resources: (Books, e-Resources) http://unipune.ac.in/pdf_files/Final%20Book_03042012.pdf		
MOOC Courses links :		
<ul style="list-style-type: none"> • https://onlinecourses.swayam2.ac.in/cec20_hs24/preview 		

SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-27 Batch

25-VEC-ME-5-02: Human rights of vulnerable and disadvantaged groups		
Teaching Scheme: Theory: 1 Hours/Week	Credit: 1	Examination Scheme: TW: 25 Marks
Prerequisites Courses: NA		
Companion Course: Human Rights and Duties		
Course Objectives: To understand the concept of vulnerability and the challenges faced by disadvantaged groups. To explain the social status and human rights of women and children from national and international perspectives. To analyze the conditions of socially and economically disadvantaged groups and their rights. To evaluate the human rights issues of vulnerable groups and explore measures for their protection.		
Course Outcomes: After completion of the course, learners should be able to		
CONo	CO	BL
C01	Explain the meaning and challenges of vulnerable and disadvantaged groups.	2
C02	Describe the human rights standards for women and children at national and international levels.	2
C03	Articulate how poverty and social status affect human rights.	3
C04	Relate the laws and policies that protect vulnerable groups	3
Course Contents		
Unit I	General Introduction	2 Hours
Meaning and Concept of Vulnerable and Disadvantaged, Groups, Customary, Socio-Economic and Cultural Problems of, Vulnerable and Disadvantaged Groups		
#Exemplar/Case Studies : Education for Children in Rural India *Mapping of Course Outcomes		
*Mapping of Course Outcomes	C01	
Unit II	Social status of women and children in International and national perspective	3 Hours

SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-27 Batch

Human Rights and Women's Rights –International and National Standards, Human Rights of Children-International and National Standards		
#Exemplar/Case Studies : Child Marriage in Rural India		
*Mapping of Course Outcomes		C02
Unit III	Status of Social and Economically Disadvantaged people	4 Hours
Status of Indigenous People and the Role of the UN, Status of SC/ST and Other Indigenous People in the Indian Scenario , Human Rights of Aged and Disabled, The Minorities and Human Rights		
#Exemplar/Case Studies : Rights of Indigenous Tribal People in Jharkhand		
*Mapping of Course Outcomes		C03
Unit IV	Human rights of vulnerable groups	3 Hours
Stateless Persons, Sex Workers, Migrant Workers, HIV/AIDS Victims		
#Exemplar/Case Studies: Rights of Vulnerable Groups in India - Migrant Workers, Sex Workers, and HIV/AIDS Victims		
*Mapping of Course Outcomes		C04
Learning Resources		
Text Books		
T1. Prof. Y.S.R. Murthy , “HUMAN RIGHTS HANDBOOK” by Lexis Nexis Butterworth in October, 2007		
T2. Prof. Dr. T.S.N. Sastry, “INDIA AND HUMAN RIGHTS REFLECTIONS” by Concept Publishing Company, New Delhi, 2005		
Reference Books :		
R1.Surinder Khanna, “DALIT WOMEN AND HUMAN RIGHTS” by Swastik Publications Delhi, ISBN: 93-80138-36-7, 2011		
Additional Resources: (Books, e-Resources)		
http://unipune.ac.in/university_files/1Human%20Rights%20of%20Vulnerable%20&%20Disadvantaged%20Groups_2112_12.pdf		
MOOC Courses links :		
<ul style="list-style-type: none"> • https://onlinecourses.swayam2.ac.in/cec21_lw07/preview 		

Internal Semester Exam Question paper Format

SNJB's Late Sau. Kantabai Bhavarlalji Jain College of Engineering

Department of Mechanical Engineering

Internal Semester Test Exam (Academic Year : __ Semester: __)

Class :

Marks : 20

Date : / /

Time :

Duration : 1 Hr.

Course Name :: Course Code

Instructions:

Q. No.	Questions	Marks	Unit No.	Marking Scheme
Q.1 A)		6		
Q.1 B)		4		
OR				
Q.2 A)		6		
Q.2 B)		4		
OR				
Q.3A)		6		
Q.3 B)		4		
OR				
Q.4A)		6		
Q.4B)		4		

Semester End Exam Question paper Format

Semester End Examination (Regular) <<Month Year>>

Programme:

Class:

Course and Code:

Semester:

Academic Year:

Pattern:

Time: 2Hr 30 Min

Examination: SEE (Month Year)

Max. Marks: 60

Instructions to the candidates:

1. Solve Q.1 OR Q.2, Q.3 OR Q.4, Q.5 OR Q.6, Q.7 OR Q.8, Q.9 OR Q.10, Q.11 OR Q.12
2. Bold-faced figures to the right indicate full marks.
3. Assume the suitable data if necessary, but Justify it.
4. Draw the neat labelled diagrams, wherever necessary.

QN	Question	Marks
1 a)	Unit I	6
1 b)	Unit I	4
OR		
2 a)	Unit I	6
2 b)	Unit I	4
3 a)	Unit II	6
3 b)	Unit II	4
OR		
4 a)	Unit II	6
4 b)	Unit II	4
5 a)	Unit III	6
5 b)	Unit III	4
OR		
6 a)	Unit III	6
6 b)	Unit III	4
7 a)	Unit IV	6
7 b)	Unit IV	4
OR		
8 a)	Unit IV	6
8 b)	Unit IV	4
9 a)	Unit V	6

SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2024-26 Batch

9 b)	Unit IV	4
OR		
10 a)	Unit V	6
10 b)	Unit V	4
11 a)	Unit VI	6
11 b)	Unit VI	4
OR		
12 a)	Unit VI	6
12 b)	Unit VI	4

SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)
Curriculum Structure and Evaluation Scheme
To be implemented for 2024-26 Batch

Supporting Document

Sr.No.	Syllabus Contains	Short Answer	Yes / No	Page No. (In Syllabus)
1	अभ्यासक्रम	Enclosed in Syllabus	Yes	1-63
2	पात्रता	(As per the Rules and Regulations mentioned in MoM)	Yes	67
3	अभ्यासक्रमाची उद्दिष्टे	Enclosed in Syllabus	Yes	11
4	विषयाचे नाव	Enclosed in Syllabus	Yes	6
5	घटकांचा तपशील	Enclosed in Syllabus	Yes	6
6	तासिका	Enclosed in Syllabus	Yes	6
7	श्रेयांक पद्धत	Enclosed in Syllabus	Yes	6
8	संदर्भ साहित्य	Enclosed in Syllabus	Yes	12
9	संदर्भ ग्रंथ	Enclosed in Syllabus	Yes	12
10	प्रश्नपत्रिकेचे स्वरूप	Enclosed in Syllabus	Yes	64
11	अंतर्गत मूल्यमापनाचे स्वरूप	Enclosed in Syllabus	Yes	6
12	सत्र परीक्षेचे स्वरूप	Enclosed in Syllabus	Yes	65
13	गुणांकन	Enclosed in Syllabus	Yes	6