Curriculum Structure for B. Tech. Mechanical Engineering Programme

(In light of NEP 2020)

NCrF Level 6

(NEP_Version II)

For students admitted in 2023-24 onwards

Government College of Engineering, Amravati

(An Autonomous Institute of Government of Maharashtra)

Near Kathora Naka, Amravati, Maharashtra

PIN 444604 www.gcoea.ac.in

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Structure for B. Tech. Programme in light of NEP 2020

For students admitted in 2023-24 onwards

Key Features of Curriculum

1. Multiple entry and exit option after every year.
2. Provision for Open Electives (OE), Vocational and Skill Enhancement Courses (VSE), Ability Enhancement Courses (AE), Indian Knowledge System (IKS), Value Education Courses (VE), Co-Curricular Courses (CC) in addition to program core courses.
3. Mandatory internship of one semester.
4. Credits for Value education courses, Ability Enhancement Courses, Co-Curricular Curricular Activities.
5. Mandatory Non-Credit Courses.
6. Interdisciplinary and multidisciplinary education through single and double minors and open electives.
7. Skill based courses and multiple exit level.
8. Provision for learning in online mode through Swayam/ NPTEL etc courses
9. Provision for B.Tech. Honours with Research degree through research project.
10. Opportunity for learner to choose courses of their interest in all disciplines.
11. Provision of Skill Based Courses and internship/Field project/mini projects for exit options at each level.

12. Flexibility for all types of learners i.e. Good, Normal and Exit

Good Students	Normal Students	Exit
B. Tech. Major with Multidisciplinary Minor	B. Tech. Major with Multidisciplinary Minor	Additional 08 credits in the form of skill-based courses / labs, internship, mini projects shall be offered in 8 weeks.
B. Tech. Honors and Multidisciplinary Minor	--	
B. Tech. Honors with Research and Multidisciplinary Minor	--	
B. Tech. with Double Minor (Multidisciplinary and Specialization Minor)	--	

Credit Distribution for each year and Exit Option

NCrFLevel	Year / Semester	Exit Option	Credits	Additional Credits for exit students	Total Credits
4.5	Semester I & II	U. G. Certificate	43	08	51
5.0	Semester III & IV	U. G. Diploma	84	08	92
5.5	Semester V & VI	B. Vocational/B.Sc. Engg.	127	08	135
6.0	Semester VII & VIII	B. Tech.Major with Multidisciplinary Minor	167	--	167
		B. Tech. Honors and Multidisciplinary Minor	167+18=185	--	185
		B. Tech. Honors with Research and Multidisciplinary Minor	167+18=185	--	185
		B. Tech. with Double Minor (Multidisciplinary and Specialization Minor)	167+18=185	--	185

Course Category-wise Credit Distribution

Course Category	As per NEP GR	GCOEA Credits	CC	As per NEP GR	GCOEA Credits
BSC/ESC	30	30	BS	14-18	18
			ES	16--12	12
Program Courses	64-76	67	PC	44-56	47
			PE	20	20
Multidisciplinary Courses	22	22	MM	14	14
			OE	8	8
Skill Courses	8	8	VSE	8	8
Humanities, Social Science & Management (HSSM)	14	14	AE	4	4
			EM	4	4
			IKS	2	2
			VE	4	4
Experiential Courses	22	22	RM	4	4
			FP	2	2
			PR	4	4
			IN/OJT	12	12
Liberal Learning Courses	4	4	CC	4	4
Total Credits	**164-176**	**167**		**164-176**	**167**

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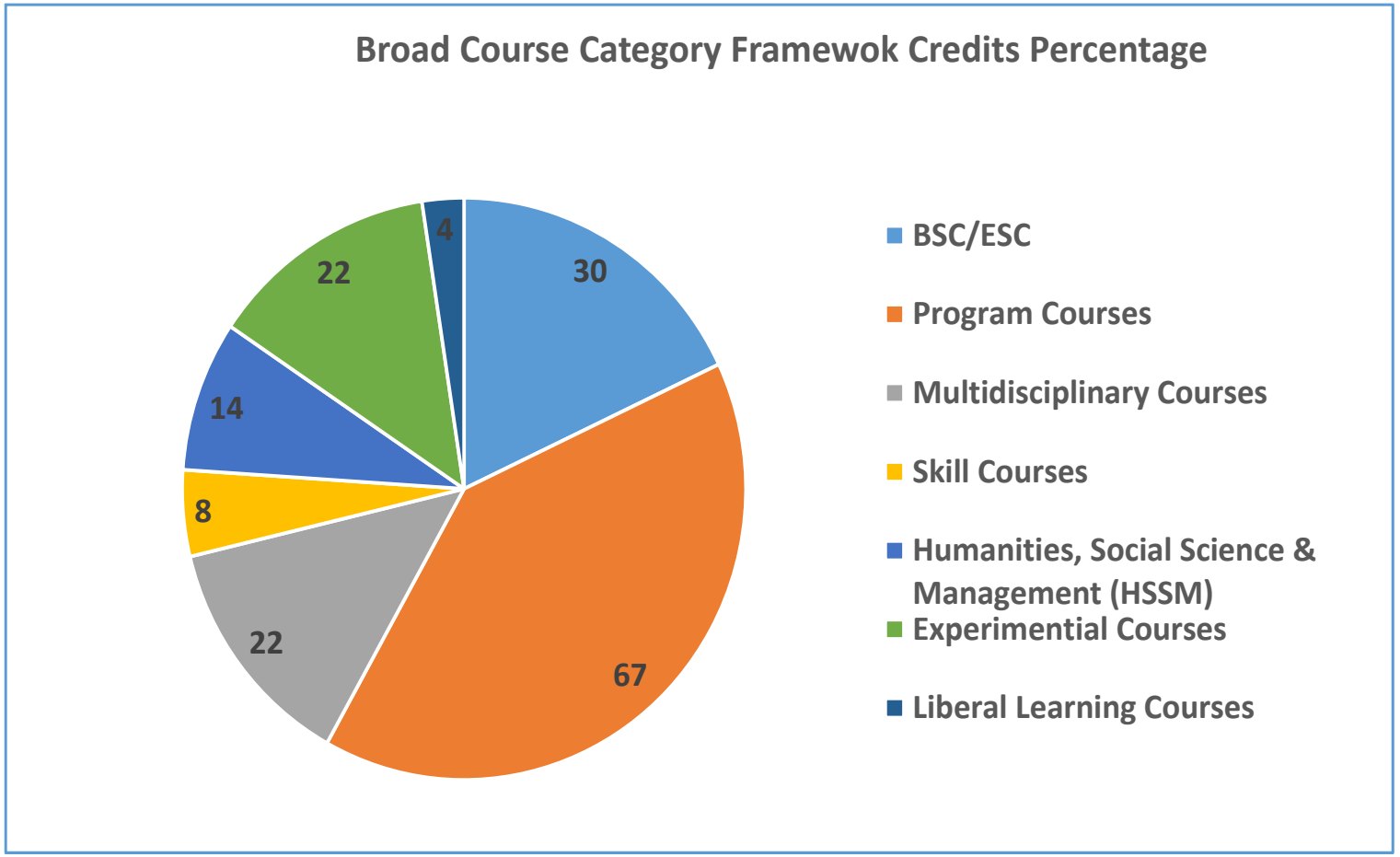
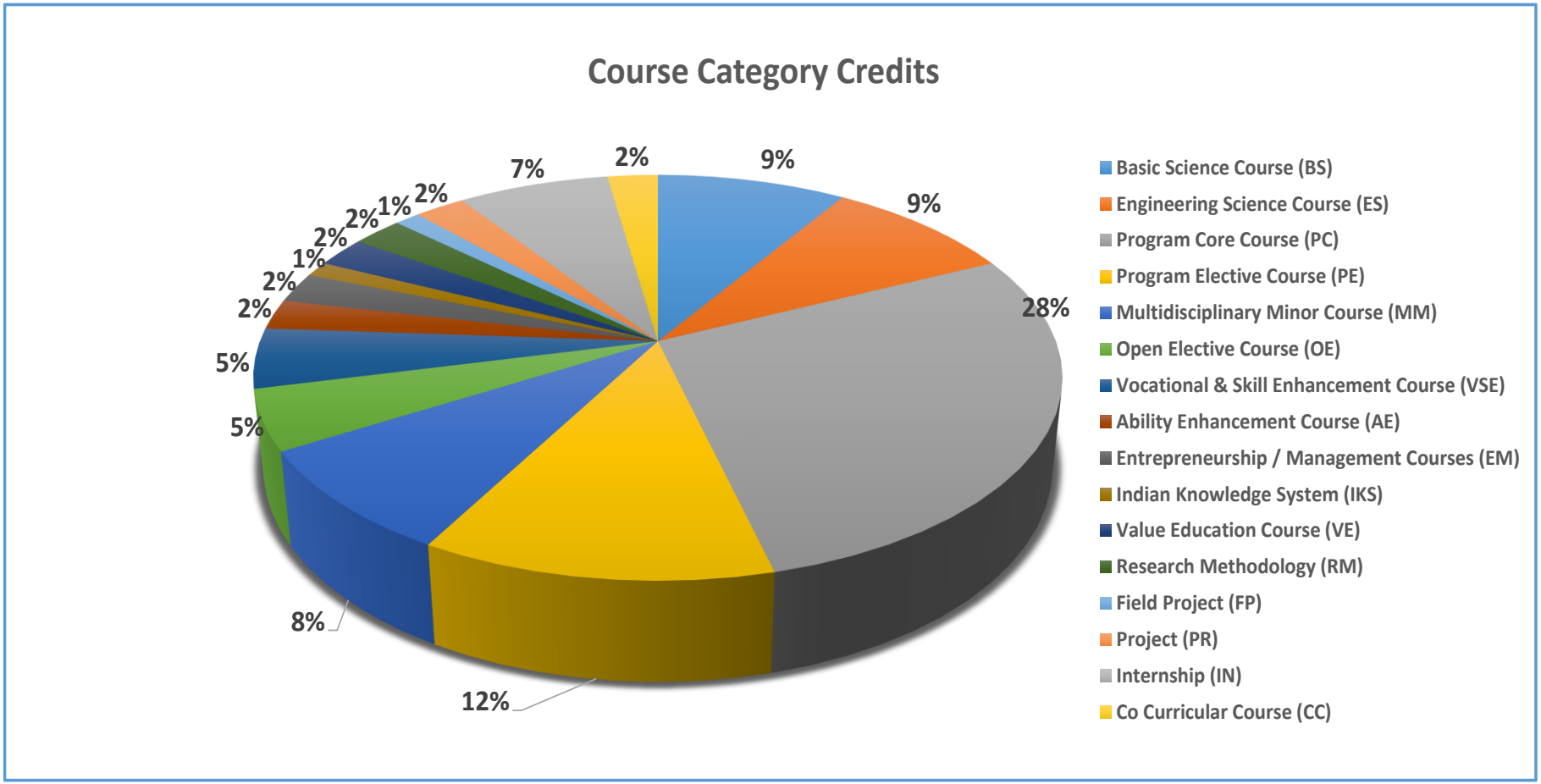

Broad Course Category Framewok Credits Percentage
30
67
22
8
14
22
4
BSC/ESC
Program Courses
Multidisciplinary Courses
Skill Courses
Humanities, Social Science & Management (HSSM)
Experimental Courses
Liberal Learning Courses



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Semester-wise Credit Distribution:

Sr. No.	SEM	I	II	III	IV	V	VI	VII	VIII	Total Credits	NEP Requirement
1	Basic Science Course (BS)	8	7	3						18	14-18
2	Engineering Science Course (ES)	8	4							12	12-16
3	Program Core Course (PC)		6	11	12	9	6	3		47	44-56
4	Program Elective Course (PE)					4	8	8		20	20
5	Multidisciplinary Minor Course (MM)			3	3	3	3	2		14	14
6	Open Elective Course (OE)				3	3		2		8	8
7	Vocational & Skill Enhancement Course (VSE)			2	1	2	1	2		8	8
8	Ability Enhancement Course (AE)	1	3							4	4
9	Entrepreneurship / Management Courses (EM)			1					3	4	4
10	Indian Knowledge System (IKS)	2								2	2
11	Value Education Course (VE)	2	2							4	4
12	Research Methodology (RM)								4	4	4
13	Field Project (FP)						2			2	2
14	Project (PR)							4		4	4
15	Internship (IN)								12	12	12
16	Co Curricular Course (CC)				2	2				4	4
	Total Credits	**21**	**22**	**20**	**21**	**23**	**20**	**21**	**19**	**167**	160-176

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General Instructions:

(General Instructions:

(1) 10% content of syllabus of each theory course shall be completed by the students with self-study. The 10% portion of each course (for self-study) shall be declared by the concerned course-coordinator at the beginning of teaching of the course.

(2) Student can complete **any Course** or programme elective courses PE1 to PE5 in "online" mode, offered through SWAYAM/ NPTEL portal or equivalent platform which provides Evaluation mechanism with the permission of Departmental Faculty Board (DFB). In this case –

(i) Students can register and complete these online courses any time after beginning of third semester, however, the student must successfully complete and pass the course, and submit the score card/certificate before declaration of result of respective semester in which the course is being offered.

(ii) In case, if a student registers for a course in online mode but fails in the course, the student will have to register for the course offered by the institute in respective semester as per curriculum. In this case, the student will have to appear for all the examinations (CT1/CT2, TA, ICA, ESE etc) of the course, and successfully complete the course.

(3) In eighth semester, the students have to complete mandatory internship of one semester in the company/ organization approved by the DFB.

(4) In eighth semester during internship, the students have to complete the theory courses in any one of the two modes:

(i) **Online courses** offered through SWAYAM/ NPTEL or equivalent platform which provides Evaluation mechanism with the permission of DFB: In this case, students can register and complete these online courses any time after beginning of third semester and complete the course and submit the score card/ certificate before declaration of result of eighth semester.

In case if a student registers for a course in online mode but fails in the course, the student will have to register for the course offered by the institute as per curriculum. In this case, the student will have to appear for all the examinations (CT1/CT2, TA, ICA, ESE etc) of the course personally as per the schedule declared by the institute, and successfully complete the course.

(ii) **Self-study mode:** In this case the student will have to study the course offered by the institute of his/her own. The student shall appear for all the college assessments/ examinations (CT1/CT2, TA and ESE) personally as per the schedule declared by the institute and successfully complete the course.

(5) In addition to program specific courses, the students have to complete vocational skill courses, internship, field projects connected to **major degree**.

(6) Exit Option:

The exit option at the end of each year will be available to students after even semester. e. 2nd semester, 4th semester &6th semester and will commence from AY 2024-25 for UG Certificate, AY 2025-26 for UG Diploma, AY 2026-27 for B. Voc./B. Sc. Engineering degree.

(7) Students opting for exit at any level (after odd semesters or even semester) will have to earn additional eight credits before exit in skill based vocational courses and internship/apprenticeship/mini project to make them eligible to get UG certificate / UG Diploma or B. Voc./B. Sc. Engineering degree as per eligibility.

(8) Re Entry and Lateral Entry: Students opting for exit at any level after even semester, will have the option to re-enter the programme from where they left off in odd semesters within **four years of exit.** There shall be a gap of at least **one year** between exit and re-entry to UG programme.

(9) Students opting for exit after odd semester, i.e. 1st, 3rd, 5th or 7th semester will have the option to re-enter the programme from where they left off in even semesters only. There shall be a gap of at least **one year** between exit and re-entry to UG programme.

(10) Maximum period for completion of B. Tech. programme:

The student has to complete the degree programme within the stipulated **maximum period of eight years** from the date of admission to first year UG. The maximum duration of the programme includes the period of exit, withdrawal, absence and different kinds of leaves permissible to a student but it shall exclude the period of rustication of the student from the institute. However, genuine cases on confirmation of valid reasons may be referred to Academic Council for extending this limit by **additional one year**.

(11) Eligibility for admission to the UG Bachelor's Degree with Honours/ Research/Double Minor:

Students with minimum **CGPA of 7.5** without backlog courses at the end of fourth semester and should have earned 84 **credits** are eligible for admission to the UG Bachelor's Degree with Honours/ Research/ Double Minor.

Multiple exits: Following options are available for multiple exists:

Multiple exits: Following options are available for multiple exists:

Option	NCrF Level	Qualification Title	Additional credit requirement	Bridge courses
Exit-1	4.5	One year UG certificate course in Engg/Tech	8	2 Month Internship **OR** Online Two skill courses at ITI Level from NSQF/ESSC/ANY Other agency which provides certification / Evaluation @ **OR** Technical Project
Exit-2	5.0	Two year UG Diploma I Engg/Tech	8	2 Month Internship **OR** Online Two skill courses at Diploma Level from NSQF/ESSC/ANY Other agency which provides certification / Evaluation @ **OR** Technical Project

SEMESTER –III														
Category	**Course Code**	**Name of the Course**	**Teaching Scheme**				**Evaluation Scheme**							**Credits**
											Practical		**Total**	
			TH	TU	PR	Total	CT-1	**CT-2**	TA	ESE	ICA	ESE		
BS5	SH1301(B)	Partial Differential Equation and Transform	3	01		4	15	15	10	60			100	4
MM1	ME1315/16/17	Multidisciplinary Minor-1	3			3	15	15	10	60			100	3
PC3	ME1301	Thermodynamics	3	1		4	15	15	10	60			100	4
PC4	ME1302	Manufacturing Processes	3			3	15	15	10	60			100	3
PC5	ME1303	Fluid Mechanics	3	1		4	15	15	10	60			100	4
VSE1	ME1304	Fluid Mechanics Lab			2	2					25	25	50	1
VSE2	ME1305	Manufacturing Processes Lab			2	2					50		50	1
EM1	ME1310	Idea Lab			2	2					50		50	1
Total			**15**	**3**	**6**	**24**	**75**	**75**	**50**	**300**	**125**	**25**	**650**	**21**

SEMESTER –IV														
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
							Theory				Practical		Total	
			TH	TU	PR	Total	CT1	CT2	TA	ESE	ICA	ESE		
MM2	ME1415/16/17	Multidisciplinary Minor-2	3			3	15	15	10	60			100	3
PC6	ME1401	Machine Design – I	3	1		4	15	15	10	60			100	4
PC7	ME1402	Thermal Engineering	3			3	15	15	10	60			100	3
PC8	ME1403	Machining Processes	3			3	15	15	10	60			100	3
OE1	SH1401	Open Elective – I	3			3	15	15	10	60			100	3
PC9	ME1404	Machine Drawing & Drafting Lab			2	2					50		50	1
PC10	ME1405	Thermal Engineering Lab			2	2					50		50	1
VSE3	ME1406	Machining Processes Lab			2	2					25	25	50	1
CC1	SH1402	Co-curricular Course			4	4			20				20	2
Total			**15**	**1**	**10**	**26**	**75**	**75**	**70**	**300**	**125**	**25**	**670**	**21**

Co-Curricular Course Activities minimum hours: 2 hours per week or 24 hours Co-Curricular Course: Active Participation in Activities such as: Health and wellness, Sports, yoga education, Tech-fest, College Club Activity, University level/ college level cultural activities, Drama, painting, fine/ applied/ visual performing arts, annual day, department student's association/IE/ISTE/Any professional body, paper presentation, foreign language certificate, NCC, NSS etc. Co-Curricular Course Activities minimum hours: 2 hours per week or 24 hours."

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EXIT CRITERIA FOR U. G. DIPLOMA															
Category	Course Code	Name of the Course @	Teaching Scheme				Evaluation Scheme								Credits
							Theory				Practical		Total		
			TH	TU	PR	Total	CT1	CT2	TA	ESE	ICA	ESE			
EX2	ME1411	Casting and forging Part Design Lab									50		50		4
EX2	ME1412	CNC Programming									50		50		4
OR															
EX2	ME1413	Internship / Technical Project									100 @		100		8

@ Based on seminar, Internship Report, Internship/ Project evaluation

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Equivalence Scheme for III & IV Semester B. Tech. Mechanical

Couse code with name of course (old)					
Revised curriculum 2019 -2020			**NEP Version 1**		
Code	**Name**	**Credit**	**Code**	**Name**	**Credit**
SHU321(A)* SHU322(A)	Differential Equations and Probability Integral Calculus and Probability	3	SH1301(A) *SH1301(B)	Differential Equations and Probability Integral Calculus and Probability	3
MEU321	Thermodynamics	4	ME1302	Thermodynamics	4
MEU322	Manufacturing Processes	4	ME1303	Manufacturing Processes	3
MEU323	Material Engineering	4		----No equivalence----	
MEU324	Machine Drawing	3		----No equivalence----	
MEU325	Material Engineering Lab	1		----No equivalence----	
MEU326	Machine Drawing Lab	1	ME1405	Machine Drawing and Drafting Lab	1
SHU323	Introduction Constitution of India	0		----No equivalence----	
SHU 425	Human Values and Ethics	0		----No equivalence----	
MEU421	Applied Thermodynamics -I	4		----No equivalence----	
MEU422	Fluid Mechanics	4	ME1304	Fluid Mechanics	4
MEU423	Manufacturing Technology	4		----No equivalence----	
MEU424	Fluid Mechanics Lab	1	ME1305	Fluid Mechanics Lab	1
CEU 430	Strength of Material	4		----No equivalence----	
CEU 430	Strength of Material Lab	1		----No equivalence----	
SHU422	Environmental Studies	0		----No equivalence----	

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SEMESTER –V														
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
								Theory			Practical		Total	
			TH	TU	PR	Total	CT1	CT2	TA	ESE	ICA	ESE		
MM3	ME1515/16/17	Multidisciplinary Minor -III	3			3	15	15	10	60			100	3
PC 11	ME1501	Heat Transfer	3			3	15	15	10	60			100	3
PC 12	ME1502	Theory of Machine	3			3	15	15	10	60			100	3
PC 13	ME1503	Machine Design - II	3			3	15	15	10	60			100	3
PE1	ME1504	Program Elective -I	3			3	15	15	10	60			100	3
OE2	SH1501	Open Elective- II	3			3	15	15	10	60			100	3
VSE4	ME1505	Machine Design and Drafting Lab			2	2					25	25	50	1
VSE5	ME1506	Heat Transfer Lab			2	2					25	25	50	1
PE	ME 1507	Program Elective -I Lab			2	2					25	25	50	1
CC2	SH1502	Co-curricular Course			4	4							20	2
MNC2	SH1503	Soft Skills	2			2			20				20	0
Total			**20**		**8**	**28**	**90**	**90**	**80**	**360**	**75**	**75**	**790**	**23**

Co-Curricular Course Activities minimum hours:2 hours per week or 24 hours Co-Curricular Course: Active Participation in Activities such as: Health and wellness, Sports, yoga education, Tech-fest, College Club Activity, University level/ college level cultural activities, Drama, painting, fine/ applied/ visual performing arts, annual day, department student's association/IE/ISTE/Any professional body, paper presentation, foreign language certificate, NCC, NSS etc. Co-Curricular Course Activities minimum hours: 2 hours per week or 24 hours."

ADDITIONAL CRITERIA FOR HONORS															
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme								Credits
							Theory				Practical		Total		
			Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	CT1	CT2	TA	ESE	ICA	ESE			
PEH1	ME1521	Program Elective for Honors 1 (Swayam/MOOCS/NPTEL/ Online) from Basket													3
PEH2	ME1522	Program Elective for Honors 2 (Swayam/MOOCS/NPTEL/ Online) from Basket													3
	Total														**6**

ADDITIONAL CRITERIA FOR HONORS WITH RESEARCH															
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme								Credits
							Theory				Practical		Total		
			TH	TU	PR	Total	CT1	CT2	TA	ESE	ICA	ESE			
PER1	ME1531	Research Project Stage 1			08	08					100		100		4
Total					08	08					100		100		4

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ADDITIONAL CRITERIA FOR DOUBLE MINOR (SPECIALIZATION)														
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
							Theory				Practical		Total	
			TH	TU	PR	Total	CT1	CT2	TA	ESE	ICA	ESE		
MN1	ME1541	Minor Track Course 1 From Basket	3				15	15	10	60			100	3
MN2	ME1542	Minor Track Course 2 From Basket	3				15	15	10	60			100	3
	Total		6				30	30	20	120			200	6

SEMESTER – VI														
Category	**Course Code**	**Name of the Course**	**Teaching Scheme**				**Evaluation Scheme**							**Credits**
							Theory				**Practical**		**Total**	
			TH	TU	PR	Total	CT1	CT2	TA	ESE	ICA	ESE		
MM4	ME1615/16/17	Multidisciplinary Minor - 4	3			3	15	15	10	60			100	3
PC 14	ME1601	Metrology and Quality Control	3			3	15	15	10	60			100	3
PC 15	ME1602	New And Renewable Energy Sources	3			3	15	15	10	60			100	3
PE2	ME1603	Program Elective - II	3			3	15	15	10	60			100	3
PE3	ME1604	Program Elective - III	3	1		4	15	15	10	60			100	4
VSE6	ME1605	Metrology and Quality Control Lab			2	2					25	25	50	1
PE	ME1606	Program Elective - II Lab			2	2					25	25	50	1
FP	ME1607	Minor Project			4	4					25	25	50	2
MNC3	ME1608	Industrial Safety	2			2	15	15	20				50	0
MNC4	SH1601	NCC/NSS/ Community Service etc .							20					0
Total			**17**	**1**	**8**	**26**	**90**	**90**	**90**	**300**	**75**	**75**	**720**	**20**

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EXIT CRITERIA FOR EXIT CRITERIA FOR B. VOC.														
Category	Course Code	Name of the Course @	Teaching Scheme				Evaluation Scheme							Credits
							Theory				Practical		Total	
			TH	TU	PR	Total	CT1	CT2	TA	ESE	ICA	ESE		
EX3	ME1611	CNC Programming and Machining									50		50	4
EX3	ME1612	Computer Aided Drafting									50		50	4
OR														
EX3	ME1613	Internship / Technical Project									100@		100	8

@ Based on seminar, Internship Report, Internship/ Project evaluation

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ADDITIONAL CRITERIA FOR HONORS														
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
							Theory				Practical		Total	
			TH	TU	PR	Total	CT1	CT2	TA	ESE	ICA	ESE		
PEH3	ME1621	Program Elective for Honors 3 (Swayam/MOOCS/NPTEL/ Online) from Basket												3
PEH4	ME1622	Program Elective for Honors 4 (Swayam/MOOCS/NPTEL/ Online) from Basket												3
	Total													**6**

ADDITIONAL CRITERIA FOR HONORS WITH RESEARCH														
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
							Theory				Practical		Total	
			TH	TU	PR	Total	CT1	CT2	TA	ESE	ICA	ESE		
PER2	ME1631	Research Project Stage 2			12						100	100	200	6
Total					12						100	100	200	6

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ADDITIONAL CRITERIA FOR DOUBLE MINOR (SPECIALIZATION)															
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme								Credits
							Theory				Practical		Total		
			Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	CT1	CT2	TA	ESE	ICA	ESE			
MN3	ME1641	Minor Track Course 3 From Basket	3				15	15	10	60			100		3
MN4	ME1642	Minor Track Course 4 From Basket	3				15	15	10	60			100		3
	Total		6				15	15	20	120			200		6

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SEMESTER –VII														
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
							Theory				Practical		Total	
			TH	TU	PR	Total	CT1	CT2	TA	ESE	ICA	ESE		
MM5	ME1715/16/17	Multidisciplinery Minor-5	2			2	15	15	10	60			100	2
PC 16	ME1701	Automation in Manufacturing	3			3	15	15	10	60			100	3
PE4	ME1702	Program Elective - IV	3	1		4	15	15	10	60			100	4
PE5	ME1703	Program Elective - V	4			4	15	15	10	60			100	4
OE3	SH1701	Open Elective - III	2			2	15	15	10	60			100	2
VSE7	ME 1704	Program Elective – IV Lab			2	2					25	25	50	1
VSE8	ME 1705	Program Elective - V Lab			2	2					25	25	50	1
PR	ME 1706	Project			8	8					50	50	100	4
MNC5	ME 1707	Engineering Economics	2			2	15	15	20				50	0
Total			**16**	**1**	**12**	**29**	**90**	**90**	**70**	**300**	**100**	**100**	**750**	**21**

Note: Project Guide Teaching load: 8 hrs/week : Students can register for the elective in seventh semester under Multidisciplinary Minor 4 using **SWAYAM/NPTEL** etc. portal. Courses will be of completely student's choice but approved by DFB of concerned department (other than MM1 to MM3) and should be **at least of 12 weeks** including tutorials, which will be considered as **4 credit course**.

Students can register and complete online courses for Multidisciplinary Minor 4 any time after completion of semester IV, however, the student must successfully complete and pass the course, and submit the score card/certificate before declaration of result of VII th semester.

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ADDITIONAL CRITERIA FOR HONORS															
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme								Credits
							Thoery				Practical		Total		
			TH	TU	PR	Total	CT1	CT2	TA	ESE	ICA	ESE			
PEH5	ME1721	Program Elective for Honors 1 (Swayam/MOOCS/NPTEL/ Online) from Basket													3
PEH6	ME1722	Program Elective for Honors 2 (Swayam/MOOCS/NPTEL/ Online) from Basket													3
	Total														**6**

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ADDITIONAL CRITERIA FOR HONORS WITH RESEARCH																
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme								Credits
							Theory				Practical		Total		
			TH	TU	PR	Total	CT1	CT2	TA	ESE	ICA	ESE		
PER3	ME1731	Research Project Stage 3			16	16					100	200	300	8
Total					16	16					100	200	300	8

ADDITIONAL CRITERIA FOR DOUBLE MINOR (SPECIALIZATION)														
Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
							Theory				Practical		Total	
			TH	TU	PR	Total	CT1	CT2	TA	ESE	ICA	ESE		
MN5	ME1741	Minor Track Course 5 From Basket	3				15	15	10	60			100	3
MN6	ME1741	Minor Track Course 6 From Basket	3				15	15	10	60			100	3
	Total		6				30	30	20	120			200	6

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SEMESTER –VIII														
Category	**Course Code**	**Name of the Course**	**Teaching Scheme**				**Evaluation Scheme**							**Credits**
								Theory			**Practical**		**Total**	
			TH	TU	PR	Total	CT1	CT2	TA	ESE	ICA	ESE	Total	
RM	SH1801	Research Methodology (Online through SWAYAM/NPTEL)	4			4	15	15	10	60			100	4
EM2	ME1802	Entrepreneurship Management Course	3			3	15	15	10	60			100	3
IN	ME1803	Internship (Online reviews - one in each month)									100	200	300	12
		Total	7			7	30	30	20	120	100	200	500	19

Note: Internship Guide Teaching load: 4 hrs/week

LIST OF PROGRAM ELECTIVES					
	PE1 ME1504	**PE2 ME1603**	**PE3 ME 1604**	**PE4 ME1703**	**PE5 ME1705**
A	IC Engine	Refrigeration and Air Conditioning	Computational Fluid Dynamics	Power Plant Engineering	Automobile Engineering
B	Mechatronics	Total Quality Management	Operations Research Technique	Production Planning and Control	Computer Integrated Manufacturing
C	Mechanical Vibration	Machine Tool Design	Industrial Robotics	Computer Aided Design	Product Design and Development
	SWAYAM/NPTEL etc related to vertical approved by DFB	**SWAYAM/NPTEL**etc related to vertical approved by DFB	**SWAYAM/NPTEL**etc related to vertical approved by DFB	**SWAYAM/NPTEL**/etc related to vertical approved by DFB	**SWAYAM/NPTEL**etc related to vertical approved by DFB

SWAYAM/NPTEL etc. portal. Courses for PE1 to PE5 should be related to concerned vertical approved by DFB and should be **at least of 12 weeks** including tutorials.

LIST OF MULTIDICIPLINARY MINOR COURSES:

Sr. No.	Offering Department	Name of Programme /Minor Course	Students from Department who can register
1	CSE	Data Science	CE,ME,EE,ENTC,INST
		Artificial Intelligence	CE,ME,EE,ENTC,INSTR
2	IT	Machine Learning	CE,ME,EE,ENTC,INST
		Software Engineering	CE,ME,EE,ENTC,INST
3	ENTC	IOT	CE,ME,EE,CSE,IT,INST
		Electronics and Telecommunication Engg.	CE,ME,EE,CSE,IT,INST
4	ME	Mechanical Engineering	CE,EE,ENTC,CSE,IT,INS
		Automation & Robotics	CE,EE,ENTC,CSE,IT,INS
		Industrial Management	ME,CE,ENTC,CSE,IT,EE,INST
5	CE	Building Construction and Management	ME,EE,ENTC,CSE,IT,INST
		Business Economics	ME,EE,ENTC,CSE,IT,INST,CE
6	EE	Energy Engineering	ME,CE,ENTC,CSE,IT,INST
		Electrical Motors & Drives	ME,CE,ENTC,CSE,IT,INST
7	INST	Instrumentation and Control	ME,CE,ENTC,CSE,IT,EE
		Banking and Finance	ME,CE,ENTC,CSE,IT,EE,INST

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Name of Programme /Minor Course	Course Code	Civil Engineering		Mechanical Engineering			Electrical Engineering	
		Building Technology (TRACK-I)	Business Economics (TRACK-II)	Mechanical Engineering (TRACK-I)	Automation & Robotics (TRACK-II)	Industrial Management (TRACK-III)	Energy Engineering (TRACK-I)	Electrical Motors & Drives (TRACK-II)
MinorCourse-1	XX1315/16/17	CE1315 Basics of Civil Engineering	CE1316 Principles of Macroeconomics	ME1315 Production Technology	ME1316 Hydraulics and Pneumatics	ME1317 Organizational Behaviour	EE1315 Introduction to Renewable Energy	EE 1316 Electrical Motors
MinorCourse-2	XX1415/16/17	CE1415 Building Construction	CE1416 Principles of Microeconomics	ME1415 New and Renewable Energy Sources	ME1416 Automation in Manufacturing	ME1417 Human Resource Management	EE1415 Energy Resources, Environment and Economics	EE 1416 Special Electrical Machines
MinorCourse-3	XX1515/16/17	CE1515 Building Planning & Drawing	CE1516 Business Statistics	ME1515 Automobile Engineering	ME1516 Mechatronic Systems	ME1517 Material Management	EE1515 Energy Efficiency in Electrical Utilities	EE 1516 Power Electronics
MinorCourse-4	XX1615/16/17	CE1615 Building Estimates & Tendering	CE1616 Financial Accounting	ME1615 Basic of Product Design	ME1616 Industrial Robotics	ME1617 Marketing Management	EE1615 Energy Management	EE 1616 Electrical Drives and Control
MinorCourse-5	XX1715/16/17	CE1715 Construction Management	CE1716 Minor Project	ME1715 Industrial Management and Quality Control	ME1716 Computer Integrated Manufacturing	ME1717 Corporate Financial Reporting and Analysis	EE1715 Project	EE 1716 Project

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Name of Programme /Minor Course	Course Code	Electronics Engineering		Computer Engineering		Information Technology		Instrumentation Engineering	
		Internet of Things (TRACK-I)	Electronics and Telecommunication Engg. (TRACK-II)	Data Science (TRACK-I)	AI (TRACK-II)	Machine Learning (TRACK-I)	Software Engineering (TRACK-II)	Instrumentation and Control (TRACK-I)	Banking and Finance (TRACK-II)
MinorCourse-1	XX1315/16	ET1315 Introduction to internet of things	ET1316 Digital Circuits	CS1315 Fundamentals of data science	CS1316 Introduction to Artificial Intelligence	IT1315 Essential math for machine learning	IT1316 Data Structure & Algorithms	IN1315 Industrial Measurement I	IN1316 Bank operations Management
MinorCourse-2	XX1415/16	ET1415 IoT Architecture & Protocols	ET1416 Communication Engineering	CS1415 Computational Data Analytics	CS1416 Data Mining	IT1415 Artificial Intelligence	IT1416 Software Engineering	IN1415 Industrial Measurement II	IN1416 Strategic management and innovation in banking
MinorCourse-3	XX1515/16	ET1515 Programming with Arduino and Raspberry-Pi	ET1516 Microprocessor &Embedded System	CS1515 Natural Language Processing	CS1516 Introduction to Machine Learning	IT1515 Machine learning Foundation	IT1516 Object Oriented Design & Programming	IN1515 Control system Engineering	IN1516 Security analysis and portfolio management
MinorCourse-4	XX1615/16	ET1615 Industrial Internet of Things	ET1616 Wireless Communication	CS1615 Application of data science	CS1616 Optimization Methods in Machine Learning	IT1615 Fundamentals Deep Learning	IT1616 Software Testing	IN1615 Industrial Automation	IN1616 Spreadsheet based data analysis
MinorCourse-5	XX1715/16/17	ET1715 Project	ET1716 Project	CS1715 Marketing Analytics for Big Data	CS1716 Human Applications of AI	IT1715 Minor Project	IT1716 Minor Project	IN1715 Programming for PLAC,DCS & SCADA	IN1716 IT operations &Management

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	LIST OF OPEN ELECTIVE COURSES		
	OE-I	**OE-II**	**OE-III**
Course Code	SH1401	SH1501	SH1701
A	**Appreciating Indian Music**	**Environmental law**	**Operational Research**
B	**Introduction to Human Psychology**	**Cyber law**	**Digital Marketing**
C	**Nanotechnology, Science and Application**	**Introduction to Mass Communication**	**Biology for Engineers**
D	**Geo informatics**	**Foreign Language Japanese (N5) /German (A1)**	**Foreign Language Japanese(N4) /German(A2)**
	SWAYAM/NPTEL **https://onlinecourses.nptel.ac.in/noc22_hs57/preview** **https://onlinecourses.nptel.ac.in/noc24_hs39/preview** **https://onlinecourses.nptel.ac.in/noc19_mm21/preview** **https://onlinecourses.nptel.ac.in/noc24_hs86/preview**	**SWAYAM/NPTEL**	**SWAYAM/NPTEL**

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LIST OF PROGRAM ELECTIVES HONOR'S COURSES (Swayam/NPTEL)	
COURSE CODE	**<Name of Area >**
ME1521	THERMAL/PRODUCTION/DESIGN
ME1522	THERMAL/PRODUCTION/DESIGN
ME1621	THERMAL/PRODUCTION/DESIGN
ME1622	THERMAL/PRODUCTION/DESIGN
ME1721	THERMAL/PRODUCTION/DESIGN
ME1722	THERMAL/PRODUCTION/DESIGN

.

LIST OF MINOR COURSES FOR DOUBLE MINOR (SPECIALIZATION)							
COURSE CODE	**Civil Engineering**	**Mechanical Engineering**				**Information Technology**	**Instrumentation Engineering**
ME1541	CE1541/ABC	ME1541 Supply Chain Management					
ME1542		ME1542 Thermal and Fluid Engineering					
ME1641		ME1641 Energy Conservation and Management					
ME1642		ME1642 Industrial Robotics					
ME1741		ME1741 Operations Research					
ME1742		ME1742 CAD-CAM					

Sample Guidelines for the Honour with Research Project

The purpose of this course is to introduce students to the process of conducting research projects/work. The students will be helped to conceptualise, design and execute a research project by a teacher guide.

Stage-1:

- Student have to complete online course related to topic/perquisite course prescribed by the assigned guide/BOS

  OR
- The focus will be on discussions and analysis of assignments. Learners will be encouraged to read books and research journals related to his/her research topic (literature review, theory and hypotheses etc) and share them in the seminars and evaluated by two member Team of department and same to be enter in ICA format.

Stage-2:

Sample steps:

- Research design/Methodology
- Sampling tool of data collection
- data processing and analysis
- Plan of research report
- Publish review paper in peer view journal/Scopus indexed journal and seminar on it
- The faculty supervisor will assess the method and procedures used by the learner
- At end evaluated by two member Team of department

Stage-3:

- If applicable initiate Actual implementation
- Data Analysis and Interpretation: The outcome of the research is presented in tabular form with the help of statistical procedures. The data are analysed and interpreted and presented in the form of a research report and presenatation/seminar.

- Report writing
- Publish paper on findings in peer view journal/Scopus indexed journal.
- Two member Team of department will assess the Findings method and procedures
- The faculty supervisor will assess the presentation of major findings depending on the methodology used, presentation of results, interpretation of the results with discussion, summary of the proposed research problem and conclusion.
- Two member Team of department (may evaluated by Guide and external expert) will assess the Findings method and procedures etc

Note : Guide Teaching load : 4 Hrs per student in Research stage -1 /2/3

IIIRD SEMESTER

Course Code	SH1301(B)	Course category	BS06
Course Name	Partial Differential Equation and Transform		

Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory				Practical		Total	
				CT	TA	ESE	ESE Duration	ICA	ESE		
03	01	00	04	30	10	60	2 hrs 30 min	00	00	100	04

Course Objectives:

1. To learn Laplace transform and its properties. Apply it to solve differential equation
2. To introduce the solution methodologies Partial Differential Equations.
3. To study applications of partial differential equations in vibration of string and heat flow.
4. To learn vector calculus and their applications
5. To introduce Random variables and Probability distributions.

Laplace Transform: (9 hours)

Definition**,** Properties of Laplace Transform, Laplace transform of periodic functions. Inverse Laplace transform, convolution theorem, unit step function, delta function, evaluation of integrals by Laplace transform, solving ODEs by Laplace Transform method.

Partial Differential Equations: (9 hours)

Solutions of first order linear and nonlinear PDEs, Solution to homogenous and non-homogenous linear partial differential equations of second order by complimentary function and particular integral method.

Applications of Partial Differential Equations: (9 hours)

Method of separation of variables, equation of vibrating string, solution of wave equation by D'Alembert's method, one dimensional heat flow, two dimensional heat flow.

Vector Calculus: (9 hours)

Scalar and vector fields, line and surface integrals, gradient, divergence and curl, directional derivative, line integral independent of path, Green's, Gauss divergence and Stoke's theorems (

Without proofs) and their simple applications

Random variables and Probability Distributions: (9 hours)

Random variables, Discrete and Continuous random variables, Distribution functions, Probability distribution of continuous random variable. Joint distribution of discrete and continuous random variables, Conditional distribution, Mathematical expectation, Mean, moments and variance. Mean and variance of Binomial, Poisson and Normal distributions.

Textbooks:

1. Higher Engineering Mathematics, B.S. Grewal, Khanna Publishers,2020,44th edition.
2. A text book of Engineering Mathematics, N.P. Bali and Manish Goyal, Laxmi Publications, Reprint, 2023.

References:

1. Advanced Engineering Mathematics, Erwin Kreyszig, 9th Edition, John Wiley & Sons, 2006.
2. Introduction to Probability Theory,P. G. Hoel, S. C. Port and C. J. Stone, Universal Book Stall, 2003 (Reprint).
3. A First Course in Probability, S. Ross, 6th Ed., Pearson Education India, 2002.
4. Advanced Engineering Mathematics, H.K.Das, S.Chand & Company Pvt.Ltd,2014.
5. Higher Engineering Mathematics, B.V,Ramana, Tata Mc Graw Hill Publishing company Ltd.,New Delhi,2008,6th edition.
6. Advanced Engineering mathematics, Reena Garg, Khanna book publishing company, 2021

Course Outcomes:

After successful completion of this course student will be able to

1. Learn Laplace transform and its properties. Apply it to solve differential equation
2. Introduce the solution methodologies Partial Differential Equations.
3. Study applications of partial differential equations in vibration of string and heat flow.
4. Learn vector calculus and their applications
5. Introduce Random variables and Probability distributions

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	3	-	-	-	-	-	-	-	2	-	-
2	3	3	3	3	3	-	-	-	-	-	-	-	2	-	-
3	3	3	3	3	3	-	-	-	-	-	-	-	2	-	-
4	3	3	3	3	3	-		-	-	-	-	-	2	-	-
5	3	3	3	3	3	-	-	-	-	-	-	-	2	-	-

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Course Code	ME1301	Course category	PC3
Course Name	THERMODYNAMICS		

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	01	00	04	15	15	10	60	2 hrs 30 min	00	00	100	04

Course Objectives:

1. To learn heat and work interactions between system and its surroundings, and energy balance
2. To apply I law of thermodynamics to various energy conversion devices
3. To evaluate the change in properties of substances during various energy conversion processes
4. To understand the difference between high grade and low grade energy
5. To comprehend the limitations imposed by II law of thermodynamics on energy conversion

Course Contents:

Fundamentals : System and Control volume, Properties of a system, State and Equilibrium, The State Postulate, Processes and Cycles, Steady Flow Process; Temperature and Zeroth Law of Thermodynamics, Temperature Scales, Temperature Measurement Devices, Pressure and Pressure Measurement Devices, Density and Specific Gravity.

Energy, Energy Transfer and Energy Analysis : Energy and various forms of energy, Internal Energy, Heat and energy transfer by Heat, Mechanism of Heat Transfer; Work, Electrical Work and forms of Mechanical Work; First Law of Thermodynamics and Energy Balance, Mechanisms of energy transfer to and from a system, Flow Energy, Energy conversion efficiencies, Implications of energy conversion on environment.

Pure Substances – Phases and Phase-Change Processes of Pure Substances, Definition of saturated states, Property diagrams for Phase-Change Processes, P-v-T Surface, Property Tables, Ideal Gas & ideal gas equation of state, Ideal gas mixtures, Real gases and Real gas mixtures, Compressibility Factor, Other equations of state, Specific heats; Internal energy, enthalpy and specific heats of ideal gases, Internal Energy, enthalpy and specific heats of liquids and solids, Use of Steam Tables and R-134a Tables, Mollier's Chart.

First Law for Flow Processes – Conservation of Mass Principle, Mass balance for steady-flow process**,** Flow work and Energy of a flowing fluid**,** Derivation of general equation for a control volume starting from Conservation of Mass Principle, Application of conservation of mass and conservation of energy equation

to steady and unsteady-flow control volumes such as nozzles, compressors, turbines, throttle valves, mixing chambers and heat exchangers.

Second Law – Introduction and need for Second law, Thermal energy reservoirs, reversible and irreversible processes, heat engines, refrigerators and heat pumps, Kelvin-Planck and Clausius Statements of Second law of Thermodynamics, Application of Second law to cycles and cyclic devices, Thermodynamic Temperature Scale, Carnot Cycle, Carnot Principles, idealized Carnot heat engines, refrigerators and heat pumps Thermal efficiency and COP of heat engines, refrigerators and heat pumps.

Entropy – Clausius Inequality, Definition of Entropy to quantify the second law effects, Increase of entropy principle, Entropy change during process for a pure substance, incompressible substances and ideal gas, Isentropic Process, Reversible Steady-flow work, Isentropic efficiency for various steady-flow devices, Entropy Balance. Irreversibility and Availability, Availability functions for systems and control volumes undergoing different processes, Lost Work, Second law analysis for a control volume, Second law efficiency.

Thermodynamic Cycles – Basic Gas power and Vapor power cycles and their simple analysis.

Text Books:

1. Thermodynamics: An Engineering Approach, Yunus Cengel and Michael Boles, 9th Edition, Mc-Graw-Hill Publication, 2019
2. Engineering Thermodynamics, P. K. Nag, 6th Edition, McGraw-Hill, 2017

Reference Books and Websites:

1. Fundamentals of Thermodynamics, Claus Borgnakke, Richard E, Sonntag, 10th Edition, Wiley, 2020.
2. Fundamentals of Engineering Thermodynamics, Michael J. Moran, Howard N. Shapiro, Daisie D. Bottener, Margaret B. Bailey, 9th Edition, Wiley, 2018.
3. Engineering Thermodynamics, J. B. Jones and R. E. Dugan, 1st Edition, Prentice-Hall, 1996
4. Thermodynamics, Kinetic Theory and Statistical Thermodynamics, Roger Sears and Salinger, 3rd Edition, Narosa Publishing House, 2019.

Course Outcomes:

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

ME1302.1	Apply energy balance to systems and control volumes in situations involving heat and work interactions
ME1302.2	Evaluate changes in properties of pure substances
ME1302.3	Evaluate and compare the performance of energy conversion devices
ME1302.4	Differentiate between high grade and low grade energies
ME1302.5	Analyze the impact of energy wastage and degradation on environment

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CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1302.1	3	2	-	-	-	-	-	-	-	-	-	-	2	2	-
ME1302.2	3	2	-	-	--	-	-	-	-	-	-	-	3	2	-
ME1302.3	3	2	-	-	--	-	1	-	-	-	-	-	3	2	-
ME1302.4	2	1	1	-	-	1	1	-	-	-	-	1	2	-	-
ME1302.5	3	2	1	-	-	-	2	-	-	-	-	1	2	1	-

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

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Course Code	ME1302	Course category	PC4
Course Name	MANUFACTURING PROCESS		

Teaching Scheme				Examination Scheme								Credits
				Theory					Practical		Total	
Th	Tu	Pr	Total	CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	00	00	03	15	15	10	60	2 hrs 30 min	0	0	100	03

Course Objectives

I. To identify the necessity and importance of manufacturing.

II. To learn the fundamentals of major classes of manufacturing processes.

III. To understand the working principles of different casting and welding operations

IV. To differentiate between these processes in terms of application, function, advantages,

Disadvantages, quality and productivity

Pattern Making and Mould Design: Introduction to basic manufacturing processes, Pattern materials, allowances, Types of patterns, Design considerations in pattern making, Color codes for patterns and core boxes. Basic principle and Terminology of sand casting, gating system, types of gate ,Risers design, Risering aids, Directional and Progressive solidification. General properties of moulding sands, Types of sands, testing of moulding sand, Mold hardness. Preparation of sand moulds of different types, Moulding processes, core making.

Technology of melting and special casting methods: Melting furnaces pit, open hearth, gas fired cupola and electric hearth furnaces, cupola operation development in cupola melting, Electric furnaces - Direct Arc, Indirect arc and electric induction furnace, Selection of furnace. Modernization and Mechanization of Foundries, permanent mold casting, slush casting, shell molding, Investment or lost wax casting, vacuum process, centrifugal casting, Continuous casting, Die casting equipments and processes for Gravity, pressure and vacuum casting methods, Comparison between casting methods.

Defects, Inspection and testing of casting: Origin and classification of defects, shaping faults, Inclusions and sand defects, Gas defects, shrinkage defects, contraction defects, dimensional errors. Radiography, ultrasonic, Eddy current testing, fluorescent penetrate test.

Mechanical working of metals: Principle of Hot and cold working processes, Different types of hot and cold working processes, e.g. Rolling, types of rolling forging operations, extrusion, piercing, pipe and tube production, manufacture of seamless pipe and tubing. Spinning, embossing and coining, squeezing and bending operations, rotary swaging

Processing of plastics: Compression, Transfer, Injection, Extrusion. Blow moulding, Rotational moulding and calendaring.

Joining processes: Introduction to riveting, soldering and brazing.

Welding: Introduction to different types of welding processes Arc welding, TIG welding: working principle and its application, MIG- welding, working principle and its application.

SAW welding**,** working principle and its application, Resistance welding, Working principle and its applications

Other welding processes: Working principle and applications of Friction Welding, Forge Welding, Plasma arc, and Thermit Welding. Ultrasonic, Electro slag, Electron Beam, laser welding.

Welding defects, Testing and Inspection of welds: Various welding defects, weld testing methods. Weld ability. Welding symbols.

Surface treatment: Introduction to surface treatment

Text Books:

1. Manufacturing Process-II H. S.Bawa, 3 rd Edition, Tata Mc Graw hill Publishing Co. Ltd.2004
2. Workshop Technology-I, B. S. Raghuwanshi, 2 nd Edition, Dhanpat Rai and Sons, 2001

References Books:

1. Manufacturing Science Ghosh and Malik, Affiliated East – West PressLtd, 3rd Edition, 2002
2. Processes and Materials of Manufacture, R A LindBerg, 2nd Edition,PHI Pub 2001
3. Rao P N Manufacturing Technology : Metal Cutting and Machine tools, 3rd Edition, Tata McGraw Hill 2001
4. Workshop Technology, Hajra Chaudhary, 4 th Edition, Dhanpat Rai and Sons 2001

Course Outcomes:

After completion of course, student will be able to:

ME 1303.1 Able to understand principles of casting, forming, welding and plastic processing.

ME 1303.2 Able to understand advantages and limitations of casting, forming, welding Processes.

ME 1303.3 Able to understand cause and remedies for different types of defects in cast, Formed, welded product.

ME 1303.4 Able to select appropriate manufacturing process based on function, material, Quality requirement, production volume of a product.

ME 1303.5 Able to find out defects in welding and understand surface treatment

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME 1303.1	2	2	-	-	-	-	1	-	-	-	-	-	2	1	-
ME 1303.2	3	2	-	-	--	-	-	-	-	-	-	-	2	2	-
ME 1303.3	2	3	-	-	--	-	1	-	-	-	-	-	3	1	-
ME 1303.4	2	1	1	-	-	1	2	-	-	-	-	1	3	-	-
ME 1303.5	2	2	1	-	-	-	1	-	-	-	-	1	2	1	-

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

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Course Code	ME1303	Course category	PC5
Course Name	FLUID MECHANICS		

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	01	00	04	15	15	10	60	2 hrs 30 min	00	00	100	04

Course Objectives:

To make the students aware and understand:

I. To recognize the basic principles and equations of fluid mechanics
II. To distinguish the various types of fluid flow problems encountered in practice
III. To apply laws of mass and momentum conservation for fluid flow system
IV. To analyze the mathematical problem of different fluid flow systems
V. To formulate the equation by using methods of dimensional analysis

Course Contents:

Fluid Statics: Definition of fluid, Newton's law of viscosity, Units and dimensions-Properties of fluids, mass density, specific volume, specific gravity, viscosity, compressibility and surface tension, pressure at a point in fluid, variation of pressure with depth, fluid application to manometer, vapor pressure, cavitation's.

Fluid Kinematics: Types of flow- Methods of describing fluid motion- Velocity and acceleration, Stream line, Streak line, Path line, Stream tube, Stream function, Velocity potential, Flow net- uses, limitations and methods of drawing, Discharge, Control volume- application of continuity equation and momentum equation, Incompressible flow.

Fluid Dynamics: Euler's equation of motion, Bernoulli's equation and its applications, assumption and limitations, Flow measurement, velocity measurement, Energy gradient line and Hydraulic gradient line, Impulse momentum equation, momentum correction factor.

Flow in Channels: Exact flow solutions in channels and ducts, Couette and Poiseuille flow, laminar flow through circular conduits and circular annuli- concept of boundary layer – measures of boundary layer thickness – Darcy Weisbach equation, friction factor, Moody's diagram, minor losses in pipes and fittings.

Dimensional Analysis: Need, Methods of dimension analysis – Similitude – types of similitude Dimensionless parameters – application of dimensionless parameters – Model analysis

Text Books:

1. Introduction to Fluid Mechanics and Fluid Machines, S. K. Som and G. Biswas, 2nd Ed Tata McGraw Hill Education Publishing Company Limited, 2007
2. Fluid mechanics and Hydraulic machines, Dr. R. K. Bansal , 9th Edition, Laxmi Publication, Delhi, 2005

Reference Books and Websites:

1. Fluid Mechanics Fundamentals and Application, Yunus A. Cengel and John M. Cimbala, 4th Edition, McGraw Hill, 2013
2. Fluid Mechanics, F.M. White, 4th International Editions, McGraw-Hill, 2005
3. Fluid Mechanics, Streeter, 7th Edition, Tata McGraw Hill (SI), 2000

Course Outcomes:

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

ME1304.1 Identify the fluid flow system and solve problems involving fluid properties.
ME1304.2 Apply conservation laws to fluid flow problems in engineering applications
ME1304.3 Recognize of laminar and turbulent flow in pipes and the analysis of fully developed flow
ME1304.4 Evaluate the major and minor losses associated with pipe flow in piping networks and determine the pumping power requirements
ME1304.5 Develop the equation by using methods of dimensional analysis

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1304.1	2	2	-	-	-	-	-	-	-	-	-	-	2	-	-
ME1304.2	2	3	1	2	--	-	-	-	-	-	-	-	3	-	-
ME1304.3	3	2	1	2	--	-	-	-	-	-	-	-	2	-	-
ME1304.4	3	2	1	-	-	-	1	-	-	-	-	-	3	-	-
ME1304.5	2	1	1	-	-	-	-	-	-	-	-	-	2	-	-

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Course Code	ME1304	Course category	VSE1
Course Name	FLUID MECHANICS LAB		

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
00	00	02	02	00	00	00	00	---	25	25	50	01

Course Objectives:

To make the students will be able to:

1. Validate the various theory concept practically by demonstrating the experiments
2. Acquire hand on experience to use the various measuring instrument for the fluid flow
3. Analyze the various frictional losses in fluid flow
4. Develop the practically evaluating ability in the different situation of fluid flow
5. Utilize this practical knowledge for upcoming related subject and research work

Course Contents:

Minimum eight experiments are to be performed from the list given below.

List of Practical

1. Measurement of fluid pressure
2. Verification of Bernoulli's equation
3. Determination of Reynolds number
4. Determination of co-efficient of friction for pipes
5. Determination of Coefficient of Discharge of given Venturi meters
6. Determination of Coefficient of Discharge of given Orifice meters
7. Determination of the density and friction factor of oil flow in a pipe
8. Analysis of velocity distribution in Boundary layer and its thickness
9. Determination of head loss due to sudden enlargement and contraction
10. Determination of losses in bends and elbows
11. Analysis of flow through pipes in series and parallel

Course Outcomes:

At the end of this course, students will demonstrate the ability to

ME1305.1 Tabulate various properties of fluids

ME1305.2 Characterize the performance of fluid systems

ME1305.3 Analyze the various frictional losses in fluid flow

ME1305.4 Identify the types of flow by using flow demonstrator

ME1305.5 Develop the experimental set-up and analyze for performance

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1306.1	2	2	-	-	-	-	-	1	2	-	-	-	2	1	1
ME1306.2	2	-	-	-	-	-	-	1	2	-	-	-	2	1	1
ME1306.3	2	2	-	-	-	-	-	1	2	-	-	-	2	1	1
ME1306.4	2	-	-	-	-	-	-	1	2	-	-	-	2	1	1
ME1306.5	2	-	-	-	-	-	-	1	2	-	-	-	2	1	1

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Course Code	ME1305	Course category	VSE2
Course Name	MANUFACTURING PROCESSES LAB		

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
00	00	02	02	--	--	--	--	--	50	---	50	01

Course Objectives:

I. To understand making of pattern using pattern making tools for sand casting
II. To learn the preparation of two box green sand mould using pattern
III. To understand the construction and Working principle of metal melting furnace
IV. To understand the preparation of a composite job with the help of Electric Arc welding and Gas welding.
V. To learn the principles of sheet metal working and learn how to prepare a job on bending Machine

List of Experiments:

1. Pattern Making Shop: Study of different types of patterns and pattern making tools, One Job on preparation of a pattern.
2. Foundry Shop: Study of any two furnaces, Study of foundry tools, Demonstration of Casting Sand preparation and testing. One job on preparation of green sand mould.
3. Welding Shop: Preparation of a composite job with the help of Electric Arc Welding, TIG-MIG welding and Gas welding.
4. Sheet Metal Working Demonstration of Mechanical and Hydraulic presses. Preparation of a job on bending Machine.

Note: ICA: The Internal Continuous Assessment shall be based on practical record and knowledge/skills acquired. The performance shall be assessed experiment wise by using continuous assessment formats.

ESE : The evaluation will be based on Job prepared by the student and viva

Course Outcomes:

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

ME1306.1 Make a pattern using pattern making tools

ME1306.2 Prepare two box green sand mould

Sign Member Secretary | Sign BoS Chairperson | Sign Dean, Academics | Sign Principal

ME1306.3 Create casting of Aluminum from the pattern prepared by the student.

ME1306.4 Prepare a Job on Injection Moulding machine.

ME1306.5 Prepare a composite job on different welding processes

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1305.1	3	2	-	-	-	-	-	1	3	-	-	-	2	2	1
ME1305.2	3	-	-	-	-	-	-	2	1	-	-	-	1	1	2
ME1305.3	3	2	-	-	-	-	-	1	2	-	-	-	2	1	1
ME1305.4	3	-	-	-	-	-	-	2	2	-	-	-	1	1	2
ME1305.5	3	-	-	-	-	-	-	1	3	-	-	-	2	2	1

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Course Code	CS1310							Course category			EM1
Course Name	IDEA LABORATORY										
Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
-	-	02	02	-	-	-	-	-	50	-	50	01

Course Objectives:

1. Understand design thinking and innovation concepts and approaches.
2. Understand the problems faced by society.
3. Identify new and unaddressed social needs.
4. Design and development of Small project based on Laboratory equipment like Machine hardware, Electronic hardware and software etc.

Students are expected to complete work in group of max.three students in pertaining to following aspects under the supervision of course coordinator/teacher.

1. Demonstration of modern manufacturing facilities available at the institute
2. Demonstration of automation and programming tools.
3. Active Sessions on brainstorming, creativity, idea generation, problem-solving techniques and new product development.
4. Visit social sites for the identification of social needs and community problems. The report on this visit is to be submitted.
5. Identification of product problems through customer surveys.
6. The minor project based on hardware (along with software if desire).
7. Building prototype and identifying modifications.
8. Write a project report.
9. The Course Coordinator/Teacher may arrange demonstration with poster presentation of all minor projects developed by the students at the end of semester.

Course Outcomes:

CS1310.1 Gain knowledge of design thinking and innovation with the modern machines and devices available in the idea lab.

CS1310.2 Generate different ideas for innovative products through ideation and brainstorming.

CS1310.3 Identify, discuss and justify the technical aspects of the chosen idea with a comprehensive and systematic approach.

CS1310.4 Design and develop innovative products for specific problems considering user- centric perspective and market.

CS1310.5 Communicate and report effectively project related activities.**References Books:**

1. Ulrich, Karl T., Steven D. Eppinger, and Maria C. Yang. Product design and development Vol. 4. Boston: McGraw-Hill higher education, 2008.
2. Mueller-Roterberg, Christian. "Handbook of design thinking." Independently publish 2018 (2018).
3. Koh, Joyce Hwee Ling, et al. Design thinking and education. Springer Singapore, 2015.
4. Uebernickel, Falk, et al. Design thinking: The handbook. World Scientific, 2020.
5. Woolery, Eli. Design thinking handbook. In Vision, 2019.

Web Resource:

1. https://www.coursera.org/learn/uva-darden-design-thinking-innovation?action=enroll
2. https://www.mygreatlearning.com/academy/learn-for-free/courses/design-thinking

Note:-ICA – The Internal Continues Assessment shall be based on project development and knowledge/skill acquired. The performance shall be assessed experiment wise using continues assessment format A and B.

CO-PO-PSO Mapping

CO	PO / PSO														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CS1310.1															
CS1310.2															
CS1310.3															
CS1310.4															
CS1310.5															

0- Not Correlated 1-Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

Sign Member Secretary | Sign BoS Chairperson | Sign Dean, Academics | Sign Principal

IVTH SEMESTER

Course Code	ME1401							Course category			PC6
Course Name	MACHINE DESIGN - I										
Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	01	00	04	15	15	10	60	03 Hrs.	00	00	100	04

Course Objectives:

I. To develop proficiency in fundamental concept of design
II. To develop an ability identify, formulate and design the mechanical component used in industry
III. To develop analytical skill in designing basic mechanical components
IV. To develop computational skills in designing basic mechanical components used for general purposes
V. To understand the use of design data book for selection of material, strength and standard dimensions.

Course Contents:

Introduction: Steps of design, Design Principle, Design consideration for dynamic and static load, selection of materials, designation of material as per ISI, Various codes and standards.

Simple Stresses : Simple stresses, factor of safety, Hertz constant stress, thermal stresses, impact stress, torsional stress, bending in straight and curved beams and application to hooks, c-clamps, Biaxial stress, theories of failure.

Variable Stresses: Fatigue and Endurance limit, factors influencing fatigue, surface finish, stress concentration, Stress Intensity Factor, notch sensitivity, combined steady and variable stresses, Gerber Line, Sordbergs line.

Design of screw and bolted Joints: Forms and Threads, types of Fastening, standard dimensions stresses due to screwing up and external forces, stresses due to combination of screwing up and external force, bolts of uniform strength, bolted joints for eccentric loads.

Design of Riveted Joints: Method of riveting, types of rivets and fixed joints, caulking, fullering, failures, strength and efficiency of riveted joints, joints of boiler shell, eccentric loaded joint.

Welded Joints: Types of welding and joints, strength of transverse and parallel fillet welded section, axially loaded unsymmetrical welded section, eccentrically loaded joint.

Design of springs: Types of spring, stresses in helical springs, Wahl's stress factor, bulking and surge, design of compression, tension, spiral helical and flat spiral springs, Introduction of leaf spring, material and construction, nipping, design of spring.

Design of Power Screw: Types of threads, torque required to raise loads, efficiency and helix angle, overhauling and self-locking of screw, acme threads, stresses in power screw.

Design of Leaver: Types and Design Procedure.

Note: - Use of Design Data Book will be permitted during the examination.

Text Book:

1. Mechanical Engineering Design, Joseph E.Shigley and Charles R.Mischke, Tata McGraw Hill Publication, 11th Edition,2020
2. Design of Machine Element, V.B.Bhandari, Tata McGraw Hill Publications, 5th Edition, 2020

Reference Books:

1. Design of Machine Element, C.S.Sharma & Kamlesh Purohit, Prentice Hall of India Publications New Delhi, 4th Edition,2003
2. Machine Design- A basic Approach , Dr S.S.Wadhwa & S.S.Jolly, Dhanpatrai and Company, 3RD Edition ,2012

Design Data Book:

1. Design Data Book for Mechanical Engineers, K.Mahadevanan & K.Balaveera Reddy, CBS Publishers & Distributor Delhi, 4th Edition 2008
2. Design Data Book – B.D.Shiwalkar, Central Techno Publication Nagpur, 2nd Edition 2007

Course Outcomes: After completion of course, students will be able to:

ME1402.1 Illustrate basic principle of machine design

ME1402.2 Analyze the stress and strain on mechanical components; and understand, identify and quantify failure modes for mechanical parts

ME1402.3 Demonstrate and design n basic machine elements used in machine design such as bolted joint, riveted and welded joint

ME1402.4 Apply the design and development procedure for different types of springs by using Design Data Hand book

ME1402.5 Design Power screw and develop the analytical ability to check different stresses in power Screw

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1402.1	2	3	2	0	0	0	0	0	0	0	0	0	3	2	0
ME1402.2	2	0	2	3	0	0	0	0	0	0	0	0	2	3	0
ME1402.3	2	0	3	0	0	0	0	0	0	0	0	0	0	3	0
ME1402.4	2	0	2	3	0	0	0	0	0	0	0	0	0	3	0
ME1402.5	2	0	2	3	0	0	0	0	0	0	0	0	0	3	0

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Course Code	ME1402								Course category			PC7
Course Name	THERMAL ENGINEERING											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	00	00	03	15	15	10	60	2 hrs 30 min	00	00	100	03

Course Objectives:

I. Understand gas compressor classifications, working principles, and performance parameters, including methods for improving efficiency.

II. Compare reciprocating and rotary compressors, evaluating their industrial applications and operational differences.

III. Analyze flow through nozzles, considering velocity, heat drop, and critical pressure ratio, and determine throat and exit areas.

IV. Explore refrigeration and air conditioning principles, including vapor compression cycles, psychrometry, and adiabatic mixing.

V. Investigate vapor power cycles, including the Rankine cycle variations, and assess their thermal efficiency and power output.

Course Contents:

Vapour Power Cycles

Carnot cycle using steam, ideal Rankine cycle, modified Rankine cycle, Reheat and Regenerative cycles with bleeding of steam, thermal efficiency, specific steam consumption, work ratio, power output, effect of superheat, inlet pressure and back pressure on performance of Rankine cycle (Numerical Treatment)

Flow Through Nozzles: Velocity and heat drop, Classification of Nozzle, mass discharge through a nozzle, critical pressure ratio and its significance, effect of friction and nozzle efficiency, determination of throat and exit areas, concept of supersaturated flow and Wilson line, elementary simple problems on determination of throat and exit areas.

Steam Turbines: Types of steam turbines such as impulse, reaction turbines, Compounding. Velocity diagrams. Graphical and analytical methods for work and power determination, axial thrust and efficiency. Need of Governing, Methods of Turbine governing and control

Gas Compressors

A) Industrial Applications of compressed air, Classifications and working principles, **Reciprocating compressors**, terminology, Performance parameters, methods of compression for improving isothermal efficiency, clearance volume and its effect on work done and volumetric efficiency, actual indicator diagram, multistage compression, condition for minimum work in two stag compression, inter-cooling and its effects (Numerical problems on reciprocating compressors)

B) **Rotary compressors:** working principles, Roots blower, Vane type blower, Centrifugal compressor, axial flow compressor, Comparison between reciprocating and rotary compressors, air motor (Descriptive treatment only).

C) **Refrigeration:** Principle of refrigeration, Applications, Unit of refrigeration, Carnot vapour cycle and its limitations. Vapour compression Refrigeration cycle and Coefficient of Performance. Vapour absorption refrigeration systems, Numericals based on Vapour compression Refrigeration cycle

Air-conditioning: Principle of Air conditioning, classification and applications of Air conditioning system, Psychrometry, Psychrometric chart, Psychrometric processes related to Air conditioning. Adiabatic Mixing of two Air-streams. Elementary simple problems based on Psychrometric chart only.

Text Books:

1. Ballaney P.L., "Thermal Engineering", Khanna Publications, New Delhi, 2014
2. Domkundwar S, Kothandaraman C. P. & Domkundwar A., "A Course in Thermal Engineering", Dhanpat Rai and Co. publication, New Delhi, 2004
3. Basic and Applied Thermodynamics, P.K. Nag. 2nd Edition, Tata Mc-Graw Hill Pub. 2010.
4. Thermal Engineering by Mahesh M Rathore, 3rd Edition, Tata Me-Graw Hill, 2010

Reference Books:

1. Domkundwar & Domkundwar, "Introduction to Thermal Power Engineering", Dhanpatrai and Sons, New Delhi, 2014
2. Thermodynamics-An Engineering Approach, Y. A. Cengel and M. A. Boles, 3rd Edition, Mc-Graw Hill, 1998
3. Applied Thermodynamics, Onkar Singh, 3rd Edition, New Age International Publishing, 2009.
4. Power Plant Engineering, P.K. Nag, 3rd Edition, Tata Me-Graw Hill Publishing, 2008
5. Rajadurai J S, "Thermodynamics and Thermal Engineering", New Age Publishers, N. Delhi, 2010

Course Outcomes:

After completing the course, students will able to:

ME1403.01. Analyze the performance and efficiency of various vapor power cycles, including the Rankine cycle and its modifications, through numerical treatment, considering factors such as superheat, inlet pressure, and back pressure

ME1403.02. Determine the mass discharge through a nozzle and assess the effect of friction on nozzle efficiency

ME1403.03. Apply graphical and analytical methods to determine work, power, and efficiency of steam turbines, and analyze the performance of steam turbines

ME1403.04. Analyze the performance parameters and efficiency improvements of reciprocating and rotary compressors, including multistage compression process

ME1403.05. Understand basic concepts of refrigeration, air conditioning and analyze psychrometric processes using psychrometric charts in air conditioning systems

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1403.01	2	3	2	2	0	1	2	1	1	1	2	2	3	3	1
ME1403.02	2	3	3	2	0	1	2	1	1	1	2	2	2	3	1
ME1403.03	2	3	3	2	0	1	2	1	1	1	2	2	3	3	1
ME1403.04	2	3	2	2	0	1	2	1	1	1	2	2	3	3	1
ME1403.05	2	3	3	2	0	1	2	1	1	1	2	2	2	3	1

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Course Code	ME1403								Course category			PC8
Course Name	MACHINING PROCESSES											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	00	00	03	15	15	10	60	2:30 HRS.	00	00	100	03

Course Objectives:

I. To identify the necessity and importance of machining processes.

II. To learn the fundamentals of metal cutting and cutting force analysis.

III. To understand the working principles various machine tools.

IV. To differentiate between various machining processes

V. To understand principle and applications of unconventional Machining Process

Theory of Metal cutting: Mechanics of Metal cutting, Cutting parameters, chip formation & types, Tool materials, Tool Geometry, Tool life, Tool wear types, Cutting forces and power consumption, Cutting fluid classification, Machining forces and merchants force circle diagram.

Lathe: Mechanical Construction, classification of lathe machine, specifications, Operations and accessories of center lathe, introduction of capstan &turret lathe, introduction to Automatic screw machines.

Drilling: Introduction, Working principle, Classification general purpose, Mass production and special purpose drilling machines, drill tool geometry.

Boring: Gear producing machines, Introduction, classification & mechanical construction of gear producing machines. Horizontal, Vertical and jig Boring machine.

Broaching and Reaming: Introduction, Working principle, classification, mechanical construction.

Milling: Introduction, Working principle, Classification, Types of Milling Cutters, Dividing head, Compound and differential indexing, Climb & conventional milling, applications Grinding: Introduction, Working principle, Classification, types of bonds & Abrasive, grinding wheel specification, selection of wheel, super finishing processes. Shaper, Planer,

Slotter: Introduction, Working principle, mechanical construction, classification **Unconventional Machining Processes Mechanical Processes:** - Ultrasonic Machining - principle and applications, process parameters, Abrasive and water abrasive jet machining.

Thermal processes: - Election Beam Machining - Generation of beam, principle and applications, Laser Beam machining

Plasma-arc machining- Concept and generation of plasma, principle of PAM, applications. Electro Chemical Machining- Classification, fundamentals, Electro mechanical milling. Electric Discharge Machining – EDM, wire EDM, Mechanism of material removal, process parameters, advantages and applications.

Text Books:

1. Workshop Technology Vol II, H S Bawa, 2nd Edition, Tata Mc Graw Hill, 2008

2. Workshop Technology Vol II, B S Raghuwanshi, 10th Edition Dhanpat Rai & Sons, Delhi, 2009

References Books:

1. Processes and Materials of Manufacture, R A Lind Berg, 5th Edition PHI Publication, 2001.

2. Manufacturing Science, A. Ghosh and Bhattacharya. 2nd Edition East West Publication, 2001

3. Workshop Technology Vol. – I, II & III, Chapman, 4th Edition, Standard Publishers Distributors, New Delhi, 2010

Course Outcomes: After Completion of Course, the students will able to

ME1404.1 Understand working principles of various machine tools
ME1404.2 Calculate the machining forces and power in different machining processes.
ME1404.3 Differentiate between various machining processes

ME1404.4 select of machining processes for a particular application

ME1404.5 understand Applications of unconventional Machining Processes

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1404.1	2	3	2	0	0	0	0	0	0	0	0	0	3	2	0
ME1404.2	2	0	2	3	0	0	0	0	0	0	0	0	2	3	0
ME1404.3	2	0	3	0	0	0	0	0	0	0	0	0	0	3	0
ME1404.4	2	0	2	3	0	0	0	0	0	0	0	0	0	3	0
ME1404.5	2	0	2	3	0	0	0	0	0	0	0	0	0	3	0

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Course Code	ME1404							Course category			PC9
Course Name	MACHINE DRAWING AND DRAFTING LAB										
Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory				Practical		Total	
				MSE	TA	ESE	ESE Duration	ICA	ESE		
00	00	02	02	00	00	00	---	50	00	50	01

Course Objectives:

I. To develop the technical knowledge regarding CAD & drawing.
II. To impart the fundamental knowledge in designing and drafting.
III. To develop the practical knowledge in the field components drafting.
IV. To impart the students with necessary skills for drafting and modelling machine components using CAD tools.
V. To draw and draft machine components

It is representative list of practical. The instructor may choose minimum eight Sheet from the list given below.

List of Drawing and Drafting:

PART A: Sheets (one each) by using Drawing sheet and Sketchbook

1. Sectional Views of objects
2. Developments of surfaces
3. Intersection of solids

PART B: Drawing of following machine elements using Pro/Engineer/CATIA Software (four sheets)

1. Pedestal Bearing
2. Lathe tool post coupling
3. Screw Jack
4. Stuffing box
5. Cotter joint
6. Knuckle joint
7. Flange Coupling
8. Rivet and Rivet Joints

Part C: One sheet on: ISI Conventions for various components like bearing, gears, springs and keys, threads, tap holes and materials

Note:

ICA: The Internal Continuous Assesment shall be based on practical record and knowledge/skills acquired.

Reference Books and Websites:

1. Machine Drawing, Narayan, K.L.Reddy 2nd Edition, New AGE International Publishers, 2004
2. Machine Drawing, P. J. Shah, 3rd Edition, Shah Publishers, 1997
3. Computer Graphics & Design, P. Radhakrishnan, 3rd Edition, Dhanpat Rai & Sons, 2009
4. Using AUTOCAD, James E Fuller, 9th Edition, Denmark Publishing Company, 2004
5. Machine Drawing, R.K. Dhawan, 4th Edition, S.Chand & Co., 2006

Course Outcomes:

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

ME1405.1 Demonstrate the complete methodology of drawing and drafting
ME1405.2 Develop the skills in designing the automobile engine components using software like Pro/Engineer/CATIA etc.
ME1405.3 Assemble Machine Parts and their usages in practical design in manufacturing fields
ME1405.4 Construct an assembly drawing using part drawing of machine components.
ME1405.5 Represent tolerances and the levels of surface finish of machine elements.
Develop skills to model the behavior of structure under mechanical and thermo-mechanical loads

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1405.1	2	-	-	-	-	-	-	1	2	-	-	-	2	1	1
ME1405.2	2	-	-	-	-	-	-	1	2	-	-	-	2	1	1
ME1405.3	2	2	-	-	-	-	-	1	2	-	-	-	2	1	1
ME1405.4	2	3	-	-	-	-	-	1	1	-	-	-	2	1	1
ME1405.5	2	2	-	-	-	-	-	1	1	-	-	-	2	1	1

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Course Code	ME1405								Course category			PC10
Course Name	THERMAL ENGINEERING LAB											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
00	00	02	02	--	--	--	--	--	50	--	50	01

Course Objectives:

I. Acquire practical knowledge of boiler operation by studying Babcock & Wilcox and Benson boilers, including their components and working principles.

II. Explore the functions of boiler mountings and accessories, understanding their significance in ensuring boiler safety and efficiency.

III. Learn experimental techniques for determining the calorific value of solid and gaseous fuels using Bomb and Boy's Gas calorimeters, respectively.

IV. Explore methods for determining steam dryness fraction using separating and throttling calorimeters

V. Develop hands-on skills in evaluating the performance of various thermal engineering systems, including reciprocating air compressors, IC engines and vapor compression refrigeration systems

Course Contents:

The student shall perform minimum eight experiments of the following

List of Experiments

1 Study of any two boilers: Babcock & Wilcox boiler and Benson boiler

2 Study of mountings and accessories of boilers.

3 Study and or determination of C.V. of solid fuel using Bomb Calorimeter.

4 Study and or determination of C.V. of gaseous fuels using Boy's Gas calorimeter

5 Determination of dryness fraction of steam using tank calorimeter.

6 Determination of dryness fraction of steam using separating and throttling calorimeter.

7 Trial on two stage reciprocating air compressor

8	Performance Evaluation of Vapour Compression Refrigeration system
9	Heat balance test on a single / Multi cylinder SI/CI engine
10	Visit to industry related to Thermal Engineering (power plant/milk processing plant/cold storage)

Course Outcomes:

After completion of this course students will be able to:

No.	Course Outcomes
ME1406.01	Develop a comprehensive understanding of boiler operation, including the principles and functionalities of Babcock & Wilcox and Benson boilers
ME1406.02	Understand the significance of boiler mountings and accessories for safety and efficiency
ME1406.03	Acquire practical skills in determining the calorific values of solid and gaseous fuels using Bomb and Boy's Gas calorimeters, respectively, and interpreting the results for energy assessment and analysis.
ME1406.04	Demonstrate proficiency in determining the dryness fraction of steam through experimental techniques using both tank and separating/throttling calorimeters.
ME1406.05	Evaluate the performance of thermal engineering systems such as reciprocating air compressors, vapor compression refrigeration systems, and internal combustion engines through practical trials and tests, developing skills in equipment assessment, troubleshooting, and optimization

Assessment

ICA – The Internal Continuous Assessment shall be based on practical record and knowledge or skills acquired. The performance shall be assessed experiment wise by using continuous assessment.

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1406.01	3	1	1	1	2	2	2	2	3	3	2	3	2	3	2
ME1406.02	3	1	1	1	2	2	2	2	3	3	2	3	2	3	2
ME1406.03	2	2	2	2	2	2	3	2	3	3	2	3	2	3	2
ME1406.04	2	1	1	1	0	1	1	1	3	3	2	3	2	3	2
ME1406.05	2	2	1	2	2	1	2	1	3	3	3	3	2	3	2

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Course Code	ME1406							Course category			VSE3
Course Name	MACHINING PROCESS LAB										
Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
00	00	02	02	00	00	00	00	00 Hrs	25	25	50	01

Course Objectives:

I. To identify the necessity and importance of machining processes.
II. To learn the fundamentals of metal cutting and cutting force analysis.
III. To understand the working principles various machine tools.
IV. To differentiate between various machining processes
I. To understand principle and applications of unconventional Machining Process

Course Content:

Representative list of practical is given below. The instructor may select any 03 practical's from the list.

1. Demonstration of operations on lathe, shaper, drilling, Milling Machine and EDM
2. One job on lathe covering taper turning, threading and other operations.
3. One composite job on shaper, milling, drilling, grinding machine.
4. Calculation of machining force on lathe , milling and drilling
5. Part programming and preparation of job on CNC Milling machine

ICA: The Internal Continuous Assessment shall be based on practical record and knowledge/skills acquired. The performance shall be assessed experiment wise by using continuous assessment formats, A&B

ESE: The end semester Exam for practical shall be based on performance in one of the experiments and viva voice

Course Outcomes: After Completion of Course, the students will able to

ME1404.1 Understand working principles of various machine tools

ME1404.2 Calculate the machining forces and power in different machining processes.

ME1404.3 Differentiate between various machining processes

ME1404.4 select of machining processes for a particular application

ME1404.5 understand Applications of unconventional Machining Processes

CO – PO – PSO Mapping

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1405.1	3	2	1	0	0	0	0	0	0	0	0	0	3	2	0
ME1405.2	2	2	3	2	0	0	0	0	0	0	0	0	0	3	0
ME1405.3	2	2	2	3	0	0	0	0	0	0	0	0	0	2	0
ME1405.4	2	2	3	3	0	0	0	0	0	0	0	0	0	2	0
ME1405.5	2	2	1	2	0	0	0	0	0	0	0	0	0	1	0

Not Correlated 1 - Weakly Correlated 2- Moderately Correlated 3-Strongly Correlated

Sign Member Secretary | Sign BoS Chairperson | Sign Dean, Academics | Sign Principal

Course Code	SH 1402								Course category			CC1
Course Name	CO-CURRICULAR COURSE											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
00	00	04	04	00	00	20	00	--	--	--	20	02

Co-Curricular Course Activities minimum hours: 2 hours per week or 24 hours
Co-Curricular Course: Active Participation in Activities such as: Health and wellness, Sports, yoga education, Tech-fest, College Club Activity, University level/ college level cultural activities, Drama, painting, fine/ applied/ visual performing arts, annual day, department student's association/IE/ISTE/Any professional body, paper presentation, foreign language certificate, NCC, NSS etc. Co-Curricular Course Activities minimum hours: 2 hours per week or 24 hours."

OPEN ELECTIVE-1

Course Code	**SH1401A**							**Course Category**			**OE1**
Course Name	**Appreciating Indian Music**										
Teaching Scheme				**Examination Scheme**							**Credits**
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT-1	Ct-2	TA	ESE	ESE Duration	ICA	ESE		
03	-	-	03	15	15	10	30	2 hrs 30 min	-	-	100	03

Course Objectives:

1. To familiarize students with the historical and cultural context of Indian Classical Music.
2. To introduce students to the fundamental concepts of raga, tala, and improvisation.
3. To develop students' listening skills through analysis and appreciation of classical music recordings.
4. To provide students with practical training in basic vocal or instrumental techniques.
5. To encourage critical thinking and reflection on the aesthetic and philosophical aspects of Indian Classical Music.

Course Contents:

Introduction to Indian Music:
Historical overview: origins, evolution, and major developments, definitions (sangeet, swar and its types, saptak and its types, aroha, aavaroha, pakad, alankar, wadi swar, sanvadi swar,varjit swar, sthayi and antara) Regional variations and prominent classical music traditions (Hindustani and Carnatic). Influence of spirituality, mythology, and philosophy on Indian Classical Music.

Fundamentals of Raga:
Understanding the concept of raga (melodic framework) and its elements, Notation systems and the role of improvisation within the framework of raga (Paluskar and Bhatkhande lipi), Different THAATs and their brief information, Definition of Raga, Sargam geet, the concept of Khyal , aalap and tana, Raga and Time Association, Basic ragas (Bhupali, Yaman, Bhimpalasi and Kedar) along with Aaroha, avaroha, pakad and sargam geet and khyal.

Introduction to Taala:
Understanding the components of a tala cycle (Defining- Taal, Lay and its types, matras, theaka, sum,tali, kaal, avartan).
Study of common talas (Teental, Rupak, Kehrarva, Dadra and Bhajni Theaka)
Practical exercises in clapping and counting rhythms to internalize talas.

Introduction to Musical Instruments:
Classification of Indian Musical Instruments (String, wind, percussion and Solid

Instruments), components parts of Indian classical instruments along with neat sketch
Biography- Ustad Zakir Husen (Tabla), Pandit Appa Jalgaokar (Harmonium)
Pandit Ravi Shankar (Sitar), Pandit Hari Prasad Chaurasiya (Flute), Dr. N Rajam (Violin)

Textbooks:

1. Indian Classical Music By Ravi S. Prasanna
2. Appreciating Indian Music By Emmons E. White
3. Fundamental of Indian Music By. S. Sharma.

References:

1. Indian Music By Dr. Thakur J. Sing
2. Finding the Raga By Amit Choudhari.
3. History of Indian Music By B. A. Pingle
4. Raga Harmony By L. Subramaniam

Course Outcomes:

After successful completion of this course student will be able to

SH1401A.1: Students will demonstrate an understanding of the historical development and cultural significance of various genres and styles of Indian music.
SH1401A.2: Students will understanding classical, folk, and contemporary forms, by discussing key historical milestones and movements.
SH1401A.3: Students will be able to applying knowledge of musical elements such as raga, tala, swara, and laya to identify stylistic features, structural patterns, and aesthetic qualities.
SH1401A.4: Students will develop skills and competencies relevant to careers in music education.
SH1401A.5: Students will develop skills and competencies relevant to research, arts administration, cultural advocacy, or related fields, preparing them for further academic pursuits or professional endeavors in the music industry.

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
SH1401A.1	1	0	0	0	0	1	2	2	3	0	0	0
SH1401A.2	1	0	0	0	0	1	2	2	3	0	0	0
SH1401A.3	1	0	0	0	0	1	2	2	3	0	0	0
SH1401A.4	1	0	0	0	0	1	2	2	3	0	0	0
SH1401A.5	1	0	0	0	0	1	2	2	3	0	0	0

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

Course Code	SH1401B							Course Category			OE1
Course Name	Introduction to Human Psychology										
Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT-1	CT-2	TA	ESE	ESE Duration	ICA	ESE		
03	-	-	03	15	15	10	60	2 hrs 30 min	-	-	100	03

Course Objectives:

To make the students will be able to:

1. Understand the human behaviour.
2. Helps humans in exerting more control over situations
3. Basic cognitive processes that guide human behaviours.
4. Tackling everyday problems and attaining optimal solutions
5. Knowledge about human cognitive systems in designing sophisticated Artificial Intelligence (AI) systems.

Course Contain:

Introduction to Cognitive Psychology:

- History,
- Theory
- Research in Human Cognition

Basic Cognitive Processes:

- Object Perception and Recognition
- Attentional Processes and cognition
- Memory Introduction
- Long Term Memory

Organizational Knowledge:

- Memory of general knowledge.
- Concept Formation
- Visual and Spatial Memory

The Use of Knowledge:

- Human language skills.
- Thought process and Problem Solving
- Reasoning
- Decision Making

Textbooks:

1. Kathleen Galotti, Cognitive Psychology, Cengage Learning.
2. Robert Stenberg, Applied Cognitive Psychology, Cengage Learning.

References:

1. Bridger Riegler, Cognitive Psychology, Pearson Press
2. Stephen Kosslyn, Cognitive Psychology, PHI Press

Course Outcomes:

At the end of this course, students will demonstrate the ability to
SH1401B.1: To learn history of Human Psychology.
SH1401B.2: To understand, theory and research in Human Psychology.
SH1401B.3: To learn the Basic Cognitive Processes.
SH1401B.4: To understand about Organizational Knowledge.
SH1401B. 5: Apply the knowledge of human Psychology to developed process of problem solving, reasoning, decision making.

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
SH1401B.1	2	3	0	0	0	0	0	1	2	0	0	0
SH1401B.2	2	0	0	0	0	0	0	1	2	0	0	0
SH1401B.3	2	2	0	0	0	0	0	1	2	0	0	0
SH1401B.4	2	0	0	0	0	0	0	1	2	0	0	0
SH1401B.5	2	2	0	0	0	0	0	1	2	0	0	0

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

Course Code	SH1401C							Course Category			OE1
Course Name	Nanotechnology, Science and Application										
Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT-1	Ct-2	TA	ESE	ESE Duration	ICA	ESE		
03	-	-	03	15	15	10	60	2 hrs. 30 min	-	-	20	00

Course Objectives:

Students will be able to:
1. To understand the history, background and nature of Nano science and nanotechnology as well as the quantum and Nano sized scale effect on materials.
2. To acquire theoretical understanding of different types of nanostructure
3. To understand the synthesis technique and its types.
4. To learn the different methods of characterization.
5.Aim to approach towards advance research and application of nanoparticals.

Course Contents:

Basics of Nanoscience:

Introduction, Effect of reduction of dimensions on physical properties, History of Nanotechnology, Quantum size effect,

Different classes of Nanomaterial's:

Classification based on dimensionality-Quantum Dots, Wells and Wires, preparation of quantum nanostructures, conduction electrons and dimensionality, Fermi gas and density of states, potential wells, partial confinement, properties dependent on density of states, exitons, single electron tunnelling.

Material Synthesis Method:

Nanostructures of one dimension: Crystalline growth, Template based synthesis. Nanostructures of two dimensions: Fundamentals of thin film growth, physical vapour deposition, chemical vapour deposition, atomic layer deposition, self-assembly, Sol-Gel films, and electrochemical deposition.

Material Characterization Methods:

UV visible microscopy, Scanning electron microscopy (SEM), Transmission electron microscope (TEM), x-ray diffraction (XRD). Atomic Force Microscope (AFM)

Application of Nanomaterial's:

Agriculture field, Medical field, Space Technology, Food Technology, Water Treatment, Energy Sector, Automobile, Electronics Field, Textile Field, Cosmetic.

Textbooks:

1. Introduction to Nanotechnology by C.P. Poole Jr. and F.J. Oweus, Wiley Interscience
2. Nano-Technology by Gregory Timp (Editior), AIP Press, Springer.
3. Pradeep T., "A Textbook of Nanoscience and Nanotechnology", Tata McGraw Hill Education Pvt. Ltd.

Reference Books and website links:

1. Hari Singh Nalwa, "Nanostructured Materials and Nanotechnology", Academic Press
2. Graphene: Synthesis and applications, edited by Wonbong Choi and Jo-won Lee.
3. Semiconductor Nanostructures and Nanodevices Vol 1-5-A. A. Balandin, K. L.Wang.
4. Springer Handbook of Nanotechnology: Bharat Bhushan
5. Nanofabrication towards biomedical application: Techniques, tools, Application and impact: Ed. Challa S., S. R. Kumar, J. H. Carola
6. A. S. Edelstein and R. C. Cammarata, "Nanomaterials: Synthesis, Properties and Applications", Institute of Physics Pub., 1998.
7. G. Cao, Nanostructures & Nanomaterials: Synthesis, Properties & Applications , Imperial College Press, 2004.
8. G.A. Ozin and A.C. Arsenault, "Nano chemistry : A chemical approach to nanomaterials", Royal Society of Chemistry, 2005.
9. Joel I. Gersten, "The Physics and Chemistry of Materials", Wiley, 2001.
10. K.W. Kolasinski, "Surface Science: Foundations of Catalysis and Nanoscience", Wiley, 2002.
11. Physical Chemistry – Atkins Peter, Paula Julio.

12. Nanotechnology in Biology and Medicine: Methods, Devices, and Applications.

Course Outcomes:

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

SH1401C.1: To learn basic of Nano science with special, emphasize on nanomaterial's.
SH1401C.2: Correlate physical behavior of materials at the Nano scale.
SH1401C.3: Understand the physical, chemical and other important methods for synthesis of nanoparticles.
SH1401C.4: Understand the various characterization techniques of Nano materials.
SH1401C.5 Apply the knowledge gained to suggest different applications of Nano science and technology.

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
SH1401C.1	2	0	2	0	0	0	0	0	1	2	2	3
SH1401C.2	3	2	3	0	2	0	2	0	0	3	2	3
SH1401C.3	3	2	3	2	0	0	3	3	1	3	3	3
SH1401C.4	3	2	3	2	2	0	2	0	0	3	3	3
SH1401C.5	3	2	3	2	2	0	3	1	0	3	3	3

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Course Code	SH1401D							Course Category			OE1
Course Name	Geo informatics										
Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT-1	Ct-2	TA	ESE	ESE Duration	ICA	ESE		
03	-	-	03	15	15	10	60	2 hrs. 30 min	-	-	20	00

Course Objectives

To make the students aware and understand:

1. The fundamental concepts of Geoinformatics, including Geographical Information Systems (GIS), Remote Sensing (RS), and Global Positioning Systems (GPS).
2. The functionalities and applications of various Remote Sensing and GIS software.
3. The importance of data acquisition, database development, and analysis in a GIS environment.
4. The significance of spatial data structures, GIS analysis, and pre-processing techniques.
5. The real-world applications of Geoinformatics in engineering fields through case studies.

Course Contents;

Fundamentals of Remote Sensing: Principles of Remote Sensing and Electromagnetic Radiation (EMR). Interaction mechanisms of EMR with the Earth's surface and image formation. Types and characteristics of sensors and platforms used in Remote Sensing.

Remote Sensing Data Analysis: Types of satellite data products in visible and other bands. Multiband concept and spectral signatures for different Earth features. Visual image interpretation and digital image processing methods. Basics of Photogrammetry and its Applications in Remote Sensing.

Global Positioning System: Fundamentals of GPS technology. Working principles of satellite-based navigation systems. Applications of GPS in mapping, navigation, and surveying.

Geographic Information System (GIS): Components of GIS: Hardware, software, data, and users. Methods of spatial data acquisition and attribute data management. Pre-processing, storage, and database management in GIS. Raster and vector data structures and their significance. GIS analysis functions and spatial queries.

Applications of Geoinformatics in various fields of Engineering including hands on exercises.

Text Books:

1. James B. Cambell, 'Introduction to Remote Sensing', Taylor & Francis.
2. John R Jensen, 'Introductory Digital Image Processing: A Remote Sensing Perspective', Prentice Hall, New Jersey
3. M. Anji Reddy, 'Text book of Remote Sensing and GIS', BS Publications

Reference Books:

1. Thomas Lillesand, Ralph W. Kiefer, Jonathan Chipman Remote Sensing and Image Interpretation, 7th Edition, Wiley Publication
2. George Dr. Joseph Fundamentals of Remote Sensing, University Press.

Course Outcomes (COs):

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

SH1401D.1	Explain the fundamental principles of Remote Sensing, GIS, and GPS
SH1401D.2	Apply knowledge of data acquisition, pre-processing, and GIS database management.
SH1401D.3	Utilize different Remote Sensing and GIS software for spatial analysis and visualization.
SH1401D.4	Analyses and interprets multispectral remote sensing data for practical applications.
SH1401D.5	Implement GIS-based solutions for various engineering applications including environmental monitoring, urban planning, and disaster management.

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
SH1401D.1	3	2	1	0	1	2	2	1	0	1	0	2
SH1401D.2	3	3	2	2	2	2	2	1	0	1	0	2
SH1401D.3	3	3	3	3	3	2	2	0	0	1	0	2
SH1401D.4	3	3	3	3	3	2	3	0	2	3	2	2
SH1401D.5	3	3	3	3	3	2	3	0	2	3	2	2

0- Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

Exit criteria for UG Diploma

Course Code	ME1411							Course category			EX2
Course Name	CASTING AND FORGING PART DESIGN LAB										
Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory				Practical		Total	
				MSE	TA	ESE	ESE Duration	ICA	ESE		
00	00	00	00	00	00	00	00	50	00	50	04

Course Objectives:

I. Introduce the fundamental of Casting and Forging**.**
II. Articulate the working principal of Metal Casting and Forging.
III. Illustrate the concept of design of Casting, Design of gating system and Forging parts.
IV. Interpret the different concept of patterns and forging operations.
V. Understand the principle of hydraulic press

Course Contents:

1. **List of Practical's**
   1. Design of pattern for a given job
   2. Design and Preparation of mould for a given job
   3. Aluminium casting for the prepared mould
   4. Preparation of a Forging job
   5. Prepare a job on mechanical/ hydraulic press.

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

ME1411.1 Design a pattern for a given job

ME1411.2 Design and Preparation mould for a given job
ME1411.3 Prepare Aluminium casting of a given Pattern
ME1411.4 Prepare a job using forging process
ME1411.5 Prepare a job on mechanical/ hydraulic press.

ICA: The Internal Continuous Assessment shall be based on practical record and knowledge/skills acquired. The performance shall be assessed experiment wise by using continuous assessment formats, A&B

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1411.1	3	3	1	0	0	0	0	0	0	0	0	0	3	2	0
ME1411.2	1	2	3	2	0	0	0	0	0	0	0	0	0	3	0
ME1411.3	1	1	1	1	0	0	0	0	0	0	0	0	0	1	0
ME1411.4	2	1	3	3	0	0	0	0	0	0	0	0	0	1	0
ME1411.5	2	1	3	3	0	0	0	0	0	0	0	0	0	1	0

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Course Code	ME1412							Course category			EX2
Course Name	CNC PROGRAMMING										
Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
00	00	00	00	00	00	00	00	00	50	00	50	04

Course Objectives:

1. To understand the working principles and classifications of CNC Machine
2. To understand different types of CNC MAHCINE
3.
4. To learn the codes for CNC part programming
5. To learn Simulation of CNC part programming
6. To learn the operation of CNC machine.

Course Contents:

List of Practical's

1. CNC Part programming CODES
2. CNC Part programming
3. SIMULATION CNC Part programs
4. Preparation of job on CNC Lathe
5. Preparation of job on CNC Milling

Course Outcomes: After Completion of Course, the students will be

ME1412.1 Able to understand basics of CNC machine

ME1412.2 Able to understand basics of AutoCAD

ME1412.3 Able to understand necessity, principle, advantages, disadvantage, limitations, applications of Machining Processes

ME1412.4 Able to understand the importance of reaming operation

ME1412.5 Able to understand laser welding technique

ICA: The Internal Continuous Assessment shall be based on practical record and knowledge/skills acquired. The performance shall be assessed experiment wise by using continuous assessment formats, A&B

CO – PO – PSO Mapping

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO2	PSO3
ME1412.1	3	3	1	0	0	0	0	0	0	0	0	0	3	2	0
ME1412.2	1	2	3	2	0	0	0	0	0	0	0	0	0	3	0
ME1412.3	1	1	1	1	0	0	0	0	0	0	0	0	0	1	0
ME1412.4	2	1	3	3	0	0	0	0	0	0	0	0	0	1	0
ME1412.5	2	1	3	3	0	0	0	0	0	0	0	0	0	1	0

Not Correlated 1 - Weakly Correlated 2- Moderately Correlated 3-Strongly Correlated

Course Code	ME1413							Course category			EX2
Course Name	Internship / Technical Project										
Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
00	00	08	08	--	--	--	--	--	50	00	50	08

Course Objectives:

1. Gain practical experience in a professional setting relevant to their field of study.
2. Apply theoretical knowledge and technical skills to solve real-world problems or contribute to ongoing projects.
3. Develop professional competencies such as communication, teamwork, problem-solving, and project management.
4. Reflect on personal and professional growth, identify areas for improvement, and set future career goals.
5. Build professional networks and establish connections with industry professionals for potential career opportunities.

Note :

1. The student should complete the internship of 01 month in industry as per the internship policy of the institute**.**
2. The student should complete the technical project within 01 month on any area of Mechanical Engineering under the supervision of the guide assigned by the department.

Course Outcomes:

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

ME1413.01 **Practical Application of Engineering Principles**: Students should be able to apply theoretical knowledge gained in their coursework to real-world situations encountered during the internship or technical project. This includes demonstrating an understanding of fundamental engineering concepts and their application in solving practical problems in industrial and project settings.

ME1413.02 **Professionalism and Work Ethic:** Students should exhibit professionalism, punctuality, and reliability in their work ethic throughout the internship or technical project. This includes adhering to workplace norms, meeting deadlines, and effectively managing their time and resources to achieve project objectives.

ME1413.03 **Problem-Solving and Critical Thinking:** Students should demonstrate the ability to analyze complex problems, identify alternative solutions, and make informed decisions based on sound engineering principles and practical considerations. This involves applying logical reasoning, creativity, and innovation to overcome challenges encountered during the internship or technical project.

ME1413.04 **Communication and Collaboration Skills:** Students should effectively communicate their ideas, findings, and project outcomes to supervisors, colleagues, and other stakeholders. This includes presenting technical information in a clear and concise manner, actively participating in team meetings and discussions, and collaborating with others to achieve common goals.

ME1413.05 **Reflective Learning and Growth:** Students should engage in reflective practices to assess their experiences, identify areas for improvement, and set goals for personal and professional development. This involves keeping a journal or log to document their experiences, reflecting on successes and failures, and actively seeking feedback from mentors and peers to enhance their learning and performance.

Assessment

Internal assessment: Student will be assigned a mentor for carrying out the internship or technical project. Student will submit the report of the work carried out by student during internship or technical project. Mentor will assess the students at the end of 8 weeks.

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1413.01	3	2	3	3	3	1	2	-	1	-	1	2	3	3	3
ME1413.02	-	-	1	1	1	3	2	3	-	1	-	1	-	1	-
ME1413.03	3	3	3	3	3	1	-	-	2	1	1	2	2	2	-
ME1413.04	1	1	2	2	-	2	-	1	3	3	1	3	1	1	2
ME1413.05	2	-	1	1	2	1	1	-	1	1	2	3	2	2	2

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

VTH SEMESTER

Course Code	ME1501								Course category			PC
Course Name	HEAT TRANSFER											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	00	00	03	15	15	10	60	2 hrs 30 min	00	00	100	3

Course Objectives:

To make the students aware and understand:

1. Concept of heat transfer and their mechanism
2. Heat transfer through thermal system
3. Local and average heat transfer coefficient
4. Natural convection from various bodies
5. Design of heat exchangers

Course Contents:

Basic modes of Heat Transfer & their mechanisms : Introduction, Conduction: Fourier law of heat conduction, Thermal conductivity, General conduction equation, thermal diffusivity, One Dimensional, steady-state, heat transfer, Concept of thermal resistance and electrical analogy, Conduction through composite slab/cylinders/spheres, Contact resistance, Overall heat transfer coefficient, Critical thickness of Insulation,

Analysis of extended surfaces: Rectangular profile longitudinal fins/ spines

Unsteady state heat conduction: Lumped system analysis, variation of temperature with time and space in one dimensional system

Forced Convection: Flow over flat plate, Hydrodynamic & Thermal boundary layer, Prandtl Number, Nusselt Number, Reynolds Number, Local and average heat transfer coefficient, Convection equation and solution for flat plate, Empirical relations for external flows, internal flow and its thermal analysis

Natural Convection: Natural Convection from vertical plate, Grashoff's Number, Rayleigh's Number, Empirical relations for natural convection from various bodies.

Condensation: Filmwise and Dropwise condensation, Nusselt theory for filmwise condensation on vertical plates, Pool Boiling Curve

Radiation : Laws of Radiation, Black body, Grey body & Coloured body, Emissivity, Black body radiation, Shape factor & its properties, Radiation exchange: black surfaces, diffuse, gray surfaces

Heat Exchanger: Classification of heat exchangers, LMTD Approach for parallel & counter flow heat exchangers, NTU approach for parallel/ counter flow heat exchangers, Design aspects of heat exchangers. Introduction to heat pipe

Text Books:

1. Sachdeva R C, “Fundamentals of Engineering Heat and Mass Transfer” New Age International, 2017
2. Kothandaraman C.P “Fundamentals of Heat and Mass Transfer” New Age International, New Delhi, 2006
3. Sukhatme, S. P., "A Textbook on Heat Transfer", Orient Longman Ltd Bombay, 1985

Reference Books:

1. Holman, J. P., "Heat Transfer", McGraw Hill, 8th Edition, 2003

2. Incropera, F.P., Dewitt, D. P., “Fundamental of Heat & Mass Transfer”, John Wiley & Sons, 4th 1996.

3. Ozisik M N. Heat Transfer, A Basic Approach, Tata McGraw Hill, 1996

Course Outcomes:

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

ME1501.1 Illustrate the basic laws of heat transfer
ME1501.2 Estimate heat transfer through thermal system
ME1501.3 Understand Empirical relations for external flows
ME1501.4 Understand convection from various bodies
ME1501.5 Design of heat exchangers

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1501.1	3	2	1	-	-	-	-	-	-	-	-	2	2	1	-
ME1501.2	3	2	1	-	-	-	-	-	-	-	-	2	2	1	-
ME1501.3	3	2	2	-	-	-	-	-	-	-	-	2	2	1	-
ME1501.4	3	1	1	-	-	-	1	-	-	-	-	2	2	1	-
ME1501.5	3	2	1	-	-	-	-	-	-	-	-	2	2	1	-

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

CO – PO –PSO Mapping AS PER NBA JULY 2024 FORMAT (wef, 1st JAN 2025)

Course Outcomes	Program outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
ME1501.1	3	2	1	-	-	-	-	-	-	-	2	2	1	-
ME1501.2	3	2	1	-	-	-	-	-	-	-	2	2	1	-
ME1501.3	3	2	2	-	-	-	-	-	-	-	2	2	1	-
ME1501.4	3	1	1	-	-	-	-	-	-	-	2	2	1	-
ME1501.5	3	2	1	-	-	-	-	-	-	-	2	2	1	-

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Course Code	ME1502								Course category			PC
Course Name	THEORY OF MACHINE											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	00	00	03	15	15	10	60	2 hrs 30 min	00	00	100	03

Course Objectives:
To make the students aware and understand:

1. Displacement, velocity, and acceleration at any point of the link of the mechanism.
2. Basic concepts of toothed gearing and find velocity ratios of gear trains.
3. Effects of friction in machine elements
4. Forces on different machine parts by different methods.
5. Effects of unbalances and write the equations for motions of vibrating machine parts.

Contents:
Kinematics of Mechanisms: Mechanisms – Terminology and definitions- Kutzbach Criterion-Grublers Criterion –Degree of Freedom kinematics inversions of 4 bars and slide crank chain-– kinematics analysis in simple mechanisms – velocity and acceleration polygons

CAMS: Classification of Followers-Classification of Cams-Uniform Velocity- Terms use in radial cams, motion of the followers, Displacement, velocity, acceleration diagram with uniform velocity Displacement, velocity, acceleration diagram with SHM, Displacement, velocity, acceleration diagram with uniform acceleration and retardation Displacement, velocity, acceleration diagram with cycloidal motion, Construction of Cam profile design, cams with specified contours.

Friction: Types of friction, friction between lubricated & unlubricated surface, limiting friction, law of statics, kinetic friction, law of solid friction, coefficient of friction angle of response, friction in general bearing & friction in collar bearing, friction clutch, single plate clutch, multiple plates, multiple discs, cone clutch, centrifugal clutch.

Gears and Gear Trains: Spur gear – law of toothed gearing – involute gearing – interchangeable gears – Gear tooth action interference and undercutting – nonstandard teeth – gear trains – parallel axis gears trains – epicyclic gear trains – automotive transmission gear trains.

Balancing and Vibration: Static and Dynamic balancing – Balancing of revolving and reciprocating masses – Balancing machines – free vibrations- Forced Vibrations- Damped Vibration-Vibrating isolation.

Text Books:

1. Rattan. S.S. “Theory of Machines”, Mc Graw-Hill Education Pvt. Ltd., 2014.
2. Thomas Bevan “THE THEORY OF MACHINES”. CBS Publisher distributers Pvt. Ltd. ISBN:81-239-0874-1

3. Joseph Edward Shigley " Theory of Machine and Mechanism, Publisher. *McGraw-Hill Education* ; Publication date. 16 January 1995

Reference Books:

1. Uicker. J,J . Pennock G.R and Shigley, J.E, "Theory of Machines and Mechanisms", Oxford University Press, 2017.
2. Amitabha Ghosh and Asok Kumar Mallik. "Theory of Mechanisms and Machines", Affiliated East-West Pvt Ltd., 1988.
3. Rao J.S and Dukkipati.R.V, "Mechanism and Machine Theory" New Age International Pvt. Ltd, 2006.
4. R S Khurmi GK Gupta 'Theory of Machine' Chand Publications 2018.

Course Outcomes:

Upon successful completion of this course students should be able to

ME1502.1. Understand and apply the concepts of mechanism terminology, kinematics and graphical Methods to analyze simple mechanisms and their inversions.
ME1502.2. Analyze the kinematics and profiles of cams and followers, including motion diagrams.
ME1502.3. Understand and analyze friction concepts in machine elements, including types, laws, and Applications in engineering mechanisms.
ME1502.4. Appraise the basic concept of toothed gearing and find the velocity ratio of gear trains
ME1502.5. Study balancing of rotating and reciprocating masses and analyze vibrations in Mechanical systems for stability and performance.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1502.1	3	3	3	1	1	0	0	0	0	0	0	2	3	3	0
ME1502.2	1	3	3	1	1	0	0	0	0	0	0	2	3	1	0
ME1502.3	3	3	3	1	1	1	0	0	0	0	0	2	1	1	0
ME1502.4	1	1	3	1	1	1	0	0	0	0	0	2	3	1	0
ME1502.5	1	3	3	2	2	1	0	0	0	0	0	2	3	3	0

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

CO – PO –PSO Mapping AS PER NBA JULY 2024 FORMAT (wef, 1st JAN 2025)

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
ME1502.1	3	3	3	1	1	0	0	0	0	0	2	3	3	0
ME1502.2	1	3	3	1	1	0	0	0	0	0	2	3	1	0
ME1502.3	3	3	3	1	1	1	0	0	0	0	2	1	1	0
ME1502.4	1	1	3	1	1	1	0	0	0	0	2	3	1	0
ME1502.5	1	3	3	2	2	1	0	0	0	0	2	3	3	0

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Course Code	ME1503	Course category	PC
Course Name	MACHINE DESIGN – II		

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	00	00	03	15	15	10	60	3 hrs	00	00	100	03

Course Objectives:
To make the students aware and understand:

1. The skill of design and drafting
2. The standard nomenclature, force, failure, applications and design procedure of mechanical components
3. Design data book for selection of material, strength and standard dimensions
4. Design of flexible machine elements and gears
5. Design of clutch and brake

Course Contents:

Design of Shaft and key: Material, Design on the basis of strength considering shaft subjected to twisting moment only, bending moment, combined twisting and bending moment, axial load in addition to twisting and bending. Design on the basis rigidity. Types of key and strength of keys.

Design of Coupling: Types, requirement of good couplings, design of sleeve coupling, clamp or compression coupling, rigid flange coupling and flexible flange coupling.

Antifriction Bearing: Types or bearing, construction, designations. Standard load rating by AFBMA for static and dynamic loads, life of bearings, selection of bearing, lubrication, mounting and enclosure.

Journal Bearing: Types of Lubrication. Stale lubrication, Thick film lubrication, pressure distribution. Minimum film thickness, relations of variable-viscosity coefficient of friction, speed, pressure, length and diameter, bearing modulus, viscosity- temperature chart. Somerfield number, selection of lubricant, design procedure and numerical.

Design of flexible machine clement: Flat belt types, material and construction of belt, types of drives, slip, creep. Design or V Belts and Rope drive- Construction and types, design of V belt and Rope drive, Chain Drive Classification, power, no of teeth on pockets, principal dimensions, Selection and design of chain. Wire Rope Design Procedure.

Design of Gears: Classification. Law of gearing, forms and system of teeth, interference, beam strength of teeth, dynamic tooth load, wear tooth load, tooth failure a) Spur gear b) helical gear : Classification face width, formative teeth number, strength of gear Design of gear c) Bevel gear: Classification, pitch angles, strength of gear, design of gear d) Worm gear: Types, efficiency of gear, design of gear.

Design of Clutch & Brake - Design of single plate, multi-plate clutch, Design of band brake and shoe brake.

Note: I. Use of design data book will be permitted during the examination

Text Books:

1. Mechanical Engineering Design, Joseph E. Shigley and Charles R. Mischke. Tara McGraw Hill Publications. 6th edition Reprint, 2005
2. Design of Machine Elements. V .B Bhandari, Tata McGraw Hill Publications, 2ndEdition 2007.

Reference Books:

I. Design of Machine Elements, C.S Sharma & Kamlesh Purohit, Prentice Hall of India publications, New-Delhi, Eastern Economy 3rd Edition, 2003.

2. Machine Design- A Basic Approach, Dr. S.S. Wadhwa and S.S. Jolly, Dhanpat Rai and Company, Delhi, lstt Edition 2007

3. Design data hand book for mechanical Engineers, K. Mahadevanan K. Balaveera Reddy. CBS Publishers. Delhi,4th Edition,2009

4. Design Data for Machine Element, B.D.Shiwalkar, Central Techno Publication.2nd Edition,2006

Course Outcomes:

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

ME1503.1 Apply fundamental principle of design to design components such as Shaft and Coupling

ME1503.2 Select antifriction bearing and design journal bearing

ME1503.3 Select and design belt drive and chain drive

ME1503.4 Design the appropriate gear for power transmission on the basis of given load and speed

ME1503.5 Design of brake and clutch

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1503.1	3	1	3	-	-	-	-	-	-	-	-	-	3	2	-
ME1503.2	2	3	2	3	--	-	-	-	-	-	-	-	1	3	-
ME1503.3	2	2	3	2	--	-	-	-	-	-	-	-	2	2	-
ME1503.4	2	2	3	2	-	-	-	-	-	-	-	-	2	3	-
ME1503.5	2	2	3	-	-	-	-	-	-	-	-	-	1	2	-

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Program outcomes in view of NBA SAR FORMAT (Tier-1, Implemented from Jan 2025)

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
ME1503.1	3	1	3	-	-	-	-	-	-	-	-	3	2	-
ME1503.2	2	3	2	3	--	-	-	-	-	-	-	1	3	-
ME1503.3	2	2	3	2	--	-	-	-	-	-	-	2	2	-
ME1503.4	2	2	3	2	-	-	-	-	-	-	-	2	3	-
ME1503.5	2	2	3	-	-	-	-	-	-	-	-	1	2	-

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Sign Member Secretary | Sign BoS Chairperson | Sign Dean, Academics | Sign Principal

Program Elective –I

Course Code	ME1504 (A)	Course category	PE1
Course Name	IC ENGINES		

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	00	00	03	15	15	10	60	2 hrs 30 min	00	00	100	03

Course Objectives:

To make the students aware and understand:

1. Engineering science (thermodynamics, fluid mechanics, heat transfer) for analysis of engine operation and performance
2. Engine operating characteristics and thermodynamic analysis of ideal and actual engine cycles for spark ignition and compression ignition engines
3. Engine performance and combustion characteristics for conventional and alternative fuels for various types of engines
4. Exhaust emissions, influence of engine operating parameters on emissions and impact of exhaust emissions on environment and human health, exhaust after treatment technologies
5. About future internal combustion engine fuels and technology

Course Contents:

Engine Types, Operation, Design and Operating Parameters: Introduction and Historical Perspective, Engine Classification, Engine Operating Cycles, Engine Components, Spark-Ignition Engine Operation – Otto Cycle, Compression Ignition Engine Operation – Diesel Cycle, Stratified Charge Engines, Engine Design and Operating Parameters

Engine Cycles and Their Analysis: Details of Two-Stroke and Four-Stroke Cycles, Air Standard Cycles, Fuel-Air cycle and Actual Cycles and Their Analysis, Thermodynamic relations for Engine Processes, Effect of Common Engine Variables on Cylinder Pressure and Temperature

Engine Fuels and Alternative Fuels: Fossil Fuels and Their Limitations, Hydrocarbon Fuels-Gasoline, Self-ignition and Octane Rating, Diesel Fuel & Cetane Rating, Potential Alternative Fuels-Liquids and Gaseous, Current Status of Use for Alcohols, Hydrogen, Bio-Fuels & Blends with Conventional Fuels.

Fuel Supply Systems in SI and CI Engines: Port Fuel Injection, Multi-Point Port Injection, Single-Point Throttle Body Injection, Direct Injection and Common Rail Injection, Fuel Injectors, Injector Nozzles and Fuel Injection Pumps, Ignition Systems for SI Engines - Conventional and

Alternative Ignition Approaches, Gas Exchange Processes- Inlet and Exhaust Processes, Supercharging and Turbo-charging

Combustion in SI Engines and Combustion Chambers: Combustion in SI Engines, Stages of Combustion, Ignition Delay and Factors Affecting Ignition Delay, Normal and Abnormal Combustion, Factors Responsible for Abnormal Combustion, Knock Limited Parameters, Requirement & Types of Combustion Chambers for SI engines

Combustion in CI Engines and Combustion Chambers: Stages of Combustion in CI Engines, Fuel Spray Behavior, Delay Period, and Physical Factors Affecting Delay Period, Diesel Knock, Combustion Chambers – Requirements & Types, Methods of Generating Turbulence,

Pollutant Formation and Control: Effect of Fuel-Air/Equivalence Ratio on Engine Exhaust Emissions, Nitrogen Oxides, Carbon Monoxide, Unburned HC Emissions, Particulate Emissions, Exhaust Gas Treatment – Methods and Devices, Study of Latest Emission Norms - BIS, EURO and US Emission Norms

Engine Operating Characteristics and Engine Performance Test: Engine Performance Parameters, Operating Variables Affecting SI and CI Engine Performance, Efficiency and Emissions, Performance Test on IC engines**,** Methods of Determination of Brake Power, Heat Balance sheet,

Advanced IC Engine Trends: Current Status, Challenges and Opportunities

Text books:

1. Internal Combustion Engines, Ganesan V, Tata McGraw-Hill, New Delhi, 1994
2. A course in Internal Combustion Engines, M. L. Mathur and R. P. Sharma, Dhanpat Rai and Sons, Delhi, 1994
3. Engineering Fundamentals of the Internal Combustion Engine, Pulkrabek Willard W, PHI, 2007

Reference Books:

1. Internal Combustion Engines Fundamentals, John B. Heywood, McGraw-Hill, 1988.
2. Internal Combustion Engines, Colin R Ferguson, John Wiley and Sons, New York, 1986

Course Outcomes:

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

ME1504 (A): Apply engineering science (thermodynamics, fluid mechanics, heat transfer) for Analysis of engine operation and performance

ME1504 (A): Demonstrate knowledge of the engine operating characteristics and thermodynamic Analysis of ideal and actual engine cycles for spark ignition and compression ignition Engines

ME1504 (A): Compare the engine performance and combustion characteristics for conventional And alternative fuels for various types of engines

ME1504 (A): Analyze the causes of exhaust emissions, influence of engine operating parameters On emissions and impact of exhaust emissions on environment and human health,

Exhaust after treatment technologies

ME1504 (A): Acquire insights about future internal combustion engine technologies

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1504(A).1	3	2	1	-	-	-	-	-	-	-	-	-	2	3	1
ME1504(A).2	3	3	1	2	1	1	-	-	-	-	-	-	3	2	-
ME1504(A).3	2	2	1	2	1	-	-	-	-	-	-	-	2	2	-
ME1504(A).4	3	3	2	1	1	-	3	-	-	-	-	-	2	2	-
ME1504(A).5	2	1	2	-	2	1	2	-	-	-	-	-	2	1	1

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CO – PO –PSO Mapping AS PER NBA JULY 2024 FORMAT (wef, 1st JAN 2025)

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
ME1504(A).1	3	2	1	-	-	-	-	-	-	-	-	2	3	1
ME1504(A).2	3	3	1	2	1	1	-	-	-	-	-	3	2	-
ME1504(A).3	2	2	1	2	1	-	-	-	-	-	-	2	2	-
ME1504(A).4	3	3	2	1	1	-	-	-	-	-	-	2	2	-
ME1504(A).5	2	1	2	-	2	1	-	-	-	-	-	2	1	1

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

Course Code	ME1504(B)							Course category			PE
Course Name	MECHATRONICS										
Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	00	00	03	15	15	10	60	2 hrs. 30 min	00	00	100	03

Course Objectives:

To make the students aware and understand:

1. Principles of Mechatronics and its integration with mechanical, electrical, and control systems.
2. Operation and application of sensors, actuators, and control systems in real-world systems.
3. Automation and mechatronics technologies in modern manufacturing and industrial processes.
4. Pneumatic and Hydraulic systems
5. Application of Mechatronics system

Course Contents:

Introduction to Mechatronics

Definition, scope, importance, comparison of traditional and mechatronic approaches, concurrent engineering principles, applications in everyday systems.

Sensors and Transducers in Mechatronics

Principles and Classifications of Sensors (Position, Proximity, Speed, Temperature), Signal Conditioning and Interfacing, Transducers and Their Applications in Mechatronic Systems

Actuators and Drives in Mechatronics

Types of actuators (electrical, hydraulic, pneumatic), classification of electrical motors, stepper motors and DC & AC servo drives, Mechanical Drives (ball screws, and linear motion bearings); practical applications

Microprocessor & micro controller

Introduction to Microprocessor and microcontrollers**,** Comparison of microprocessor and micro controller, Advantages and disadvantages.**,** programming of microcontrollers, Programable logic controllers Applications in mechatronics

Pneumatic systems: Different control components of pneumatic systems, auxiliary devices, synchronizing, clamping, de-clamping, application to robotics.

Hydraulic systems: Different control components of hydraulic systems, valves and auxiliary devices, design and analysis of hydraulic circuits sequencing, synchronizing, pneumo-hydraulic, CNC lubrication, machine tool applications.

Advanced Applications of Mechatronics: Automation and Mechatronics in Modern Manufacturing (CNC Machines, Robots, and Industrial Automation Systems), Examples of Automated Braking Systems and Conveyor Systems, Case Studies: Automation in Mechatronic Industrial Systems.

Text Books:

1. W. Bolton, Mechatronics, Pearson Education

2. Mechatronic system Design; Shetty Dedas, Kolk and Richard

Reference Books and Websites:

1. Automation, Production Systems, and Computer-Integrated Manufacturing by Mikell P. Groover.

2. Introduction to Mechatronics and Measurement Systems by David G. Alciatore and Michael B. Histand.

3. Mechatronics: Principles and Applications" by Godfrey Onwubolu

4. N.P. Mahalik, Mechatronics, Tata McGraw Hill Publication

Course Outcomes:

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

ME1504 (B).1 Understand the principles of mechatronics and its applications in engineering Systems
ME1504 (B).2 Analyze the operation and functionality of sensors and transducers in mechatronic Systems
ME1504 (B).3 Explore various types of actuators and drives, and evaluate their applications in Automation
ME1504 (B).4 Design and implement control systems using PID controllers and PLCs for industrial applications.
ME1504 (B).5 Apply mechatronic principles to advanced industrial applications such as CNC Machines, robotics, and automated systems.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1504 B.1	2	2	-	-	-	-	-	-	-	-	-	-	2	-	-
ME1504 B.2	2	3	1	2	--	-	-	-	-	-	-	-	3	-	-
ME1504 B.3	3	2	1	2	--	-	-	-	-	-	-	-	2	-	-
ME1504 B.4	3	2	1	-	-	-	1	-	-	-	-	-	3	-	-
ME1504 B.5	2	1	1	-	-	-	-	-	-	-	-	-	2	-	-

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

CO – PO –PSO Mapping AS PER NBA JULY 2024 FORMAT (wef, 1st JAN 2025)

Course Outcomes	Program Outcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO2	PSO3
ME1504 B.1	2	2	-	-	-	-	-	-	-	-	2	-	-
ME1504 B.2	2	3	1	2	--	-	-	-	-	-	3	-	-
ME1504 B.3	3	2	1	2	--	-	-	-	-	-	2	-	-
ME1504 B.4	3	2	1	-	-	-	-	-	-	-	3	-	-
ME1504 B.5	2	1	1	-	-	-	-	-	-	-	2	-	-

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Course Code	ME1504 (C)								Course category			PE
Course Name	MECHANICAL VIBRATIONS											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	00	00	03	15	15	10	60	2 hrs 30 min	00	00	100	03

Course Objectives:

To make the students aware and understand:

1. Appraise the fundamentals of Vibration Theory.
2. Write mathematical model of mechanical vibration problems
3. Apply various techniques to solve mechanical vibration problem
4. Use vibration testing and measuring equipment in preventive maintenance
5. Examine Overview of the course, practical applications and research trends Harmonic and Periodic motions, vibration terminology

Course Contents:

Single DOF system: Vibration model, Equation of motion-Natural Frequency, Energy method, Rayleigh method Principle of virtual work, Principle of virtual Work, damping models, viscously damped free vibration Special cases: oscillatory. non-oscillatory and critically damped motions, Logarithmic decrement, Experimental determination of damping coefficient, Forced harmonic vibration, Magnification factor. Rotor unbalance, Transmissibility Vibration Isolation, Equivalent viscous damping, Sharpness of resonance.

Torsional Vibrations: Simple systems with one or two rotor masses Multi-DoF systems- transfer matrix method, Geared system, branched system

Two-DoF Free Vibrations: Generalized and Principal coordinates, derivation of equations of motion Lagrange's equation Coordinate coupling Forced Harmonic vibration

Multi-DoF System: Derivation of equations of motion, influence coefficient method, Properties of vibrating systems: flexibility and stiffness matrices, reciprocity theorem Modal analysis: undamped, damped system, Calculation of natural frequencies Rayleigh method, Stodala method, Matrix iteration method Holzer method and Dunkerley's method

Continuous systems: Vibration of strings Longitudinal and torsional vibration of rods Transverse vibration of beams: equations of motion and boundary conditions transverse vibration of beams: natural Frequencies and mode shapes Rayleigh's energy method, Rayleigh-Ritz method, assumed modes and Galerkin's , methods

Preventive maintenance: vibration testing and measuring equipment, signal generation, signal analysis instruments, data acquisition, active and passive vibration control principle and material, damping based material selection: design consideration and specification

Text Books:

1. L Rao S. S, Mechanical Vibrations.4e. Pearson Education Inc..2004
2. V.P.Singh. Mechanical vibrations. Dhanpat Rai & Co.,2006

Reference Books and Websites:

1. G.K. Crover, Mechanical Vibrations. Nemchand & Brothers. Roorkee. 8c. 2009
2. William T, Thomson & Marie Dillon Dehleh, Theory of Vibrations with application,5e, Pearson Education Publication, 2007
3. Tse, Morse and Hinkel, Mechanical Vibrations, Chapman and Hall, 1991
4. DenHartog J.P . Mechanical Vibrations, McGraw Hill, 1986

Course Outcomes:

On completion of this course students will be able to:

ME1504C.1 Synthesize mathematical models for single DoF vibration systems and Compute frequencies

ME1504C.2 Compute amplitude ratios, natural frequencies, and damping ratios of damped vibration systems

ME1504C.3 Select vibration isolation systems and evaluate the effect of damping on the above systems.

ME1504C.4 Analyse Two-DoF Free Vibration systems, Multi-DoF System Continuous vibration systems

ME1504C.5 Analyse mechanical vibrating system

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1504.1	3	3	2	3	0	0	0	0	0	0	0	0	2	3	0
ME1504.2	3	3	3	3	0	0	0	0	0	0	0	0	3	2	0
ME1504.3	3	2	3	3	0	0	0	0	0	0	0	0	2	1	0
ME1504.4	2	3	3	2	0	0	1	0	0	0	0	0	3	2	0
ME1504.5	3	3	3	3	0	0	1	0	0	0	0	0	2	2	0

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

CO – PO –PSO Mapping AS PER NBA JULY 2024 FORMAT (wef, 1st JAN 2025)

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1504.1	3	3	2	3	0	0	0	0	0	0	0	2	3	0
ME1504.2	3	3	3	3	0	0	0	0	0	0	0	3	2	0
ME1504.3	3	2	3	3	0	0	0	0	0	0	0	2	1	0
ME1504.4	2	3	3	2	0	0	0	0	0	0	0	3	2	0
ME1504.5	3	3	3	3	0	0	0	0	0	0	0	2	2	0

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Sign Member Secretary | Sign BoS Chairperson | Sign Dean, Academics | Sign Principal

Course Code	ME1505	Course category	VSE
Course Name	MACHINE DESIGN AND DRAFTING LAB		

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
00	00	02	02	-	-	-	-	-	25	25	50	01

Course Objectives:

To make the students aware and understand:

1. Acquire the skill of design and drafting
2. Design procedure of machine component.
3. Use of design data book for selection of material, strength and standard dimensions

Course Contents:

- Minimum six Practical's to be performed. Drawing sheet (Manual) 03 and using software 03is mandatory.
- It is representative list of practical's. The Faculty may choose minimum six practical's from the list.

List of Practical's:

1. Design of shaft.
2. Design of' bushed pin type flexible coupling.
3. Design of Chain Drive.
4. Design of Belt Drive.
5. Design of Antifriction Bearing.
6. Design of Journal Bearing.
7. Design or Brake.
8. Design of' Clutch.

Note: Term Work shall consist of drawing sheet/design report based on above practicals.

ICA – Internal Continuous Assessment shall be based on the practical record and knowledge/ skills acquired. The performance shall be assessed experiment wise using continuous assessment formats, A and B.

ESE: The end semester exam for practical shall be based on viva-voce.

Course Outcomes:

After completion of course Students will be able to:

ME1505.1 Apply fundamental principle of design.

ME1505.2 Design basic machine elements.

ME1505.3. Use of design data book for selection of material.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1505.1	3	2	1	-	-	-	-	-	-	-	-	-	3	2	-
ME1505.2	2	2	3	2	--	-	-	-	-	-	-	-	-	3	-
ME1505.3	2	2	2	3	-	-	-	-	-	-	-	-	-	2	-

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

CO – PO –PSO Mapping AS PER NBA JULY 2024 FORMAT (wef, 1st JAN 2025)

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
ME1505.1	3	2	1	-	-	-	-	-	-	-	-	3	2	-
ME1505.2	2	2	3	2	--	-	-	-	-	-	-	-	3	-
ME1505.3	2	2	2	3	-	-	-	-	-	-	-	-	2	-

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Course Code	ME1506	Course category	VSE
Course Name	HEAT TRANSFER LAB		

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
00	00	02	02	00	00	00	00	---	25	25	50	01

Course Objectives:
To make the students aware and understand:

1. Concepts of conduction, convection and radiation heat transfer
2. Working of heat exchangers and its performance
3. Thermal conductivity of metal.

Course Contents:

Minimum Eight Practical's to be performed to achieve course outcomes.

It is representative list of Practical's. The course coordinator may choose minimum Eight practical's as per requirement.

List of experiments

1. Performance of Heat transfer through Natural Convection
2. Performance of Heat transfer through Forced Convection
3. Performance of Heat transfer from PIN-FIN Apparatus
4. Performance of Composite lagged pipe Apparatus
5. Performance of Composite Wall Apparatus
6. Performance of Thermal conductivity of metal rod
7. Performance of Thermal conductivity of Insulating powder
8. Study of Shell and Tube Heat Exchanger
9. Performance of Parallel & Counter-flow Heat Exchanger
10. Performance of Heat Pipe Demonstration Apparatus.
11. Performance of of Emissive apparatus
12. Performance of Stefan Boltzman Apparatus.
13. Thermocouple calibration

ICA – Internal Continuous Assessment shall be based on the practical record and knowledge/ skills acquired. The performance shall be assessed experiment wise using continuous assessment formats, A and B.

Course Outcomes:
After completion of course Students will be able to:

ME1506.1 Determine the thermal conductivity of insulating materials

ME1506.2 Determine the convective heat transfer coefficient in free and forced convective conditions

ME1506.3 Estimate the rating of a heat exchanger

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1506.1	3	1	2	-	-	-	-		2	-	-	-	2	2	2
ME1506.2	3	1	2	-	-	-	-		2	-	-	-	2	2	2
ME1506.3	3	1	2	-	-	-	-		2	-	-	-	2	2	2

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

CO – PO –PSO Mapping AS PER NBA JULY 2024 FORMAT (wef, 1st JAN 2025)

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
ME1506.1	3	1	2	-	-	-		2	-	-	-	2	2	2
ME1506.2	3	1	2	-	-	-		2	-	-	-	2	2	2
ME1506.3	3	1	2	-	-	-		2	-	-	-	2	2	2

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Course Code	ME1507 (A)	Course category	PE
Course Name	IC ENGINES LAB		

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
00	00	02	02	00	00	00	00	--	25	25	50	01

Course Objectives:
To make the students aware and understand:

1. To familiarize the students with the design and operating characteristics of modern internal combustion engines
2. To apply the analytical techniques to the performance analysis of internal combustion engines
3. To study the thermodynamics, combustion, heat transfer, friction and other factors affecting engine power, efficiency and emissions

A minimum of eight e xperiments (five to be selected by course teacher and three performance experiments by the student) shall be performed to achieve course outcomes

List of Experiments:

The following is a representative list of practical/exercises. The instructor may choose experiments to fulfill the course outcomes.

1. To perform constant speed test on a 4-Stroke, Single-cylinder SI/CI engine
2. To conduct performance test on a 4-Stroke, Single-cylinder SI/CI engine to obtain heat balance sheet
3. To conduct performance test on a 4-Stroke, Multi-cylinder SI engine coupled with eddy current dynamometer to carry out thermodynamic analysis
4. To conduct perform test on a 4-Stroke, Multi-cylinder CI engine coupled with eddy current dynamometer to carry out thermodynamic analysis
5. To conduct Morse test on a 4-Stroke, Multi-cylinder SI engine
6. To conduct constant speed performance test on a dual fuel engine with various blend proportions of conventional and any renewable fuel
7. To perform constant speed test on a 4-Stroke, Single-cylinder SI/CI engine with variable compression ratio
8. To study engine exhaust emissions, emission control systems and emission measuring instruments for SI and CI Engines

Course Outcomes:
On completion of the course, students will be able to:

ME1507.1 Recognize and understand reasons for differences among operating characteristics of different engine types and designs

ME1507.2 Predict performance and fuel economy trends for a given engine design specification

ME1507.3 Analyze the combustion process to predict concentrations of primary exhaust pollutants

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1507.1	3	2	2	2	--	--	--	--	--	--	--	--	2	2	--
ME1507.2	3	3	2	3	1	--	--	--	--	--	--	--	2	2	--
ME1507.3	3	3	3	2	--	--	--	--	--	--	--	--	2	3	--
ME1507.4	3	3	3	3	--	--	--	--	--	--	--	--	3	2	--
ME1507.5	3	2	3	3	2	--	--	--	--	--	--	--	3	3	--

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CO – PO –PSO Mapping AS PER NBA JULY 2024 FORMAT (wef, 1st JAN 2025)

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
ME1507.1	3	2	2	2	--	--	--	--	--	--	--	2	2	--
ME1507.2	3	3	2	3	1	--	--	--	--	--	--	2	2	--
ME1507.3	3	3	3	2	--	--	--	--	--	--	--	2	3	--
ME1507.4	3	3	3	3	--	--	--	--	--	--	--	3	2	--
ME1507.5	3	2	3	3	2	--	--	--	--	--	--	3	3	--

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

Course Code	ME1507 (B)							Course category			PE
Course Name	MECHATRONICS LAB										
Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
00	00	02	02	00	00	00	00	---	25	00	25	01

Course Objectives:

To make the students aware and understand:

1. Describe and demonstrate Mechatronics systems and overview of control systems & actuators.
2. Distinguish between various sensors, transducers and actuators and their applications.
3. Understand the basic concept of microprocessor, single conditioning unit , amplifier, logic gate and perform simple operations on it.

Course Contents:

Minimum five experiments related to the course contents of ME1507 (Mechatronics Lab) are to be performed.

Representative list of experiments related to the course contents of ME1507 (Mechatronics Lab):

1. Open loop position control;
2. Closed loop position control using positional and velocity feedback;
3. Use of analoge and digital servo systems,
4. Use of PID control;
5. Experiments on pneumatic drives and actuators;
6. Experiments on hydraulic drives and actuators;
7. Use of logic gates;
8. Programming on a 8085 Microprocessor training kit.
9. Programming on a PLC for simple control operations.

Course Outcomes:

At the end of this course, students will demonstrate the ability to

ME1507.1Describe and demonstrate the working of Actuators, Mechatronics and control systems

ME1507.2Distinguish between various sensors, transducers, and actuators and their applications

ME1507.3Perform basic programming and operations on PLC & Microprocessors.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1507.1	2	-	-	-	-	-	-	1	2	-	-	-	2	1	1
ME1507.2	2	-	-	-	-	-	-	1	2	-	-	-	2	1	1
ME1507.3	2	2	-	-	-	-	-	1	2	-	-	-	2	1	1

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

CO – PO –PSO Mapping AS PER NBA JULY 2024 FORMAT (wef, 1st JAN 2025)

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
ME1507.1	2	-	-	-	-	-	1	2	-	-	-	2	1	1
ME1507.2	2	-	-	-	-	-	1	2	-	-	-	2	1	1
ME1507.3	2	2	-	-	-	-	1	2	-	-	-	2	1	1

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

ICA – Internal Continuous Assessment shall be based on the practical record and knowledge/ skills acquired. The performance shall be assessed experiment wise using continuous assessment formats, A and B.

Course Code	ME1507 (C)							Course category			PE
Course Name	MECHANICAL VIBRATION LAB										
Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
00	00	02	02	00	00	00	00	--	25	25	50	01

Course Objectives:
To make the students aware and understand:

1. Mathematical model of mechanical vibration problems
2. Various techniques to solve mechanical vibration problem
3. Vibration testing and measuring equipment in preventive maintenance

Minimum Six Practical's to be performed to achieve course outcomes.

It is representative list of Practical's. The course coordinator may choose minimum six practical's as per requirement.

List of experiments :

1. To verify relation $T=2\pi\sqrt{Lg}$ for a simple pendulum
2. To determine radius of gyration of compound pendulum
3. To determine the radius of gyration of given bar by using bifilar suspension
4. To determine natural frequency of spring mass system
5. To determine natural frequency Equivalent spring mass system
6. To determine natural frequency of free torsional vibrations of single rotor system i) Horizontal rotor ii) Vertical rotor
7. To verify the Dunkerley 's rule
8. Performing the experiment to find out damping coefficient in case of free damped torsional vibration

Course Outcomes:
On completion of the course, students will be able to:

ME1507.1 Compute amplitude ratios, natural frequencies, and damping ratios of damped Vibration systems
ME1507.2 Select vibration isolation systems and evaluate the effect of damping on the Above systems.
ME1507.3 Analyze Two-DoF Free Vibration systems, Multi-DoF System Continuous Vibration systems

CO – PO – PSO Mapping:

CO	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1507.1	3	2	2	2	--	--	--	--	--	--	--	--	2	2	--
ME1507.2	3	3	2	3	1	--	--	--	--	--	--	--	2	2	--
ME1507.3	3	3	3	2	--	--	--	--	--	--	--	--	2	3	--

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CO – PO –PSO Mapping AS PER NBA JULY 2024 FORMAT (wef, 1st JAN 2025)

CO	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1507.1	3	2	2	2	--	--	--	--	--	--	--	2	2	--
ME1507.2	3	3	2	3	1	--	--	--	--	--	--	2	2	--
ME1507.3	3	3	3	2	--	--	--	--	--	--	--	2	3	--

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

Course Code	SH 1502								Course category			CC
Course Name	CO-CURRICULAR COURSE											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
00	00	04	04	00	00	00	00	--	20		20	02

Co-Curricular Course Activities minimum hours:2 hours per week or 24 hours Co-Curricular Course: Active Participation in Activities such as: Health and wellness, Sports, yoga education, Tech-fest, College Club Activity, University level/ college level cultural activities, Drama, painting, fine/ applied/ visual performing arts, annual day, department student's association/IE/ISTE/Any professional body, paper presentation, foreign language certificate, NCC, NSS etc. Co-Curricular Course Activities minimum hours: 2 hours per week or 24 hours."

Course Code	SH1503	Course Category	MNC2
Course Name	SOFT SKILLS		

Teaching Scheme				Examination Scheme								Credits
				Theory					Practical		Total	
Th	Tu	Pr	Total	CT-1	CT-2	TA	ESE	ESE Duration	ICA	ESE		
02	-	-	02	-	-	20	-	-	-	-	20	2

Course Objectives:

To make the student aware and understand:

1. Develop essential soft skills for academic, professional, and personal growth.
2. Enhance communication, teamwork, leadership, and emotional intelligence.
3. Provide hands-on training through interactive activities and real-world scenarios.
4. Improve employability and workplace readiness.

Course Contents:

Introduction to Soft Skills:

- Definition and importance of soft skills
- Difference between hard skills and soft skills
- Self-assessment: Identifying strengths and areas for improvement

Effective Communication:

- Verbal & Non-verbal communication
- Active listening & feedback techniques
- Public speaking & presentation skills
- Business email etiquette

Interpersonal & Teamwork Skills:

- Building rapport & networking
- Conflict resolution & negotiation
- Collaboration & team dynamics

Emotional Intelligence:

- Self-awareness & self-regulation
- Empathy & social skills
- Stress management & resilience

Leadership & Professional Ethics:

- Traits of effective leaders
- Decision-making & problem-solving
- Workplace ethics & professionalism

Time Management & Adaptability:

- Prioritization & goal setting
- Handling multitasking & deadlines
- Adapting to change & workplace challenges

Career Readiness:

- Resume writing & interview skills
- Personal branding (LinkedIn, networking)
- Workplace etiquette & corporate culture

Text Books:

1. Text Book of Soft Skills (Paperback, Paul Martin, Kavita Krishnamurthi)
2. How to Win Friends & Influence People (Dale Carnegie), Emotional Intelligence 2.0 (Travis Bradberry)
3. Soft Skills Unleashed By Krishna Suresh

Reference Books:

1. "Personality Development and Soft Skills (Old Edition)" by Barun K Mitra
2. "Soft Skills - Enhancing Employability: Connecting Campus with Corporate" by M S Rao
3. "communication and soft skill development (first edition)" by career publications and Ashwini Deshpande
4. "Soft Skills Training: A Workbook to Develop Skills for Employment" by Frederick H Wentz

Course Outcomes:

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

SH1503.1. Understand the importance of soft skill.
SH1503.2. Communicate confidently in professional settings.
SH1503.3. Work effectively in teams with strong interpersonal skills.
SH1503.4. Demonstrate leadership and problem-solving abilities.
SH1503.5. Be better prepared for job interviews and workplace challenges.

CO – PO – PSO mapping as per NBA Jan 2016 format:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
SH1503.1	0	1	0	0	0	1	2	2	2	0	2	0
SH15032	0	0	0	0	0	1	2	2	2	0	2	0
SH1503.3	0	1	0	0	0	1	2	2	2	0	2	0
SH1503.4	0	0	0	0	0	1	2	2	2	0	2	0
SH1503.5	0	1	0	0	0	1	2	2	2	0	2	0

CO – PO – PSO mapping as per NBA July 2024 format (w.e.f. 1 Jan. 2025):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
SH1503.1	0	0	1	0	0	2	0	2	0	2	1
SH15032	0	0	1	0	0	2	0	2	0	2	1
SH1503.3	0	0	1	0	0	2	0	2	0	2	1
SH1503.4	0	0	1	0	0	2	0	2	0	2	1
SH1503.5	0	0	1	0	0	2	0	2	0	2	1

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

OPEN ELECTIVE-II

Course Code	SH1501 A	Course Category	OE
Course Name	ENVIRONMENTAL LAW		

Teaching Scheme				Examination Scheme								
				Theory					Practical		Total	Credits
Th	Tu	Pr	Total	CT-1	CT-2	TA	ESE	ESE Duration	ICA	ESE		
03	-	-	03	15	15	10	60	2 hrs. 30 min	-	-	100	3

Course Objectives:

To make the student aware and understand:

3. To introduce students to the basic concepts of environment, environmental studies, and the scope of environmental law.
4. To analyze how these principles are incorporated into Indian environmental legislation and upheld by the judiciary
3. To study the evolution of environmental protection from ancient, medieval, and modern India.
4. To analyze the role of the Indian Constitution in protecting the environment.
5. To critically analyze the role of the judiciary in interpreting and enforcing environmental laws.

Course Contents:

Introduction: Introduction to Environment and Environmental Law, Scope and Importance of Environmental Studies, Important Case Laws on Environmental Law.

Fundamental Principles of Environmental Law: Important Principles of Environmental Law, All about Public Trust Doctrine, incorporation of Precautionary Principle in Environmental Legislation, Application of Polluter Pays Principle In Indian Legal Jurisprudence, Role of Indian Judiciary in Upholding International Principles of Environmental Law, Sustainable Development.

History and Development of Environmental Law in India: History of Environment Protection Ancient, Medieval and Modern India, Efficacy of Environment Protection Act, 1986, Efficacy of Water Legislation in India,Efficacy of Air Legislation in India, Efficacy of Wildlife Protection Laws in India. Efficacy of Forest Legislation in India, Protection of Tribal Rights: An Effort through Environmental Legislation, A Critique on Criminal Law Provisions on Environment Protection.

Protection of Environment under the Indian Constitution: Protection of Environment under the Indian Constitution, Right to Clean and Healthy Environment under Indian Constitution: An Analysis.

Environment and the Judiciary: Section 133 CrPC: A Critical Analysis, Role of National Green Tribunal in Environment Protection, Role of Judiciary in Environment Protection, Role of Public Interest Litigation in Environmental Protection, Nature and Scope of Environmental Torts in India, The emergence of Noise Pollution Jurisprudence in India,Role of Judiciary in Preventing Noise Pollution, Role of Judiciary in Preventing Air Pollution.

Text Books:

4. Environmental Law by DrNishthaJaswal Dr. P S Jaswal
5. EBC Environmental Law S.C Shastri.
6. Introduction To Environmental Law by S. Shantakumar

Reference Books:

1. Lectures on Environmental Law by Rega Surya Rao
2. Environmental Laws Bare Act with Amendments
3. Universal's Environment Laws bare act (all acts)

Course Outcomes:

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

SH1501A.1. Understand the basic Environmental law
SH1501A.2. Demonstrate a thorough understanding of the principles, laws, and policies governing Environmental protection in India.
SH1501A.3. Critically analyze the role of the judiciary, legislature, and other institutions in upholding environmental laws.
SH1501A.4. Apply legal principles to contemporary environmental issues and propose solutions.
SH1501A.5. Develop a nuanced perspective on the intersection of environmental law with constitutional rights, tribal rights, and criminal law.

CO – PO – PSO mapping as per NBA Jan 2016 format:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
SH1501A.1	0	0	0	0	0	2	2	2	2	0	2	0
SH1501A.2	0	0	0	0	0	2	2	2	2	0	2	0
SH1501A.3	0	0	0	0	0	2	2	2	2	0	2	0
SH1501A.4	0	0	0	0	0	2	2	2	2	0	2	0
SH1501A.5	0	0	0	0	0	2	2	2	2	0	2	0

CO – PO – PSO mapping as per NBA July 2024 format (w.e.f. 1 Jan. 2025):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
SH1501A.1	0	0	0	0	0	2	2	2	0	2	1
SH1501A.2	0	0	0	0	0	2	2	2	0	2	1
SH1501A.3	0	0	0	0	0	2	2	2	0	2	1
SH1501A.4	0	0	0	0	0	2	2	2	0	2	1
SH1501A.5	0	0	0	0	0	2	2	2	0	2	1

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

Course Code	SH1501 B							Course Category			OE
Course Name	CYBER LAW										
Teaching Scheme				Examination Scheme							Credits
				Theory					Practical		
Th	Tu	Pr	Total	CT-1	CT-2	TA	ESE	ESE Duration	ICA	ESE	Total
03	-	-	03	15	15	10	60	2 hrs. 30 min	-	-	100	3

Course Objectives:

To make the student aware and understand:

1. To introduce students to the legal and regulatory frameworks governing cyberspace.
2. To familiarize students with key concepts such as cybercrime, data protection, intellectual property, and digital privacy.
3. To explore the ethical implications of technology and its impact on society.
4. To understand the role of national and international laws in addressing cyber threats and challenges.
5. To equip students with the knowledge to identify and mitigate legal risks in the development and deployment of technology.

Course Contents:

Introduction to Cyber Law

- Overview of Cyberspace and Cyber Law: Definition, scope, and importance.
- Evolution of Cyber Law: Historical development and global perspectives.
- Key Concepts: Jurisdiction, sovereignty, and challenges in cyberspace.
- Introduction to Cyber Ethics: Ethical issues in technology and digital behavior.

Cybercrime and Legal Frameworks

- Types of Cybercrimes: Hacking, phishing, identity theft, cyber terrorism, etc.
- Legal Frameworks for Cybercrime:
  Indian Context: Information Technology Act, 2000 (IT Act) and amendments.
  International Context: Budapest Convention on Cybercrime.
- Case Studies: Landmark cybercrime cases and their legal implications.
- Role of Law Enforcement Agencies: Cyber cells, CERT-In, and Interpol.

Data Protection and Privacy Laws

- Concept of Data Privacy: Importance and challenges.
- Data Protection Laws:
  Indian Context: Personal Data Protection Bill (PDPB), IT Act provisions.
  Global Context: GDPR (General Data Protection Regulation), CCPA.
- Right to Privacy: Judicial interpretations and constitutional perspectives.
- Data Breaches and Legal Liabilities: Case studies and mitigation strategies.

Cybersecurity Laws and Regulations:

- Importance of Cybersecurity: Threats, vulnerabilities, and risk management.
- Legal Frameworks for Cybersecurity:
  Indian Context: National Cybersecurity Policy, IT Act provisions.
  Global Context: NIST Framework, EU Cybersecurity Act.
- Role of Organizations: CERT-In, NCIIPC, and international cybersecurity agencies.
- Compliance and Best Practices: Implementing cybersecurity measures in organizations.

Text Books:

1. "Cyber Law in India" by S. S. Jaswal.
2. "Information Technology Law and Practice" by Vakul Sharma.
3. "Cyber Law and Cyber Crimes" by Nandan Kamath.

Reference Books:

1. Information Technology Act, 2000 (India).
2. General Data Protection Regulation (GDPR).
3. "Cybersecurity and Cyber Law" by Nina Godbole.
4. "The Law of Cybercrimes and Their Investigations" by George Curtis.

Course Outcomes:

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

SH1501B.1 Understand the legal and ethical dimensions of cyberspace.
SH1501B.2 Identify and analyze cybercrimes and their legal consequences.
SH1501B.3 Apply cyber law principles to real-world scenarios in technology development and usage.
SH1501B.4 Evaluate the impact of cyber security laws on businesses and individuals.
SH1501B.5 Develop strategies to comply with data protection and privacy regulations.

CO – PO – PSO mapping as per NBA Jan 2016 format:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
SH1501B.1	2	2	2	2	2	2	0	2	2	2	1	1
SH1501B.2	2	2	2	2	2	2	0	2	2	2	1	0
SH1501B.3	2	2	2	2	2	2	0	2	2	2	1	2
SH1501B.4	2	2	2	2	2	2	0	2	2	2	1	2
SH1501B.5	2	2	2	2	2	2	0	2	2	2	1	2

CO – PO – PSO mapping as per NBA July 2024 format (w.e.f. 1 Jan. 2025):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
SH1501B.1	2	2	2	2	2	2	2	2	2	2	1
SH1501B.2	2	2	2	2	2	2	2	2	2	2	1
SH1501B.3	2	2	2	2	2	2	2	2	2	2	1
SH1501B.4	2	2	2	2	2	2	2	2	2	2	1
SH1501B.5	2	2	2	2	2	2	2	2	2	2	1

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

Course Code	SH1501 C								Course Category			OE
Course Name	INTRODUCTION TO MASS COMMUNICATION											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT-1	CT-2	TA	ESE	ESE Duration	ICA	ESE		
03	-	-	03	15	15	10	60	2 hrs. 30 min	-	-	100	3

Course Objectives:

To make the student aware and understand:

1. To introduce students to the basic concepts, theories, and models of mass communication.
2. To explore the role of mass media in shaping public opinion, culture, and society.
3. To familiarize students with the various forms of mass media (print, electronic, digital, and social media).
4. To examine the ethical and legal issues in mass communication.
5. To develop critical thinking and analytical skills in evaluating media content and provide hands-on experience in creating basic media content.

Course Contents:

Introduction to Mass Communication

- Definition and Scope: What is mass communication?
- Elements of Mass Communication: Sender, message, channel, receiver, feedback, and noise.
- Functions of Mass Media: Information, education, entertainment, and persuasion.
- Theories of Mass Communication: Hypodermic Needle Theory, Two-Step Flow Theory, Agenda-Setting Theory, and Uses and Gratifications Theory.

Forms of Mass Media

- Print Media: Newspapers, magazines, and books.
- Electronic Media: Radio, television, and cinema.
- Digital Media: Internet, websites, and blogs.
- Social Media: Platforms, trends, and impact.
- Comparative Analysis: Strengths and limitations of each medium.

Role of Mass Media in Society

- Media and Public Opinion: Shaping perceptions and attitudes.
- Media and Culture: Influence on language, traditions, and values.
- Media and Democracy: Role in elections, governance, and accountability.

- Media and Globalization: Cross-cultural communication and global trends.

Media Ethics and Laws

- Ethical Issues in Mass Communication: Bias, sensationalism, and privacy concerns.
- Media Laws and Regulations: Freedom of speech, censorship, and regulatory bodies.
- Case Studies: Ethical dilemmas and legal controversies in media.

Technology and Mass Communication

- Impact of Technology on Media: Digital transformation and convergence.
- Emerging Trends: Artificial Intelligence, Virtual Reality, and Augmented Reality in media.
- Social Media Algorithms: How they shape content consumption.
- Fake News and Misinformation: Challenges and solutions.

Text Books:

1. "Mass Communication in India" by Keval J. Kumar.
2. "Introduction to Mass Communication" by Stanley J. Baran.
3. "Media and Communication Studies: An Introduction" by James Watson and Anne Hill.

Reference Books:

1. "Understanding Media: The Extensions of Man" by Marshall McLuhan.
2. "Media and Society: Power, Platforms, and Participation" by Nicholas Carah.
3. "The Elements of Journalism" by Bill Kovach and Tom Rosenstiel.

Course Outcomes:

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

SH1501C.1 Understand the fundamentals of mass communication and its role in society.
SH1501C.2 Analyze the impact of mass media on individuals, communities, and cultures.
SH1501C.3 Identify the strengths and limitations of different forms of mass media.
SH1501C.4 Critically evaluate media content for bias, accuracy, and ethical considerations.
SH1501C.5 Create basic media content using simple tools and techniques and appreciate the intersection of technology and mass communication.

CO – PO – PSO mapping as per NBA Jan 2016 format:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
SH1501C.1	1	0	0	1	1	0	0	0	1	0	0	1
SH1501C.2	0	1	1	0	2	0	0	0	1	0	0	1
SH1501C.3	1	1	1	0	1	0	0	0	0	0	0	1
SH1501C.4	1	0	1	1	0	0	0	0	1	0	0	1
SH1501C.5	1	0	1	1	3	0	0	0	1	0	0	1

CO – PO – PSO mapping as per NBA July 2024 format (w.e.f. 1 Jan. 2025):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
SH1501C.1	1	0	0	1	0	0	0	0	1	0	1
SH1501C.2	0	1	1	0	0	0	0	0	2	0	1
SH1501C.3	1	1	1	0	0	0	0	0	1	0	1
SH1501C.4	1	0	1	1	0	0	0	0	0	0	1
SH1501C.5	1	0	1	1	0	0	0	0	3	0	1

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

Course Code	SH1501 D								Course Category			OE
Course Name	BASIC GERMAN LANGUAGE A1											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT-1	CT-2	TA	ESE	ESE Duration	ICA	ESE		
03	-	-	03	15	15	10	60	2 hrs. 30 min	-	-	100	3

Course Objectives:

To make the student aware and understand:

1. To introduce students to the basics of the German language, including pronunciation, grammar, and vocabulary.
2. To develop basic communication skills in German for everyday situations.
3. To familiarize students with German culture, traditions, and etiquette.
4. To prepare students for further language learning and potential opportunities in German-speaking countries.
5. To enhance students' global competence and intercultural communication skills.

Course Contents:

Introduction to German Language and Culture

- Alphabet and Pronunciation: German alphabet, sounds, and basic pronunciation rules.
- Greetings and Introductions: Common greetings, introducing oneself, and basic polite expressions.
- Numbers and Dates: Counting, telling time, and discussing dates.
- Cultural Insights: Overview of German-speaking countries, traditions, and etiquette.

Basic Grammar and Sentence Structure

- Articles and Gender: Definite and indefinite articles (der, die, das).
- Nouns and Plurals: Basic noun forms and pluralization rules.
- Pronouns: Personal pronouns (ich, du, er/sie/es, etc.).
- Basic Sentence Structure: Subject-verb-object order and forming simple sentences.

Everyday Communication

- Asking for Directions: Common phrases for navigating and understanding directions.
- Shopping and Ordering: Vocabulary for shopping, ordering food, and making payments.
- Daily Activities: Talking about daily routines, hobbies, and free time.
- Role-Playing: Simulating real-life situations (e.g., at a café, market, or train station).

Vocabulary Building

- Family and Friends: Vocabulary for describing family members and relationships.

- Food and Drink: Common food items, meals, and dining vocabulary.
- Travel and Transportation: Vocabulary for travel, public transport, and booking tickets.
- Practice Sessions: Interactive activities to reinforce vocabulary

Reading and Writing in German

- Reading Simple Texts: Short dialogues, signs, and advertisements.
- Writing Practice: Filling out forms, writing short messages, and emails.
- Listening Comprehension: Understanding slow and clear spoken German.
- Speaking Practice: Participating in simple conversations and role-plays.

Cultural Immersion and Practical Applications

- German Culture: Festivals, traditions, and cultural norms.
- Engineering and Technology in Germany: Overview of Germany's role in engineering and innovation.
- Opportunities in German-Speaking Countries: Study, work, and internship opportunities.
- Final Project: Presenting a short dialogue or skit in German.

Text Books:

1. "Netzwerk A1" by Stefanie Dengler et al.
2. "Menschen A1" by Sandra Evans et al.
3. "Schritte International A1" by Daniela Niebisch et al.

Reference Books:

1. "German for Dummies" by Paulina Christensen et al.
2. "Practice Makes Perfect: Basic German" by Jolene Wochenske.
3. "Langenscheidt German-English Dictionary".

Course Outcomes:

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

SH1501D.1 Understand and use familiar everyday expressions and basic phrases.
SH1501D.2 Introduce themselves and others, and ask and answer questions about personal details.
SH1501D.3 Interact in a simple way, provided the other person speaks slowly and clearly.
SH1501D.4 Read and write simple texts in German.
SH1501D.5 Appreciate German culture and its relevance in a global context.

CO – PO – PSO mapping as per NBA Jan 2016 format:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
SH1501D.1	1	0	0	0	0	0	1	0	3	0	0	0
SH1501D.2	0	1	1	0	0	0	1	0	3	0	0	0
SH1501D.3	1	1	1	0	0	0	1	0	3	0	0	0
SH1501D.4	1	0	1	0	0	0	1	0	0	0	0	0
SH1501D.5	1	0	1	0	0	0	1	0	3	0	0	0

CO – PO – PSO mapping as per NBA July 2024 format (w.e.f. 1 Jan. 2025):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
SH1501D.1	1	0	0	1	0	0	0	0	0	0	0
SH1501D.2	0	1	1	0	0	0	0	0	0	0	0
SH1501D.3	1	1	1	0	0	0	0	0	0	0	0
SH1501D.4	1	0	1	1	0	0	0	0	0	0	0
SH1501D.5	1	0	1	1	0	0	0	0	0	0	0

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

ADDITIONAL CRITERIA FOR HONORS

Course Code	ME1521								Course category			PEH
Course Name	PROGRAM ELECTIVE FOR HONORS 1											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
3	-	-	3	15	15	10	60	--	-	-	100	3

Note: The students appearing for ME1521 should select any online course (Swayam/MOOCS/NPTEL) from areas: Thermal/Production/Design and get approval from Department Faculty Board

Course Code	ME1522								Course category			PEH
Course Name	PROGRAM ELECTIVE FOR HONORS 1											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
3	-	-	3	15	15	10	60	--	-	-	100	3

Note: The students appearing for ME1522 should select any online course (Swayam/MOOCS/NPTEL) from areas: Thermal/Production/Design and get approval from Department Faculty Board

ADDITIONAL CRITERIA FOR HONORS WITH RESEARCH

Course Code	**ME1531**								**Course category**			**PER**
Course Name	**RESEARCH PROJECT STAGE 1**											
Teaching Scheme				**Examination Scheme**								**Credits**
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
-	-	8	8	-	-	-	-	--	100	-	100	4

Guidelines for Research Project Stage -1

Purpose of research project is to gain new insights into a phenomenon, to solve problems facing society or businesses, to access new facts, to provide logical solutions to problems, to forecast the future, to innovate and renew.

Stage-1: The student is expected to**:**

- Identify the broad area of the research in consultation with the guide
- Complete the literature review and identify the research gaps
- Formulate the problem statement
- Define the objectives of the research work
- Write hypothesis
- Define the research methodology
- Prepare, submit and present the report on the work completed
- Write a review paper on literature and present in international/National conference.

Evaluation: The evaluation of research project stage 1 will be done by Expert appointed by Head of the Department and project guide**.** The evaluation will be done as per the standard format in the department.

ADDITIONAL CRITERIA FOR DOUBLE MINOR

Course Code	ME1541								Course category			MN
Course Name	SUPPLY CHAIN MANAGMEMNT											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
3				15	15	10	60			100	3	3

Course Objectives: The objectives of this course are to:

1. Understand the basics of logistics and supply chain management
2. Know supply chain management and their interrelationships within individual companies and across the supply chain
3. Evaluate supply chain
4. Use tools and techniques in implementing supply chain management
5. Introduce about planning and scheduling of resources.

Course Contents:

Introduction: Definitions of SCM, Basic steps of SCM, SCM and Logistics, Components of Supply Chain (SC), Mapping SC.

Planning demand, Inventory and Supply: Demand forecasting- Meaning, objectives, types, qualitative and quantitative methods. Managing supply chain cycle inventory, Uncertainty in the supply chain, managing inventory for short life – cycle products.

Resource Planning and |Scheduling: Introduction to operation planning, Enterprise resource planning, Material requirement planning, scheduling service and manufacturing processes.

Supply Chain Performance Measurement: Benchmarking, Performance dimensions and measures, Supply Chain Operation Reference (SCOR) model, Performance measurement and control.

Supply Chain Risk Management: Introduction, supply chain vulnerability, meaning of risk, categories of risk, model of risk management, success factors in risk management process, approach to mitigate risk.

Sustainability Practices: Corporate social responsibility, supply chain responsibility, competitive sustainability, Green procurement, Green manufacturing, Green marketing, Regulatory compliance (Multi-model transport of goods Act, Free Trade and Warehousing Zones Act, GST) Ethical practices in procurement, manufacturing and marketing.

Textbooks:

1. Supply Chain Logistic Management, Bowersox, Closs and Cooper, McGraw Hill, 5th Edition.
2. Essential of Supply Chain Management, Michael H. Hugos, John Wiley and sons, 3rd Edition
3. Logistics and Supply Chain Management, Martin Christopher, Prentice Hall, 4th edition.

Reference Books:

1. Designing and Managing the Supply Chain, David Levi and Philip Kaminsky, McGraw Hill, 3rd edition.
2. Purchasing and Supply Chain Management, Monczka, Handfield, Giunipero, Patterson, Cengage learning (7th edition).

Course Outcomes: After completion of course, students will be able to:

ME1541.1 Explain the importance, benefits, and applications of SCM.
ME1541.2 Apply quantitative methods for forecasting demand of resources in industry.
ME1541.3 Plan and schedule the enterprise resources.
ME1541.4 Measure the performance of supply chain.
ME1541.5 Understand the legal aspect of supply chain performance.

CO – PO –PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1541.1	0	0	0	0	0	0	0	0	0	3	0	2	0	0	0
ME1541.2	0	0	3	0	3	0	0	0	0	0	0	0	3	3	3
ME1541.3	0	0	3	0	3	0	2	0	0	0	0	0	3	3	3
ME1541.4	0	0	3	0	3	0	0	0	0	0	0	0	3	3	3
ME1541.5	0	0	0	0	0	3	0	2	0	0	0	0	0	0	0

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 – Strongly Correlated

CO – PO –PSO Mapping AS PER NBA JULY 2024 FORMAT (wef, 1st JAN 2025)

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1541.1	0	0	0	0	0	0	0	0	3	0	2	0	0	0
ME1541.2	0	0	3	0	3	0	0	0	0	0	0	3	3	3
ME1541.3	0	0	3	0	3	0	0	0	0	0	0	3	3	3
ME1541.4	0	0	3	0	3	0	0	0	0	0	0	3	3	3
ME1541.5	0	0	0	0	0	3	2	0	0	0	0	0	0	0

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 – Strongly Correlated

Course Code	ME1542								Course category			MN
Course Name	THERMAL AND FLUID ENGINEERING											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
3			3	15	15	10	60			100	3	3

Course Objectives:

1. To integrate the concepts, laws ancl methodologies lrom the first course in thermodynamics
2. To study the thermodynamic concepts into various thermal application
3. To understand the various properties of fluid and instruments lor mcasrrrcn.rcnt ol' pressure
4. To study the behavior of Fluid at rest and in motion to understand the concept of laminar and turbulent flow ,and flow of fluid in pipe

Fundamental Concepts and Definitions : Thermodynamic systems; properties. Processes and cycles. Thermodynamic equilibrium, euasi-static process. Macroscopic vs. Microsc6pie viewpoint, work and heat Transfer: Zeroth law of thermodynamics, specific heat and latent heat. Point function. Path function.

First Law of thermodynamics: First law or thermodynamics for a closed system, undergoing a cycle and change of state, Energy, different forms of energy, Enthalpy. PMM-l control volume. Application of first law of steady flow processes (nozzle, turbine. compressor pump, boiler, throttle valve etc.), Second Law of thermodynamics Limitation of' first Law of thermodynamics, cycle heat engine, refrigerator and heat pump. Kelvinplank and Clausius statements and their equivalence, Reversibility

Basics Definition of fluid, fluid properties such as viscosity. Vapour pressure. Compressible surface tension. Capillarity, Mach number etc., pressure at a point in the static mass of fluid variation of pressure, Pascal's law. Pressure measurement b1, simple and differential nanometres using nanometres expression.

Fluid Statics: Hydrostatic forces on the plane and curved surfaces. Centre of pressure. Buoyancy. Centre buoyancy. Stability of floating bodies. Metacentre

Fluid Kinematics: Velocity of fluid particle. Types of fluid flow. Description. Flow, continuity equation, rotational and irrational flow.

Fluid Dynamics: Euler's equation to obtain Bernoulli's equation. Bernoulli's theorem types of Flow. Laminar Flow, Turbulent flow: Reynolds's experiment, frictional loss in pipe flow, shear stress in turbulent flow '

Text Books:

l. P.K. Nag. Engineering Thermodynamics. ‘Tata McGraw-Hill. 2012 Ed.

2. Fluid Engineering / Mahesh Rathore. 'Tata Mcgraw Hill New Delhi 2010 ed

3. Fluid Mechanics and Fluid power Engineering by D.S. Kumar. S.K. Kataria & Sons

Reference Books :

l. Engineering Thermodynamics, J.P.Holman, Mc Graw_Hill.

2. Thermodynamics: an engineering approach, Y.A,Cengel & M.A.Boles,.l.ata McGrawHill.

3. Engineering Thermodynamics, P.L.Dhar, Elsevier publication.

4. Fluid Mechanics and Hydraulic Machines by R.K. Bansal, Iaxmi prakashan

5. Introduction to Fluid power, Thomson. Prentice Hall 2012.

Course Outcomes: On completion of the course, students will be able to:

ME1541.l. Illustrate the basic concepts of thermodynamics such as heat, work, state etc.

ME1541.2 Apply First Law of thermodynamics to open & closed systems, and study the fundamental Knowledge of Second Law of thermodynamics

ME1541.3. Calculate various properties of fluid

ME1541.4. Appl1, Bernoulli's equation to simple problems in fluid mechanics

ME15415. Analyse the laminar and turbulent flows on pipes

CO – PO –PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1541.1	0	0	0	0	0	0	0	0	0	3	0	2	0	0	0
ME1541.2	0	0	3	0	3	0	0	0	0	0	0	0	3	3	3
ME1541.3	0	0	3	0	3	0	2	0	0	0	0	0	3	3	3
ME1541.4	0	0	3	0	3	0	0	0	0	0	0	0	3	3	3
ME1541.5	0	0	0	0	0	3	0	2	0	0	0	0	0	0	0

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 – Strongly Correlated

CO – PO –PSO Mapping AS PER NBA JULY 2024 FORMAT (wef, 1st JAN 2025)

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
ME1541.1	0	0	0	0	0	0	0	0	3	0	2	0	0	0
ME1541.2	0	0	3	0	3	0	0	0	0	0	0	3	3	3
ME1541.3	0	0	3	0	3	0	0	0	0	0	0	3	3	3
ME1541.4	0	0	3	0	3	0	0	0	0	0	0	3	3	3
ME1541.5	0	0	0	0	0	3	2	0	0	0	0	0	0	0

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 – Strongly Correlated

SIX SEMESTER

Course Code	ME 1601								Course category			PC
Course Name	METROLOGY AND QUALITY CONTROL											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	-	-	03	15	15	10	60	2.30 hr	–	–	100	03

Course Objectives:

To make the students aware and understand:

1. Basics of Metrology, Precision and Accuracy
2. Determine measuring instruments capabilities.
3. Measuring instruments used for linear and angular measurement.
4. Concept of limits and fits for engineering applications.
5. Various comparative measurements, Control chart techniques.

Course Contents:

Introduction to Metrology: Definition:

Linear and Angular Measurement: Measurement, precision, accuracy, sensitivity, Classification of method of measurement. Standards, line standards, end standards, classification of standards, precision measurement, precision measuring instruments and their characteristics, slip gauge. Angle measurement: Sine bars, Sine centres, angle gauges, autocollimator, angle dekkor, constant deviation prism.

Measurement of surface finish:-Types of Surface texture, elements of surface texture, measuring surface finish by stylus probe, Tomlinson & Taly-surf. Measurement by light wave, Interference: Basic principle, sources of light, optical flats, fringe patterns and their interpretation.

Testing of Machine Tools: Surface plates, measurement of straightness, flatness testing, squareness testing, roundness testing.

Design of Gauges and Comparators: Types of gauges, limits, fits, tolerances, Taylor's principle, problems on design of gauges, Comparators: Characteristics, application, types, construction and working of different mechanical, optical, electrical, pneumatic comparators.

Screw Thread and Gear Measurement: Terminology, errors and their effects, thread gauges, measurement of elements of external and internal threads, Gear measurement: callipers measurements, involute testing, and roller measurements.

Recent Trend in Metrology: Precision instrument based on laser, probes, telemetric systems, Isometric viewing of surface defects, Machine vision Study of measuring machines:-Universal measuring machine, coordinate measuring machine, Errors in CMM, electronic inspection and measuring machine,.

Quality Control : Definition, meaning of quality of produce & service, Quality characteristics, Quality design, Quality conformation, Quality of performance, Concept of reliability, Cost, Quality assurance, Cost of rework and repair, Quality and Inspection.

Statistically Quality Control: Basics of Statistical concepts, Meaning and importance of SQC, Variable and attribute Measurement. control charts - inherent and assignable sources of variation, control charts for variables - X & R charts, control charts for attributes p, np, C charts, process capability of machine,. C, and Cpk calculations, determination of statistical limits, different possibilities. Rejection area, Statistically capable and incapable processes, Acceptance Sampling: Concept, Comparison with 100% inspection, Different types of sampling plans, sampling methods, merits and demerits of acceptance sampling OC Curve.

Text Books:

1. Engineering Metrology, R. K. Jain, Khanna Publishers, New Delhi, 2002 onwards

2. Statistical quality control, M. Mahajan, Dhanpat Rai & Co., New Delhi, 2002 onwards

Reference Books:

1. A textbook of Engineering Metrology, I. C. Gupta, 2002, Khanna Publishers, New Delhi,

2. A textbook of metrology, M. Mahajan, Dhanpat Rai & co., New Delhi, 2010 onwards

3. Statistical quality control, M. Jeya Chandra, CRC Press, 2001 onwards

4. Statistical quality control, Douglas Montgomery, Wiley, 2001 onwards.

Course Outcomes:

On completion of this course; student shall be able to:

ME1601.1 To understand the basic of metrology and calculate the least count of measuring instrument.

ME1601.2 To calculate the basic and gauge tolerances.

ME1601.3 To know the terminology of surface finish.

ME1601.4 To understand the concept of quality.

ME1601.5 To Know basics of statistics.

CO – PO – PSO Mapping:

Course outcome	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1601.1	2	-	-	-	-	-	-	1	2	-	-	-	2	1	1
ME1601.2	2	-	-	-	-	-	-	1	2	-	-	-	2	1	1
ME1601.3	2	2	-	-	-	-	-	1	2	-	-	-	2	1	1
ME1601.4	2	-	-	-	-	-	-	1	2	-	-	-	2	1	1
ME1601.5	2	2	-	-	-	-	-	1	2	-	-	-	2	1	1

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

CO – PO –PSO Mapping AS PER NBA JULY 2024 FORMAT (wef, 1st JAN 2025)

Course Outcome	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
ME1601.1	2	-	-	-	-	-	1	2	-	-	-	2	1	1
ME1601.2	2	-	-	-	-	-	1	2	-	-	-	2	1	1
ME1601.3	2	2	-	-	-	-	1	2	-	-	-	2	1	1
ME1601.4	2	-	-	-	-	-	1	2	-	-	-	2	1	1
ME1601.5	2	2	-	-	-	-	1	2	-	-	-	2	1	1

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Course Code	ME1602								Course category			PC
Course Name	NEW AND RENEWABLE ENERGY SOURCES											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	00	00	03	15	15	10	60	2 hrs 30 min	00	00	100	03

Course Objectives:
To make the students aware and understand:

1. Need of renewable energy
2. Different renewable energy sources.
3. Basic concepts of solar radiation and various applications of solar energy.
4. Principles of energy conversion from various alternate energy sources
5. Hydrogen as a future energy source and fuel cell.

Course Contents:

Introduction: Need to adopt renewable energy, various renewable energy sources, current energy scenario of India, Role and potential of new and renewable sources.
Principles of solar radiation: basic concepts of solar energy, the solar constant, extra-terrestrial and terrestrial solar radiation, basic solar geometry, instruments for measuring solar radiation and sun shine, solar radiation data.
Solar energy collection: classification, Study of flat plate and concentrating collectors, Applications of various collectors
Solar energy storage: Various ways of energy storage, Sensible, latent heat and stratified storage, solar ponds.
Solar thermal Applications: solar water heaters, Solar cockers, Solar dryers, Solar thermal power plant
Solar photovoltaic systems: Solar cell fundamentals, classification of solar PV collectors, solar photovoltaic systems and its applications.
Wind Energy: Introduction, Basics of Wind Energy Conversion, present status and future prospects, Classification of wind turbines, performance characteristics, Betz criteria. Wind energy conversion systems, Advantages and drawbacks of wind energy
Bio-Mass: Principles of Bio-Conversion, usable forms of biomass and conversion technologies, Anaerobic/aerobic digestion, Bio-gas digesters, biomass gasification, biomass to ethanol production, biomass to biodiesel production.
Hydrogen as future energy source: Review of hydrogen as future energy source, brief idea about production methods, storage of hydrogen.

Fuels cells: Principle, construction, working, classification, advantages and disadvantages.
Other renewable energy sources: geothermal energy, Ocean energy

Text Books:

1. Non-conventional Energy Resources, B. H. Khan, Tata McGraw-Hill Education
2. Solar Energy, Sukhatme & Nayak Tata McGraw-Hill Education,
3. Non-Conventional Energy Sources, G.D. Rai, Tata McGraw-Hill Education,

Reference Book:

1. Renewable Energy Resources, John Twidel & Anthony D. Weir, 2nd Edition, Taylor & Francis,
2. Principles of Solar Energy, D. Yogi Goswami, Frank Krieth & John F Kreider,
3. A. Duffie and W.A. Beckman, Solar Energy - Thermal Processes, John Wiley,
4. H. P. Garg & J. Prakash Solar Energy fundamental & applications. Tata McGraw Hill Publication

Course Outcomes:

On completion of this course; student shall be able to:

ME1602.1 Identify renewable energy sources and their utilization in India
ME1602.2 Apply basic principles to design solar thermal and photovoltaic systems
ME1602.3 Illustrate the concept of wind energy conversion
ME1602.4 Analyse the working of energy conversion system using various alternative Sources like biomass, geothermal, ocean and MHD
ME1602.5 Explain the concepts and applications of hydrogen as afuel and various fuel cells,

CO – PO – PSO Mapping:

Course outcome	Program outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1602.1	2	1	1	2	1	-	-	-	2	1	-	1	2	2	2
ME1602.2	2	1	1	2	1	-	-	-	2	1	-	1	2	2	2
ME1602.3	2	1	1	2	1	-	-	-	2	1	-	1	2	2	2
ME1602.4	2	1	1	2	1	-	-	-	2	1	-	1	2	2	2
ME1602.5	2	1	1	2	1	-	-	-	2	1	-	1	2	2	2

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

CO – PO –PSO Mapping AS PER NBA JULY 2024 FORMAT (wef, 1st JAN 2025)

Course outcome	Program outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
ME1602.1	2	1	1	2	1	-	-	2	1	-	1	2	2	2
ME1602.2	2	1	1	2	1	-	-	2	1	-	1	2	2	2
ME1602.3	2	1	1	2	1	-	-	2	1	-	1	2	2	2
ME1602.4	2	1	1	2	1	-	-	2	1	-	1	2	2	2
ME1602.5	2	1	1	2	1	-	-	2	1	-	1	2	2	2

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Sign Member Secretary | Sign BoS Chairperson | Sign Dean, Academics | Sign Principal

PROGRAM ELECTIVE – II

Course Code	ME1603 A								Course category			PE
Course Name	REFRIGERATION AND AIR CONDITIONING											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	00	00	03	15	15	10	60	2 hrs 30 min	00	00	100	03

Course Objectives:

To make the students aware and understand:

VI. History, methods, and applications of refrigeration and air conditioning systems.
VII. Principles of vapour compression refrigeration systems, including system components and operating conditions.
VIII. Multi-pressure vapour compression systems and their components, including compound compression and expansion valves.
IX. Properties, types, and environmental impact of various refrigerants used in refrigeration and air conditioning systems.
X. Heating and cooling loads and apply psychrometric processes in air conditioning systems

Course Contents:

Introduction: History, methods and applications of refrigeration; Types and applications of air conditioning systems; current status and future trends; air cycle refrigeration systems.

Vapourcompressionrefrigeration(VCR)systems: AnalysisofsimpleVCRsystem;Useof *p-h* and *T-s* charts; Effect of operating conditions such as condenser and evaporator Pressure, superheating and sub-cooling; Actual VCR system, Numerical based on Vapour compression Refrigeration cycle
Multi pressure vapours compression systems: classification; compound compression systems, multi-evaporator systems, individual and multiple expansion valves

Refrigeration system components and controls: Brief description of compressors, condensers, evaporators, defrosting methods, expansion devices, accessories and refrigeration controls
Refrigerants: Classification, desirable properties and designation of refrigerants; merits and demerits of commonly used refrigerants. Ozone layer depletion and global warming issues.
Vapour absorption systems: Simple vapour absorption cycle; practical absorption systems, comparison of vapour compression and absorption cycles

Heating and cooling load calculations: Basic considerations, heat gain/losses, sensible and latent, heating load estimates, sensible heat factor, bypass factor, apparatus dew point.
Psychrometry of air conditioning processes: Properties of moist air; Psychrometric chart, Psychrometric processes, Psychrometric processes related to air conditioning, Adiabatic Mixing of two Air-streams.

Elementary simple problems based on Psychrometric chart only, Concept of comfort air conditioning, Effective temperature concept.

Air conditioning systems: Unitary system, window type and split type air conditioning; Central system: direct expansion system, all water and all air systems; winter, summer and year round air conditioning

Text Books:

1. Arora & Domkundwar, "A course in refrigeration and air conditioning", Dhanpatrai and Co, New Delhi, 2018
2. Refrigeration and air conditioning, C P Arora, Tata McGraw-Hill,2nd edition,2003

Reference Books:

1. Thermodynamics-An Engineering Approach, Y. A. Cengel and M. A. Boles, 3rd Edition, Mc-Graw Hill, 1998
2. Ananthanarayanan, " Basic Refrigeration And Air Conditioning", Wiley-VCH Verlag GmbH, vol 3, 2005
3. ASHARE Handbook: Fundamental, ASHARE publication, 2013
4. ASHARE Handbook: Standards, ASHARE publication, 2013
5. ASHARE Handbook: System and Equipment, ASHARE publication, 2008

Course Outcomes:

After completing the course, students will be able to:

ME1603A.1: Evaluate various refrigeration and air conditioning systems, including vapour compression and absorption systems.

ME1603A.2: Analyse vapour compression refrigeration cycles and understand the effects of operating conditions.

ME1603A.3: Understand multi-pressure vapour compression systems, compound compression and multi-evaporator systems

ME1603A.4: Understand refrigerant properties, classification, and their environmental impact

ME1603A.5: Calculate heating and cooling loads, understand psychrometric processes

CO – PO – PSO Mapping:

Course outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1603A.1	2	-	-	2	-	1	2	-	-	-	-	1	2	3	-
ME1603A.2	2	-	-	2	-	1	2	-	-	-	-	1	2	3	-
ME1603A.3	2	-	-	2	-	1	2	-	-	-	-	1	2	3	-
ME1603A.4	2	-	-	2	-	1	2	-	-	-	-	1	2	3	-
ME1603A.5	2	-	-	2	-	1	2	-	-	-	-	1	2	3	-

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CO – PO –PSO Mapping AS PER NBA JULY 2024 FORMAT (wef, 1st JAN 2025)

Course outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
ME1603A.1	2	-	-	2	-	2	-	-	-	-	1	2	3	-
ME1603A.2	2	-	-	2	-	2	-	-	-	-	1	2	3	-
ME1603A.3	2	-	-	2	-	2	-	-	-	-	1	2	3	-
ME1603A.4	2	-	-	2	-	2	-	-	-	-	1	2	3	-
ME1603A.5	2	-	-	2	-	2	-	-	-	-	1	2	3	-

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

Course Code	ME1603B	Course category	PE
Course Name	TOTAL QUALITY MANAGEMENT		

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	00	00	03	15	15	10	60	2 hrs 30 min	00	00	100	03

Course Objectives:

To make the students aware and understand

1. The concept and importance of quality and philosophies of TQM
2. Design for quality, Reliability and Design Optimization
3. Measuring and Controlling Quality
4. The concept of Quality Circle, Kaizen, and Six Sigma for quality improvement
5. The importance of Quality standards

Course Contents:

Introduction: Concept of Quality, Definitions of Quality, Dimensions of product and service quality, Cost of Quality.

TQM Philosophy: Definition of TQM, Principles of TQM, Importance and Benefits of TQM, Four Pillars of TQM, Deming's Philosophy, Juran's Philosophy, Crossby's Philosophy and Quality Awards. Customer Focus, Supplier-partnership, Employee involvement, Importance of Leadership for successful TQM, Customer satisfaction index, Vision, Mission and Policy statements.

Design for Quality: Product Development, Quality Function Development (QFD), Voice of customer, House of quality (HOQ), Taguchi Quality Loss Function, Design for Reliability, Design Optimization, Fault tree Analysis, Design for Manufacturability, Total Productive maintenance(TPM).

Measuring and Controlling Quality: Process of Measuring Quality, Process Capability Measurement, Statistical Process Control for Variables and Attributes.

Quality Control Tools: Stratification, Check sheet, Histogram, Pareto chart. Cause- and- Effect diagrams, and Scatter diagram.

Improve for Quality Excellence: Continuous Process Improvement- Benchmarking, PDCA Cycle, 6S, POKA YOKE, Kaizen, and Six- Sigma- Principle's, and Methodology, Quality Circles- Concept, Formation, impact of quality Circles.

Quality Standards: Introduction to ISO series of Quality Standards, Need of ISO 9000, ISO 14000.

Text Books:

1 "What is Total Quality Control? -The Japanese Way", Ishikawa and Lu, Prentice Hall, 1988.
2. "Total Quality Management", Tally O.J., ASQC Quality Press.
3. "Total Quality Management", A.V. Feigenbaum, 6th Edition, McGraw Hill International USA. 2009.

Reference Books and Websites:

1. "Out or Crisis", Deming W. Edward. MIT Publishing,1982.
2. "Quality Control Handbook", Juran J.M. 5th edition, McGraw Hill Book Company, USA, 2009.
3. "Kaizen: The Key to Japan's Competitive Success", Masaaki Imai. McGraw Hill Int., USA, 2009.

Course Outcomes:

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

ME1603B.1 Explain the concept of TQM and its benefits to industry
ME1603B.2 Use appropriate tools and techniques to design the quality system
ME1603B.3 Measure and Control the quality of a business through appropriate tools and techniques
ME1603B.4 Continuously improve the business to achieve business Excellence
ME1603B.5 Illustrate and apply Quality standards

CO – PO – PSO Mapping:

Course outcome	Program outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1603B.1	0	0	0	-	-	-	-	-	-	-	3	1	0	0	0
ME1603B.2	1	2	2		3	-	-	-	-	-	2	-	2	3	2
ME1603B.3	1	2	2		3	-	-	-	-	-	2	-	2	3	2
ME1603B.4	1	2	2	3	3	-	1	-	-	-	2	-	2	3	2
ME1603B.5	1	2	2	-	3	-	-	-	-	-	2	-	2	3	2

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

CO – PO –PSO Mapping AS PER NBA JULY 2024 FORMAT (wef, 1st JAN 2025)

Course outcome	Program outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1603B.1	0	0	0	-	-	-	-	-	-	3	1	0	0	0
ME1603B.2	1	2	2		3	-	-	-	-	2	-	2	3	2
ME1603B.3	1	2	2		3	-	-	-	-	2	-	2	3	2
ME1603B.4	1	2	2	3	3	1	-	-	-	2	-	2	3	2
ME1603B.5	1	2	2	-	3	-	-	-	-	2	-	2	3	2

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Course Code	ME1603C	Course category	PE2
Course Name	MACHINE TOOL DESIGN		

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	00	00	03	15	15	10	60	2 hrs 30 min	00	00	100	03

Course Objectives:
To make the students aware and understand:

1. General requirements of Machine Tool Design
2. Design of speed and feed boxes
3. Design of machine tool structure
4. Machine tool guide ways and slide-ways
5. Effects of vibration on machine tool

Course Contents:

Introduction: General requirements of Machine Tool Design, Kinematics of machine tool, Various driving systems used in machine tools, Mechanical, Electrical, Hydraulic.

Regulation of Speed and Feed Rates: Basic design consideration in the design of variable speed range in the machine tools, step less regulation of speeds, Layout of speed in geometric, logarithmic and arithmetic progression, Design of speed and feed boxes and their classification, Gear box design

Machine Tool Structure (bed, column, cross-rail): Functions and their requirements, design criterion for machine tool structure, design procedure, factors affecting stiffness of machine tool structure and their profile

Machine Tool Spindles: Functions of spindle, Materials and requirements for spindles, Design of spindles, Effect of Machine Tool Compliance on Machine Accuracy, Bearings for spindles

Machine Tool Guide-ways and Slide-ways: Design based on force of beds, slide ways, carriage, tables of Lathes, shapes of guide-ways and slide-ways of Milling machines, Materials, Methods of adjusting clearance in guide-ways.

Vibrations of Machine Tools: Effects of vibration on machine tool on cutting controls, work piece, tool life. Sources of vibrations, Types of vibrations (forced, chatter, stickup vibrations) and its minimization, Shock absorbers

Control systems in Machine Tools: Functions, Requirements and classification, control systems for speeds and feeds, various motions etc., Manual and automatic control systems.

Machine Tools Testing: Static and Dynamic rigidity, Methods of increasing rigidity of structure, Procedure for assessing dynamic stability, Dynamic characteristics, Stability analysis, Static and dynamic testing of

machines as per Schlesinger's test and Tobias stability.

Text Books:

1. Machine Tool Design and Numerical Control, N. K Mehta, Tata McGraw Hill, Third Edition, 2012
2. Design of Machine Tools, D. K. Pal and S. K. Basu, Oxford-IBH, Fifth Edition, 2008

Reference Books and Websites:

1. Machine Tool Design Handbook, Central Machine Tool Institute, Bangalore, Tata McGraw Hill
2. Principles of Machine Tools, A. Bhattacharya and G. C. Sen, New Central Book Agency, Calcutta, 3rd Edition
3. Numerical Control and Computer Aided Manufacturing, T. Kundra, P.N. Rao, N. K. Tiwari, Tata Mc Graw Hill, 3rd Edition

Course Outcomes:

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

ME1603C.1 Demonstrate knowledge of standard machine tool elements and moving parts.

ME1603C2 Articulate the concepts of dimensional measurement and explain its importance.

ME1603C.3 Interpret tool design methods and punch and die manufacturing techniques.

ME1603C.4 Explain effects of vibration on machine tool and cutting controls.

ME1603C.5 Analyze stability of machine tool and static/ dynamic testing of machines.

CO – PO – PSO Mapping:

Course outcomes	Program outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1603C.1	2	1	1	2	1	-	-	-	2	1	-	1	2	2	2
ME1603C.2	2	1	1	2	1	-	-	-	2	1	-	1	2	2	2
ME1603C.3	2	1	1	2	1	-	-	-	2	1	-	1	2	2	2
ME1603C.4	2	1	1	2	1	-	-	-	2	1	-	1	2	2	2
ME1603C.5	2	1	1	2	1	-	-	-	2	1	-	1	2	2	2

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

CO – PO –PSO Mapping AS PER NBA JULY 2024 FORMAT (wef, 1st JAN 2025)

Course outcomes	Program outcome													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
ME1603C.1	2	1	1	2	1	-	-	2	1	-	1	2	2	2
ME1603C.2	2	1	1	2	1	-	-	2	1	-	1	2	2	2
ME1603C.3	2	1	1	2	1	-	-	2	1	-	1	2	2	2
ME1603C.4	2	1	1	2	1	-	-	2	1	-	1	2	2	2
ME1603C.5	2	1	1	2	1	-	-	2	1	-	1	2	2	2

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

PROGRAM ELECTIVE-III

Course Code	ME1604A							Course category			PE
Course Name	COMPUTATIONAL FLUID DYNAMICS										
Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	01	00	04	15	15	10	60	2 hrs. 30 min	00	00	100	04

Course Objective:

To make the students aware and understand:

1. The major theories, approaches and methodologies used in CFD
2. The skills in the actual implementation of CFD methods (e.g. boundary conditions, turbulence modelling etc.) in using commercial CFD codes
3. Experience in the application of CFD analysis to real engineering designs.
4. Use of theoretical knowledge of fluid Dynamics.
5. For application of CFD Analysis.

Course Content:

Introduction to CFD: Computational approach to Fluid Dynamics and its comparison with experimental and analytical methods, Basics of PDE: Elliptic, Parabolic and Hyperbolic Equations.

Governing Equations: Review of Navier-Stokes Equation and simplified forms, Solution Methodology: FDM and FVM with special emphasis on FVM, Stability, Convergence and Accuracy.

Finite Volume Method: Domain discretization, types of mesh and quality of mesh, SIMPLE, pressure velocity coupling, Checkerboard pressure field and staggered grid approach.

Geometry Modelling and Grid Generation: Practical aspects of computational modelling of flow domains, Grid Generation, Types of mesh and selection criteria, Mesh quality, Key parameters and their importance.

Methodology of CFDHT: Objectives and importance of CFDHT, CFDHT for Diffusion Equation, Convection Equation and Convection-Diffusion Equation.

Solution of N-S Equations for Incompressible Flows:

Semi-Explicit and Semi-Implicit Algorithms for Staggered Grid System and Non-Staggered Grid System of N-S Equations for Incompressible Flows

Text Books:

1. Computational Fluid Dynamics, The Basic with applications by John A. Anderson, Jr.,Mc-Graw Hill International Editions, Mechanical Engineering series.
2. Computational Fluid Dynamics: Principles and Applications, Blazek, J., Elsevier Science, 2001.

Reference Books:

1. An Introduction to Computational Fluid Flow (Finite Volume Method), by H.K. Versteeg, W. Malalasekera, Prentice Hall
2. Computational Methods for Fluid Dynamics by Ferziger and Peric, Springer Publication.
3. Numerical Methods in Fluid Flow & Heat Transfer by Dr. Suhas Patankar.
4. An Introduction to Computational Fluid Mechanics by Chuen-Yen Chow, Wiley Publication.
5. Computational Fluid Flow & Heat Transfer by Murlidhar and Sundarrajan, Narosa Publication

Course Outcomes:

On successful completion of the course, student will be able to:

ME1605 (A).1 Explain the basic concept of Computational Fluid Dynamics.

ME1605 (A).2 Build theories, approaches and methodologies used in CFD.

ME1605 (A).3 Develop skills in the actual implementation of CFD methods.

ME1605 (A).4 Apply CFD as tool to solve the thermal-fluid related problems.

ME1605 (A).5 Create the base and interest to carry out the future research.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1605(A).1	3	3	3	3	3	-	-	-	-	-	-	2	2	2	-
ME1605(A).2	3	3	3	3	3	-	-	-	-	-	-	2	2	2	-
ME1605(A).3	2	2	2	2	3	-	-	-	-	-	-	2	2	2	-
ME1605(A).4	2	2	2	3	3	-	-	-	-	-	-	2	2	2	-
ME1605(A).5	2	2	2	2	2	-	-	-	-	-	-	2	2	2	-

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

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Course Outcomes	Program outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
ME1605(A).1	3	3	3	3	3	-	-	-	-	-	2	2	2	-
ME1605(A).2	3	3	3	3	3	-	-	-	-	-	2	2	2	-
ME1605(A).3	2	2	2	2	3	-	-	-	-	-	2	2	2	-
ME1605(A).4	2	2	2	3	3	-	-	-	-	-	2	2	2	-
ME1605(A).5	2	2	2	2	2	-	-	-	-	-	2	2	2	-

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Sign Member Secretary | Sign BoS Chairperson | Sign Dean, Academics | Sign Principal

Course Code	ME1604 B	Course category	PE
Course Name	OPERATIONS RESEARCH TECHNIQUES		

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	01	00	04	15	15	10	60	2 hrs 30 min	00	00	100	04

Course Objectives:

To make the students aware and understand

1. Importance and need of operations research in industry.
2. Formulation of Linear Programming problems
3. Mathematical tools that are needed to solve and optimize OR problems.
4. Project planning and Use of PERT and CPM techniques
5. Application of OR techniques to solve real life problems in industry

Course Contents:

Introduction: Definitions, Characteristics, Phases, and limitations of OR, Classification of O.R. Models.

Linear programming: Problem formulation, Graphical method, Simplex method.

Transportation Models: Introduction, formulation of transportation problems, methods for finding initial solution, Optimization by MODI method.

Assignment Models: Introduction, Mathematical formulation Hungarian method,

Project Management : Introduction, Project planning, Network construction, PERT analysis, CPM analysis.

Waiting line models: Introduction, Elements of Queuing system, Characteristics, Classification, analysis of M/M/1.

Simulation: introduction to Simulation, Generation of Random numbers.

Sequencing Models: Introduction, Assumptions, Processing of n jobs through 2 machines, Processing of n jobs through 3 machines.

Replacement Models: Introduction, Individual replacement policies.

Dynamic Programming: Concept, Characteristics, Principle of' Optimality, Applications.

Inventory Model: Introduction, Cost associated with Inventory, Deterministic models, Economic Order Quantity (EOQ).

Decision Making: Characteristics of decision-making process, decision making techniques under risk and uncertainty

Text Books:

1. Operation Research, H. A. Taha, 7th Edition, PHI.

2. Introduction to Operations Research, Billy E. Gillett, 2nd Edition, Tata McGraw Hill.

3. Operations Research, Panncerselvan , 3rd Edition, PHI.

Reference Books and Websites:

1. Operation Research, Natarajan, Balasubramani, and Tamilarasi, 3rd Edition, Pearson Education.

2. System Simulation with Digital Computer, Narsingh Deo, PHI.

3. Linear Programming, N. Paul Loornba, TMII Edition, Tata McGraw -Hill.

Course Outcomes:

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

ME1605B.1 Explain the importance, benefits and applications of Operations Research.

ME1605B.2 Identify and formulate Operations Research problems in industry

ME1605B.3 Solve the linear programming, Transportation and Assignment problems

ME1605B.4 Apply PERT and CPM for project Planning and Management

ME1605B.5 Apply the techniques of OR to solve real life problems in industry

CO – PO – PSO Mapping:

Course outcome	Program outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1605B.1	0	-	-	-	-	-	-	-	-	-	3	1	0	-	-
ME1605 B.2	3	-	-	-	--	-	-	-	-	-	3	-	3	-	1
ME1605 B.3	3	-	-	-	--	3	-	-	-	-	-	-	2	-	1
ME1605 B.4	3	-	-	-	-	3	-	-	-	-	-	-	2	3	2
ME1605 B.5	3	-	-	-	-	3	-	-	-	-	-	-	1	3	2

0 - Not correlated 1 - Weakly Correlated2 - Moderately Correlated 3 - Strongly Correlated

CO – PO –PSO Mapping AS PER NBA JULY 2024 FORMAT (wef, 1st JAN 2025)

Course outcome	Program outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
ME1605B.1	0	-	-	-	-	-	-	-	-	3	1	0	-	-
ME1605 B.2	3	-	-	-	--	-	-	-	-	3	-	3	-	1
ME1605 B.3	3	-	-	-	--	3	-	-	-	-	-	2	-	1
ME1605 B.4	3	-	-	-	-	3	-	-	-	-	-	2	3	2
ME1605 B.5	3	-	-	-	-	3	-	-	-	-	-	1	3	2

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Course Code	ME 1604C								Course category			PE
Course Name	INDUSTRIAL ROBOTICS											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	01	00	04	15	15	10	60	2 hrs 30 min	00	00	100	04

Course Objectives:
To make the students aware and understand:

1. Various types of Industrial robots in industries.
2. Various types of Robot Control System in industries.
3. Types of End Effectors and Sensors, transformations, and its kinematics in robotics
4. Robot programming methods in robotic system.
5. Approach for Robot implementation issues in robotics

Course Contents:

Introduction : Basic concepts - Robot anatomy - Robot configurations - Basic robot motions -Types of robots- Types of drives - Applications - Material handling - processing -Assembly and Inspection -safety considerations.

Fundamentals of Industrial Robots : Specifications and Characteristics, Basic components, configurations, Criteria for selection, various industrial applications.

Transformations and Kinematics : Vector operations - Translational transformations and Rotational transformations- Properties of Transformation matrices-Homogeneous transformations and Manipulator - Forward solution -Inverse solution.

Robotic Control Systems :Actuators, Power transmission systems, Robot controllers, Dynamic properties of robots- stability, control resolution, spatial resolution, accuracy, Repeatability ,Compliance.

Robotic End Effectors and Sensors : Transducers and sensors- sensors in robotics and their classification, Touch (Tactile) sensors, proximity and range sensors, force and torque sensing. End Effectors- Types. grippers, various process tools as end effectors. Robot- End effectors. interface, Active and passive compliance, Gripper selection and design.

Robot Programming : Lead through method, Robot program as a path in space. Methods of defining positions in space. Motion interpolation, branching: Textual robot programming languages

Robot Implementation Issues : Approach for implementing Robotics, Safety. Training and Maintenance Social Aspects of Robotics

Text Books:

1. Industrial Robotics: Technology, Programming and Applications, M. P. Grover. McGraw- Hill International Editions, 2018
2. Robotics and Control. Nagrath and Mitral. Tara McGraw-Hili, 2005.
3. Robot Dynamics and Control. Spong and Vidhyasagar,John Wiley and sons. 2008.
4. Robotics Technologies and Flexible Automation, Deb, S. R. Deb. ,McGraw Hill, 2019

Reference Books and Websites:

1. Robotics for Engineers, Y. Koren, McGraw Hill International Editions
2. Robotic Engineering: An Integrated Approach, Richard D. Klafter, at.el, Prentice Hall of India
3. Handbook of Robotics, off. Shimon Y. ,John Wiley & Sons Robotics for Engineers, Y. Koren, McGraw Hill, 1985
4. Robotics. Control. Sensing, Vision and Intelligence. Fu. K.S. Gonzalez, R.C., Lee. C. .G.McGraw Hill International. 1987
5. Fundamentals or Robotics. Analysis & Control. Ed Schilling, Robert J. Prentice Hall of India. ISBN : 81-203-1047-0, (2004)

Course Outcomes:

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

ME1604C.1 Explain the manipulator and its kinematics.

ME1604C.2 Classify the actuators, types of robotic configurations and study their characteristics

ME1604C.3 Understand the motions of robots and its control and various implementing Issues.

ME1604C.4 Determination of the solution to inverse kinematics and trajectory planning in robot Movement

ME1604C.5 Acquire the knowledge of sensors, robot programming used in robots

CO – PO – PSO Mapping:

Course outcome	Program outcome														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1604C .1	3	2	0	1	0	1	1	0	0	0	0	0	1	2	0
ME1604C .2	2	2	0	1	3	2	0	0	0	0	0	1	0	0	1
ME1604C.3	3	2	2	1	2	1	0	3	0	0	0	0	0	1	0
ME1604C .4	3	3	3	1	0	3	0	3	0	2	0	0	1	0	0
ME1604C.5	2	0	0	1	3	0	1	0	0	0	0	1	0	0	2

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

CO – PO –PSO Mapping AS PER NBA JULY 2024 FORMAT (wef, 1st JAN 2025)

Course outcome	Program outcome													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
ME1604C .1	3	2	0	1	0	1	0	0	0	0	0	1	2	0
ME1604C .2	2	2	0	1	3	2	0	0	0	0	1	0	0	1
ME1604C.3	3	2	2	1	2	1	3	0	0	0	0	0	1	0
ME1604C .4	3	3	3	1	0	3	3	0	2	0	0	1	0	0
ME1604C.5	2	0	0	1	3	0	0	0	0	0	1	0	0	2

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Course Code	ME 1605							Course category			VSE
Course Name	METROLOGY AND QUALITY CONTROL LAB										
Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
00	-	02	02	-	-	-	-	---	25	25	50	01

Course Objectives:

To make the aware and understand:

1. Linear and Angular instrument.
2. Concept and used of various measuring tools.
3. The error and corrections factor of various measuring instruments.

Course Contents:

Minimum Eight Practical's to be performed to achieve course outcomes.

It is representative list of Practical's. The course coordinator may choose minimum six practical's as per requirement.

1. Determination of linear and angular dimensions of part using precision & non Precision instrument.

2. Machine tool testing

3. Interferometer-Study of surfaces using optical flat.

4. Surface finish measurement.

5. Measurement of roundness and circularity using mechanical comparator.

6. Measurement of screw parameters

7. Measurement of Gear parameters, gear tooth thickness, PCD

8. Study and applications of tool maker's microscope

9. Use of profile projector

10. Preparation of control charts

ICA – Internal Continuous Assessment shall be based on the practical record and knowledge/ skills acquired. The performance shall be assessed experiment wise using continuous assessment formats, A and B.

Course Outcomes:

At the end of this course, students will demonstrate the ability to

ME1605.1 Demonstrate measurement using Linear and Angular Instruments.

ME1605.2 Calibrate measuring instrument.

ME1605.3 To express the error and corrections factor of various measuring instruments.

CO – PO – PSO Mapping:

Course outcome	Program Outcome														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1605.1	2	-	-	-	-	-	-	1	2	-	-	-	2	1	1
ME1605.2	2	-	-	-	-	-	-	1	2	-	-	-	2	1	1
ME1605.3	2	2	-	-	-	-	-	1	2	-	-	-	2	1	1

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

CO – PO –PSO Mapping AS PER NBA JULY 2024 FORMAT (wef, 1st JAN 2025)

Course outcome	Program outcome													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
ME1605.1	2	-	-	-	-	-	1	2	-	-	-	2	1	1
ME1605.2	2	-	-	-	-	-	1	2	-	-	-	2	1	1
ME1605.3	2	2	-	-	-	-	1	2	-	-	-	2	1	1

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

Course Code	ME1606A							Course category		PE
Course Name	REFRIGERATION AND AIR CONDITIONING LAB									
Teaching Scheme				Examination Scheme						Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
00	00	02	02	--	--	--	--	--	25	25	50	01

Course Objectives:

To make the students aware and understand

- Coefficient of Performance (COP) calculation of a pilot Vapour Compression Refrigeration (VCR) system through practical trials.
- Operation of industrial refrigeration systems, including water chiller plants, pasteurization heat exchangers, and cold storage facilities, through on-site visits.
- Functioning of various expansion devices used in Vapour Compression Refrigeration systems.

Minimum Eight Practical's to be performed to achieve course outcomes.

It is representative list of Practical's. The course coordinator may choose minimum six practical's as per requirement.

1. Study of refrigerant compressors
2. Trial on pilot VCR System to evaluate cycle performance and actual coefficient of Performance
3. Trial on vapour compression refrigeration test rig using capillary tube as expansion device.
4. Demonstration on thermostat with range and differential setting
5. Plotting of psychometric processes of air conditioning using air conditioning rig
6. Study of charging of refrigeration system
7. Industrial visit to study central air conditioning plant
8. Industrial visit to understand working of water chiller plant, pasteurization heat exchangers, cold storage of a milk plant

Course Outcomes:

After completion of this course students will be able to:

ME1606A.01: Evaluate the cycle performance and Coefficient of Performance (COP) of a Vapour Compression Refrigeration (VCR) system

ME1606A.02: Industrial refrigeration systems, including the operation of water chiller plants, Pasteurization heat exchangers, and cold storage facilities

ME1606A.03: Function of expansion devices in Vapour Compression Refrigeration systems

ME1606A.04: Acquire skills in adjusting and setting thermostats, with a focus on range and differential settings in refrigeration systems.
ME1606A.05: Plot psychometric processes and apply air conditioning system principles

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1606.01	2	-	-	2		1	2	-	-	-	-	1	2	3	-
ME1606.02	2	-	-	2		1	2	-	-	-	-	1	2	3	-
ME1606.03	2	-	-	2		1	2	-	-	-	-	1	2	3	-
ME1606.04	2	-	-	2		1	2	-	-	-	-	1	2	3	-
ME1606.05	2	-	-	2		1	2	-	-	-	-	1	2	3	-

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CO – PO –PSO Mapping AS PER NBA JULY 2024 FORMAT (wef, 1st JAN 2025)

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
ME1606.01	2	-	-	2		1	2	-	-	-	1	2	3	-
ME1606.02	2	-	-	2		1	2	-	-	-	1	2	3	-
ME1606.03	2	-	-	2		1	2	-	-	-	1	2	3	-
ME1606.04	2	-	-	2		1	2	-	-	-	1	2	3	-
ME1606.05	2	-	-	2		1	2	-	-	-	1	2	3	-

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

Course Code	ME1606B							Course category			PE
Course Name	TOTAL QUALITY MANAGEMENT LAB										
Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
00	00	02	02	--	--	--	--	--	25	25	50	01

Course Objectives:

To make the students aware and understand

1. Design for quality, Reliability, Design Optimization and Measuring and Controlling Quality
2. The concept of Quality Circle, Kaizen, and Six Sigma for quality improvement
3. The importance of Quality standards

Minimum Five Practical's to be performed to achieve course outcomes.

It is representative list of Practical's. The course coordinator may choose minimum Five practical's as per requirement.

1. Study the specification of any Two industrial products
2. Study application of quality control tools in local industry
3. Study application of control chart in local industry
4. Case Study on quality management practices
5. Visit any ISO certified industry and submit report on its implementation
6. Study vision and mission statement of an organisation
7. Case study on quality circle
8. Case study on bench marking

Course Outcomes:

After completion of this course students will be able to:

ME1606B.01: Measure and Control the quality of a business through appropriate tools and techniques

ME1606B.02: Continuously improve the business to achieve business Excellence

ME1606B.03: Illustrate and apply Quality standards

CO – PO – PSO Mapping:

Course outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1606B.01	2	-	-	2		1	2	-	-	-	-	1	2	3	-
ME1606B.02	2	-	-	2		1	2	-	-	-	-	1	2	3	-
ME1606B.03	2	-	-	2		1	2	-	-	-	-	1	2	3	-

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CO – PO –PSO Mapping AS PER NBA JULY 2024 FORMAT (wef, 1st JAN 2025)

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1606B.01	2	-	-	2		1	2	-	-	-	-	1	2	3	-
ME1606B.02	2	-	-	2		1	2	-	-	-	-	1	2	3	-
ME1606B.03	2	-	-	2		1	2	-	-	-	-	1	2	3	-

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

Course Code	ME1606C	Course category	PE
Course Name	MACHINE TOOL DESING LAB		

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
00	00	02	02	--	--	--	--	--	25	25	50	01

Course Objectives:
To make the students aware and understand:

1. Concepts, methods and application of Machine Tool Design.
2. A solution oriented approach by in depth knowledge of Machine Tool Design.
3. Design of Gear box , Feed box

Course Contents:

Minimum six experiments to be performed to achieve course outcomes.

It is representative list of practical. The instructor may choose minimum six experiments as per his/her requirement.

List of Experiments:

1. Study of motion transmission mechanisms in various machine tools.

2. Design and drawing of gear box and feed box for speed and feed transmission.

3. To study about design procedures of machine tool structure.

4.To study about design selection procedures of spindle.

5.To study about design selection procedures of slide ways.

6. Vibration analysis of machine tools.

7. Control analysis of machine tools.

ICA: The Internal Continuous Assessment shall be based on practical record and Knowledge/skills acquired. The performance shall be assessed experiment wise by using

continuous assessment .

ESE: The end semester exam for practical may/shall be based on viva voce.

Course Outcomes:

After completion of course. Students will be able to

ME1607C.1 Explain basic concepts of machine tool drives and mechanisms.

ME1607C.2 Design and analyze systems for specified speeds and feeds.

ME1607C.3 Design machine tool structures, Guideways , Spindle

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
ME1607C.1	2	3	2	-	-	1	1	2	1	-	-	3	2	-
ME1607C.2	3	3	3	3	2	-	-	2	1	-	2	3	3	-
ME1607C.3	3	3	3	3	2	-	-	2	1	-	2	3	2	-

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CO – PO –PSO Mapping AS PER NBA JULY 2024 FORMAT (wef, 1st JAN 2025)

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
ME1607C.1	2	3	2	-	-	1	2	1	-	-	3	3	2	-
ME1607C.2	3	3	3	3	2	-	2	1	-	2	3	3	3	-
ME1607C.3	3	3	3	3	2	-	2	1	-	2	3	3	2	-

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

Course Code	ME1607							Course category			FP
Course Name	MINOR PROJECT										
Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
00	00	04	04	00	00	00	00	-	25	25	50	02

Course Objectives:

To make the students aware and understand:

1. Literature review and identify problem statement
2. Engineering tools and techniques for solving problem
3. Report writing and presentation

Course Content:

Minor project includes topics such as,

- Design
- Fabrication
- Experimentation,
- Analysis
- Simulations
- Field study
- Market survey and
- Case Study

The guide would be allotted by the department to the batch of 15 students. However the topic may be given to the group of not more than 04 students. Students shall prepare and submit the report in consultation with the guide in three copies based on the work done. The evaluation Committee should consist of Guide and One Expert from the department. Evaluation will be done as per the format C of the department. Evaluation is based on content of report, presentation and Question answers.

Note:

ICA : The Internal Continuous Assessment shall be based on practical record and knowledge/skills acquired.

The performance shall be assessed experiment wise by using continuous assessment formats, A&B

ESE : Evaluation is done by the external examiner based on the content of report, presentation and Question answers

Course Outcomes:

On successful completion of the course, student will be able to:

ME1607.1 Review the literature and prepare problem statement

ME1607.2 Provide solution using Engineering tools and techniques.

ME1607.3 Write comprehensive report on the project work.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1607.1	3	2	3	0	2	3	2	1	3	3	2	2	1	3	1
ME1607.2	3	2	3	3	2	0	2	1	3	3	2	0	3	3	0
ME1607.3	0	2	3	3	2	3	2	1	0	3	2	2	0	3	1

0 - Not correlated 1 - Weakly Correlated 2 – Moderately 3 - Strongly Correlated

CO – PO –PSO Mapping AS PER NBA JULY 2024 FORMAT (wef, 1st JAN 2025)

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
ME1607.1	3	2	3	0	2	3	1	3	3	2	2	1	3	1
ME1607.2	3	2	3	3	2	0	1	3	3	2	0	3	3	0
ME1607.3	0	2	3	3	2	3	1	0	3	2	2	0	3	1

0 - Not correlated 1 - Weakly Correlated 2 – Moderately 3 - Strongly Correlated

MANDATORY NON-CREDIT COURSE

Course Code	ME1608						Course category			MNC
Course Name	INDUSTRIAL SAFTEY									
Teaching Scheme				Examination Scheme						Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
2	00	00	2	15	15	20	00	00	00	00	50	00

Course Objectives:

To make the students aware and understand:

1. Working principles of Industrial Safety
2. Types of Industrial Safety
3. Personal protection in work environment
4. Relevance of ergonomics in industrial safety
5. Safeguard point of operation in industrial safety

Course Contents:

Safety introduction- : Need for safety. Safety and productivity. Definitions:. Theories of accident causation. Safety organization- objectives, types, functions, Safety policy. Safety Officer-responsibilities, authority.

Personal protection in work environment- : Personal protection in the Accident, Injury, Unsafe act, Unsafe Condition, Dangerous Occurrence, Reportable accidents work environment, Types of PPEs, Personal protective equipment respiratory and non-respiratory equipment. Monitoring Safety Performance

Safety issues in construction: Introduction to construction industry and safety issues in construction Safety in various construction operations. Familiarization with relevant Indian Standards Relevance of ergonomics in construction safety. Ergonomics Hazards

Safety hazards in machines: Machinery safeguard-Point-of-Operation, Principle of machine guarding -types of guards and devices. Safety in turning, and grinding. Handling assessments and techniques- lifting, carrying, pulling, pushing, palletizing and stocking.

Hazard identification and analysis: Hazard and risk, Types of hazards –Classification of Fire, Types of Fire extinguishers, fire explosion and toxic gas release, Structure of hazard identification and risk assessment. Fire and explosion hazard rating of process plants.

Hazard and Operability study (HAZOP)) –methodology, criticality analysis, corrective action and follow-up. Control of Chemical Hazards, Hazardous properties of chemicals, Material Safety Data Sheets

Course Outcomes: After Completion of Course, the students will be able to :

ME1608.1 Understand basics of Industrial safety

ME1608.2 Understand Classification of Fire

ME1608.3 Understand Theories of accident

ME1608.4 Understand the Machinery safeguard-Point-of-Operation

ME1608.5 Understand Hazard and Operability study

Text Books:

1. Health and Environment management systems R.K Jain (2000) Industrial Safety, , Khanna Publications.
2. Safety management System and Documentation training Programme handbook Paul S V (2000 CBS Publication.
3. Safety management in Industry Krishnan, N.V. (1997).. Jaico Publishing House, New Delhi

Reference:

1. Safety management John V. Grimaldi and Rollin H.Simonds. (1989). All IndiaTraveller Book Seller, Delhi.
2. Industrial safety. Ronald P. Blake. (1973). Prentice Hall, NewDelhi.

CO – PO – PSO Mapping

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1608.1	3	3	1	0	0	0	0	0	0	0	0	0	3	2	0
ME1608.2	1	2	3	2	0	0	0	0	0	0	0	0	0	3	0
ME1608.3	1	1	1	1	0	0	0	0	0	0	0	0	0	1	0
ME1608.4	2	1	3	3	0	0	0	0	0	0	0	0	0	1	0
ME1608.5	2	1	3	3	0	0	0	0	0	0	0	0	0	1	0

Not Correlated 1 - Weakly Correlated 2- Moderately Correlated 3-Strongly Correlated

Sign Member Secretary | Sign BoS Chairperson | Sign Dean, Academics | Sign Principal

CO – PO –PSO Mapping AS PER NBA JULY 2024 FORMAT (wef, 1st JAN 2025)

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
ME1608.1	3	3	1	0	0	0	0	0	0	0	0	3	2	0
ME1608.2	1	2	3	2	0	0	0	0	0	0	0	0	3	0
ME1608.3	1	1	1	1	0	0	0	0	0	0	0	0	1	0
ME1608.4	2	1	3	3	0	0	0	0	0	0	0	0	1	0
ME1608.5	2	1	3	3	0	0	0	0	0	0	0	0	1	0

Not Correlated 1 - Weakly Correlated 2- Moderately Correlated 3-Strongly Correlated

Course Code	SH1601	Course category	MNC
Course Name	NCC/NSS/Community Services etc.		

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
0	00	00	0	00	00	20	00	00	00	00	20	00

Ref: GCOEA/1651 Dated 24-4-2025

Evaluation Mechanism for SH1402/SH1502 Co-curricular Course , SH1601(NCC/NSS/Cummunity services)

Marks per Activity, Maximum Limit = 20 (Sr 1+2+3)

Sr No	Name of Activity	Level	Participated	Organised /Cordinator	Winner /1st Prize Holder	Runner Up/2ND Prize
1	Sports, Students Association activity, Professional society Activities(IE/ISTE/IETE/IEEE/ACM/CSI /SCRS/IWWA), Paper presentation, Cultural activity, Drama, Painting, Fine/applied/Visual Perofrming arts, Annual day, Technical Festival, Community Services, Foreign Language /skill enhancement certification, Blood Donation, Tree Planation, Health and wellness, Yoga Education, College Club activity etc.	Department	5	6	10	7
		Institute	6	8	11	10
		University	8	10	15	12
		State	10	12	18	15
		National	12	15	20	18
2	NSS various Events	Institute	5	7	NA	NA
		University	7	NA	NA	NA
		Residential Camp	20	NA	NA	NA

3	NCC	Institute (B & C certificate)	B Certifcate 05 M	C Certificate 10 M
		University Level coat holder/NCC Camp	Per camp 05 marks, Coat Holder 15 marks	
		TSC (Thal Sena Camp)	15 M	
		National (RD Parade)	20 M	
		National Level camp	15 M	
		Flag Hosting parade Paticipation	Per Hosting activity 05M marks	
		Events at Institute /Battalion level	Participation in events: 05 Marks, SSB training Participation 10 marks, Attending SSB Test for officer entry: 15 Marks	

Note 1: Any other activity not listed above, being notified by Deptt. Level/Insitulte/State Govt/Central Govt time to time,Marks will be alloted by the respective Board of Studies Chairman/Head/NSS/NCC coordinator/Event Cordinator

2. All above activity (sr no 1,2,3) to consider/counted for SH1402/SH1502/SH1601 course

Sign Member Secretary | Sign BoS Chairperson | Sign Dean, Academics | Sign Principal

EXIT CRITERIA FOR BVOC

Course Code	ME1611	Course category	EX
Course Name	CNC PROGRAMMING AND MACHINING		

Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
00	00	00	00	00	00	00	00	00	50	00	50	04

Course Objectives:

To make the students aware and understand:

1. Fundamentals of CNC Machine
2. Codes for CNC part programming
3. Simulation and preparation of CNC part programming

Course Contents:

List of Practical's

6. Study of CNC Part programming-Codes
7. Study of CNC Part programming
8. SIMULATION OF CNC Part programs
9. Preparation of job on CNC Lathe
10. Preparation of job on CNC Milling

Course Outcomes: After Completion of Course, the students will be able to :

ME1611.1 Understand basics of CNC machine and programming codes

ME1611.2 Prepare CNC part program

ME1611.3 Simulate CNC part program and prepare Job on CNC lathe and Milling

ICA: The Internal Continuous Assessment shall be based on practical record and knowledge/skills acquired. The performance shall be assessed experiment wise by using continuous assessment formats, A&B

CO – PO – PSO Mapping

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1611.1	3	3	1	0	0	0	0	0	0	2	0	1	3	2	0
ME1611.2	1		3	2	0	0	1	0	0	0	0	0	1	3	0
ME1611.3	1	1	1	1	0	3	0	0	2	0	2	2	0	1	0

Not Correlated 1 - Weakly Correlated 2- Moderately Correlated 3-Strongly Correlated

CO – PO –PSO Mapping AS PER NBA JULY 2024 FORMAT (wef, 1st JAN 2025)

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
ME1611.1	3	3	1	0	0	0	0	0	2	0	1	3	2	0
ME1611.2	1		3	2	0	0	0	0	0	0	0	1	3	0
ME1611.3	1	1	1	1	0	3	0	2	0	2	2	0	1	0

Not Correlated 1 - Weakly Correlated 2- Moderately Correlated 3-Strongly Correlated

Course Code	ME1612							Course category			EX
Course Name	COMPUTER AIDED DRAFTING										
Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
00	00	00	00	-	-	-	-	-	50	-	50	04

Course Objectives:

To make the students aware and understand:

1. CAD software's, Basics of Autodesk CAD tool, Use of computer in drafting
2. Prepare 2D drawing using sketcher module of AUTOCAD.
3. Prepare isometric/3D drawing using CAD

Course Contents:

The students should learn Auto Cad software and shall complete following practical's

1. Prepare a drawing template consisting of name plate boundary lines and projection method symbol
2. Draw and plot/print two simple 2D geometries using sketcher command
3. Draw and plot/print two complex 2D geometries using sketcher command

Course Outcomes:

After completion of course. Students will be able to :

ME1612.1. Able to know use of computer in drafting

ME1612.2. Learn all CAD commands used for drafting

ME1612.3. Draw and plot/print two simple 2D geometries using sketcher command

CO – PO – PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1612.1	3	2	1	-	-	-	-	-	-	-	-	-	3	2	-
ME1612.2	2	2	3	2	--	-	-	-	-	-	-	-	-	3	-
ME1612.3	2	2	2	3	-	-	-	-	-	-	-	-	-	2	-

Not Correlated 1 - Weakly Correlated 2- Moderately Correlated 3-Strongly Correlated

Sign Member Secretary | Sign BoS Chairperson | Sign Dean, Academics | Sign Principal

CO – PO –PSO Mapping AS PER NBA JULY 2024 FORMAT (wef, 1st JAN 2025)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1612.1	3	2	1	-	-	-	-	-	-	-	-	-	3	2	-
ME1612.2	2	2	3	2	--	-	-	-	-	-	-	-	-	3	-
ME1612.3	2	2	2	3	-	-	-	-	-	-	-	-	-	2	-

Not Correlated 1 - Weakly Correlated 2- Moderately Correlated 3-Strongly Correlated

Sign Member Secretary | Sign BoS Chairperson | Sign Dean, Academics | Sign Principal

Course Code	ME1613								Course category			EX
Course Name	INTERNSHIP/ TECHNICAL PROJECT											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
00	00	00	00	00	00	00	00	-	100	--	100	08

Course Objective:

To make the students aware and understand:

1. Literature review and identify problem statement
2. Engineering tools and techniques for solving problem
3. Report writing and presentation

Course Content:

Minor project includes topics such as,

- Design
- Fabrication
- Experimentation,
- Analysis
- Simulations
- Field study
- Market survey and
- Case Study

The guide would be allotted by the department to the batch of 15 students. However the topic may be given to the group of not more than 04 students. Students shall prepare and submit the report in consultation with the guide in three copies based on the work done. The evaluation Committee should consist of Guide and One Expert from the department. Evaluation will be done as per the format C of the department. Evaluation is based on content of report, presentation and Question answers.

ICA: The Internal Continuous Assessment shall be based on practical record and knowledge/skills acquired. The performance shall be assessed experiment wise by using continuous assessment formats, A&B

Course Outcomes:

On successful completion of the course, student will be able to:

ME1613.1 Review the literature and prepare problem statement

ME1613.2 Provide solution using Engineering tools and techniques.

ME1613.3 Write comprehensive report on the project work.

CO – PO – PSO Mapping:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1613.1	3	2	3	0	2	3	2	1	3	3	2	2	1	3	1
ME1613.2	3	2	3	3	2	0	2	1	3	3	2	0	3	3	0
ME1613.3	0	2	3	3	2	3	2	1	0	3	2	2	0	3	1

0 - Not correlated 1 - Weakly Correlated 2 – Moderately 3 - Strongly Correlated

CO – PO –PSO Mapping AS PER NBA JULY 2024 FORMAT (wef, 1st JAN 2025)

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1613.1	3	2	3	0	2	3	1	3	3	2	2	1	3	1
ME1613.2	3	2	3	3	2	0	1	3	3	2	0	3	3	0
ME1613.3	0	2	3	3	2	3	1	0	3	2	2	0	3	1

0 - Not correlated 1 - Weakly Correlated 2 – Moderately 3 - Strongly Correlated

ADDITIONAL CRITERIA FOR HONORS

Course Code	ME1621								Course category			PEH
Course Name	PROGRAM ELECTIVE FOR HONORS 3											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
3	-	-	3	15	15	10	60	--	-	-	100	3

Note: The students appearing for ME1621 should select any online course (Swayam/MOOCS/NPTEL) from areas: Thermal/Production/Design and get approval from Department Faculty Board

Course Code	ME1622								Course category			PEH
Course Name	PROGRAM ELECTIVE FOR HONORS 4											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
3	-	-	3	15	15	10	60	--	-	-	100	3

Note: The students appearing for ME1622 should select any online course (Swayam/MOOCS/NPTEL) from areas: Thermal/Production/Design and get approval from Department Faculty Board

ADDITIONAL CRITERIA FOR HONORS WITH RESEARCH

Course Code	ME1631								Course category			PER
Course Name	RESEARCH PROJECT STAGE 2											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
-	-	12	12	-	-	-	-	--	100	100	200	6

Guidelines for Research Project Stage -2

Purpose of research project is to gain new insights into a phenomenon, to solve problems facing society or businesses, to access new facts, to provide logical solutions to problems, to forecast the future, to innovate and renew.

Stage-2: The student is expected to**:**

- Preparation of Experimental setup
- Experimentation/data collection
- Data analysis
- Paper submission/Publication in international/National conference/Journal on data analysis
- Prepare, submit and present the report on the work completed

Evaluation: The evaluation of research project stage 1 will be done by Expert appointed by Head of the Department and project guide**.** The evaluation will be done as per the standard format in the department.

ADDITIONAL CRITERIA FOR DOUBLE MINOR

Course Code	ME1641							Course category		MN
Course Name	ENERGY CONSERVATION AND MANAGEMENT									
Teaching Scheme				Examination Scheme						Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
3	--	--	3	15	15	10	60	2hr. 30min	--	100	3	3

Course Objectives:

1. To introduce the concepts, techniques, design and applications of energy conservation and auditing.
2. To understand the methods of energy auditing in electrical systems in this course
3. To enable students to understand and implement the energy conservation in thermal mechanical system
4. To identify the problems, analyze the data and choose the relevant methods to apply.
5. To give solutions to the problems in field of energy conservation.

Course contents:

Introduction: energy & power scenario of world, National Energy consumption data, and environmental aspects associated with energy utilization; Energy Auditing- need, types, methodology and barriers, role of energy managers, instruments of energy auditing.

Energy Conservation in electrical systems: Components of electric billing, HT and LT supply, transformers, cable sizing; Concept of capacitors, power factor improvement, harmonics; Electric motors- motor efficiency, computation, energy efficient motors; Illumination- Lux, Lumens, types of lighting, efficacy, LED lighting and scope of energy conservation in lighting.

Energy Conservation in Thermal systems: Boilers, Furnaces and Thermic Fluid heaters- efficiency computation and energy conservation measures; Steam distribution and usage, steam traps, condensate recovery, flash steam utilization; Insulation & Refractoriness.

Energy conservation in major utilities: pumps, fans, blowers, compressed air systems, Refrigeration& Air Conditioning systems, Cooling Towers, DG sets.

Energy Economics: discount period, payback period, internal rate of return, net present value; Life Cycle costing- ESCO concept.

Text Books:

1. Energy Manager Training Manual (4 Volumes) available at www.energymanagertraining.com, a website administered by Bureau of Energy Efficiency (BEE), a statutory body under Ministry of Power, Government of India, 2004

Reference Books:

1. Industrial energy management and utilization, Witte, L C, Schmidt, P S, and Brown, D R., United States: N. p., 1988. Web
2. Design and Management for Energy Conservation, Callaghn P.W., Pergamon Press, Oxford, 1981
3. The Efficient Use of Energy, Dryden. I.G.C., Butterworths, London, 1982
4. Energy Management Hand book, Turner. W.C., Wiley, New York, 1982
5. Energy Management ,Murphy W.R.; G.A. McKay, Butterworths, London, 1987

Course Outcomes:

On the completion of this course, the students will be able

ME1641. 1 To use the instruments of energy auditing

ME1641 .2 To audit the energy consumption of different industries

ME1641. 3 To suggest the strategy for its conservation of energy

ME1641. 4 To offer energy services, usually design, retrofitting and implementation of Energy efficiency projects

ME1641. 5 To implement the strategy of conservation of energy and to evolve new Solution

CO-PO-PSO Mappings:

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1641. 1	2	1	2	1	2	3	2	1	3	3	2	2	3	3	3
ME1641. 2	2	1	1	3	2	2	2	1	3	3	2	1	3	3	2
ME1641. 3	2	2	3	3	2	3	2	1	1	3	2	2	1	3	3
ME1641. 4	2	1	3	3	2	3	1	1	3	3	2	2	3	3	3
ME1641. 5	2	1	3	3	2	3	1	1	2	2	2	2	3	3	3

0- Not correlated 1 - Weakly Correlated2- Moderately Correlated 3- Strongly Correlated

CO – PO –PSO Mapping AS PER NBA JULY 2024 FORMAT (wef, 1st JAN 2025)

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
ME1641. 1	2	1	2	1	2	3	1	3	3	2	2	3	3	3
ME1641. 2	2	1	1	3	2	2	1	3	3	2	1	3	3	2
ME1641. 3	2	2	3	3	2	3	1	1	3	2	2	1	3	3
ME1641. 4	2	1	3	3	2	3	1	3	3	2	2	3	3	3
ME1641. 5	2	1	3	3	2	3	1	2	2	2	2	3	3	3

0- Not correlated 1 - Weakly Correlated2- Moderately Correlated 3- Strongly Correlated

Sign Member Secretary | Sign BoS Chairperson | Sign Dean, Academics | Sign Principal

Course Code	ME1642								Course category			MN4
Course Name	INDUSTRIAL ROBOTICS											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
3			3	15	15	10	60	2hr. 30min		100	3	3

Course Objectives:

To make the students aware and understand:

1. Various types of Industrial robots in industries.
2. Types of Robot Control System in industries.
3. End Effectors and Sensors, transformations, and its kinematics in robotics
4. Robot programming methods in robotic system.
5. Approach for Robot implementation issues in robotics

Course Contents:

Introduction: Basic concepts - Robot anatomy - Robot configurations - Basic robot motions -Types of robots- Types of drives - Applications - Material handling - processing -Assembly and Inspection -safety considerations.

Fundamentals of Industrial Robots: Specifications and Characteristics, Basic components, configurations, Criteria for selection, various industrial applications.

Transformations and Kinematics: Vector operations - Translational transformations and Rotational transformations- Properties of Transformation matrices-Homogeneous transformations and Manipulator - Forward solution -Inverse solution.

Robotic Control Systems: Actuators, Power transmission systems, Robot controllers, Dynamic properties of robots- stability, control resolution, spatial resolution, accuracy, Repeatability, Compliance.

Robotic End Effectors and Sensors : Transducers and sensors- sensors in robotics and their classification, Touch (Tactile) sensors, proximity and range sensors, force and torque sensing. End Effectors- Types, grippers, various process tools as end effectors. Robot- End effectors. Interface, Active and passive compliance, Gripper selection and design.

Robot Programming: Lead through method, Robot program as a path in space. Methods of defining positions in space. Motion interpolation, branching: Textual robot programming languages

Robot Implementation Issues : Approach for implementing Robotics, Safety. Training and Maintenance Social Aspects of Robotics

Text Books:

1. Industrial Robotics: Technology, Programming and Applications, M. P. Grover. McGraw- Hill International Editions, 2018
2. Robotics and Control. Nagrath and Mitral. Tara McGraw-Hili, 2005.

Reference Books and Websites:

1. Robotics for Engineers, Y. Koren, McGraw Hill International Editions
2. Robotic Engineering: An Integrated Approach, Richard D. Klafter, at.el, Prentice Hall of India
3. Handbook of Robotics, off. Shimon Y. ,John Wiley & Sons Robotics for Engineers, Y. Koren, McGraw Hill, 1985
4. Robotics. Control. Sensing, Vision and Intelligence. Fu. K.S. Gonzalez, R.C., Lee. C. .McGraw Hill International. 1987

Course Outcomes:

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

ME1642.1 Explain the manipulator and its kinematics.

ME1642.2 Explain actuators, types of robotic configurations and their characteristics

ME1642.3 Understand the motions of robots and its control and various implementing Issues.

ME16424 Determine the solution to inverse kinematics and trajectory planning in robot movement

ME1642.5 Implement the knowledge of sensors, robot programming

CO – PO – PSO Mapping:

Course outcome	Program Outcome														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME1642.1	3	2	0	1	0	1	1	0	0	0	0	0	1	2	0
ME1642.2	2	2	0	1	3	2	0	0	0	0	0	1	0	0	1
ME1642.3	3	2	2	1	2	1	0	3	0	0	0	0	0	1	0
ME1642.4	3	3	3	1	0	3	0	3	0	2	0	0	1	0	0
ME1642.5	2	0	0	1	3	0	1	0	0	0	0	1	0	0	2

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

CO – PO –PSO Mapping AS PER NBA JULY 2024 FORMAT (wef, 1st JAN 2025)

Course outcome	Program outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
ME1642.1	3	2	0	1	0	1	0	0	0	0	0	1	2	0
ME1642.2	2	2	0	1	3	2	0	0	0	0	1	0	0	1
ME1642.3	3	2	2	1	2	1	3	0	0	0	0	0	1	0
ME1642.4	3	3	3	1	0	3	3	0	2	0	0	1	0	0
ME1642.5	2	0	0	1	3	0	0	0	0	0	1	0	0	2

0 - Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Stro