

NAAC Criterion-I

Curricular Aspects

Key Indicator -1.1 Curriculum Design and Development

Sub-Criteria -1.1.2



MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV, Bhopal)

Gola ka Mandir, Gwalior - 474005, Madhya Pradesh, India

MADHAV INSTITUTE OF TECHNOLOGY AND SCIENCE, GWALIOR – 474005

(A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to R.G.P.V. Bhopal)

MECHANICAL ENGINEERING DEPARTMENT

SEM.	2019-2023 BATCH		2020-2024 BATCH		Percentage Change
	COURSE CODE	COURSE NAME	COURSE CODE	COURSE NAME	
I	100101	Engineering Chemistry	100011	Engineering Mathematics-I	25.42
	100102	Engineering Mathematics-I	100012	Engineering Chemistry	
	100103	Technical English	100014	Engineering Graphics	
	100104	Basic Electrical & Electronics Engineering	100015	Energy, Environment, Ecology & Society	
	100105	Engineering Graphics	100016	Technical Language	
	100106	Manufacturing Practices	100017	Language Lab	
			100018	Engineering Graphics Lab	
II	100201	Engineering Physics	120211	Material Science	
	100202	Energy, Environment, Ecology & Society	100020	Basic Civil Engineering & Mechanics	
	100203	Basic Computer Engineering	100021	Basic Mechanical Engineering	
	100204	Basic Mechanical Engineering	100022	Basic Electrical and Electronics Engineering	
	100205	Basic Civil Engineering & Mechanics	100023	Basic Computer Engineering	
	100206	Language Lab. & Seminars	100024	Manufacturing Practices	
			120026	Basic Mechanical Engineering Lab	
III	100001	Engineering Mathematics-II	100025	Engineering Mathematics-II	
	120301	Material Science	120311	Manufacturing Processes	
	120302	Mechanics of Materials	120312	Mechanics of Materials	
	120303	Theory of Machines –I	120313	Theory of Machines –I	
	120304	Fluid Mechanics and Hydraulic Machines	120314	Fluid Mechanics and Hydraulic Machines	
	120305	Software Lab	120315	Software Lab	
	120306	Self-learning/Presentation (SWAYAM/NPTEL/MOOC)	120316	Self-learning/Presentation	
	120307	Summer Internship Project–I (Institute Level) (Evaluation)	200XXX	Novel Engaging Course	
			120318	Summer Internship Project–I	
		1000001	Indian Constitution and Traditional Knowledge		
IV	100003	Mathematics- III	100003	Mathematics- III	
	120401	Theory of Machines –II	120411	Theory of Machines –II	
	120402	Design of Machine Elements	120412	Design of Machine Elements	
	120403	Manufacturing Processes	120413	Metal Cutting and Machine Tools	
	120404	Engineering Thermodynamics	120414	Engineering Thermodynamics	
	100004	Cyber Security	100004	Cyber Security	
	120405	Production Lab	120415	Production Lab	
	100002	Biology for Engineers	200XXX	Novel Engaging Course (Informal Learning)	
		1000002	Biology for Engineers		
	120501	Industrial Engineering	120519	Data Science	

V	120502	Metal Cutting and Machine Tools	120511	Industrial Engineering
	120503	Heat and Mass Transfer	120513	Heat and Mass Transfer
	120504	Thermal Engineering	120514	Thermal Engineering
	120505	Machine Design	120515	Machine Design
	120506	Minor Project-I	120516	Minor Project-I
	120507	Summer Internship Project-II (Evaluation)	120517	Self-learning/Presentation (SWAYAM/NPTEL/MOOC)
	120508	Self-learning/Presentation (SWAYAM/NPTEL/MOOC)	200XXX	Novel Engaging Course (Informal Learning)
			120518	Summer Internship Project-II (Evaluation)
			1000006	Disaster Management
		1000005	Project Management & Financing	
VI	100005	Ethics, Economics, Entrepreneurship & Management	120615	Mechanical Vibrations
	120601	Advance Production Technology	120616	Refrigeration and Air-Conditioning
	DE	120611 Vibration and Noise Engineering 120612 Statistical Quality Control 120613 Work Study and Ergonomics 120614 Turbo Machinery	120617	Artificial Intelligence & Machine Learning
	DE	120652 Fundamental of Welding Science and Technology 120654 Viscous Fluid Flow 120655 Properties of Materials (Nature and Properties of Material: III) 120656 Nature and Properties of Materials	DE	120661 Fundamental of Welding Science and Technology 120662 Viscous Fluid Flow 120663 Properties of Materials (Nature and Properties of Material: III)
	OC	900101 Robotics 900102 Product Design	OC	910108 Product Design 910109 Robotics
	100007	Disaster Management	120618	Minor Project-II
	120605	Minor Project-II	200XXX	Novel Engaging Course (Informal Learning)
	100006	Indian Constitution & Traditional Knowledge (Audit Course)	100008	Intellectual Property Rights (IPR)
VII	DE	120711 Refrigeration and Air-Conditioning 120713 Metrology, Measurement and Control 120714 Total Quality Management	DE	120713 Metrology, Measurement and Control 120714 Total Quality Management
	DE	120751 Foundation of Computational Fluid Dynamics 120752 Introduction to Composites 120753 Advanced Machining Processes	DE	120751 Foundation of Computational Fluid Dynamics 120752 Introduction to Composites 120753 Advanced Machining Processes
	OC	900203 Industrial Automation 900204 Solar Energy	OC	900203 Industrial Automation 900204 Solar Energy
	OC	900214 Engineering Materials for Industrial Applications 900215 Maintenance Engineering	OC	900214 Engineering Materials for Industrial Applications 900215 Maintenance Engineering
	100008	Intellectual Property Rights (IPR)	120701	Reliability and Vibration Lab
	120701	Reliability and Vibration Lab	120702	Summer Internship Project-III (04 weeks) (Evaluation)
	120702	Summer Internship Project-III (04 weeks) (Evaluation)	120703	Creative Problem Solving (Evaluation)
	120703	Creative Problem Solving (Evaluation)		
	DE	120851 Quality Design and Control 120852 Robotics: Basics and Selected Advanced Concepts 120855 Carbon Materials and Manufacturing	DE	120851 Quality Design and Control 120852 Robotics: Basics and Selected Advanced Concepts 120855 Carbon Materials and Manufacturing

VIII	OC	900605 Waste to Energy Conversion 900609 Product Design and Manufacturing 900610 Automatic Control	OC	900605 Waste to Energy Conversion 900609 Product Design and Manufacturing 900610 Automatic Control
	120801	Internship/Project	120801	Internship/Project
	120802	Professional Development	120802	Professional Development

OLD SCHEME (2019-23)

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
(A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV, Bhopal)
Department of Mechanical Engineering

Scheme of Examination: Bachelor of Technology (B.Tech.) Mechanical Engineering
GROUP B: I Semester
For batches admitted in Session 2019-20
B.Tech. I Semester (Mechanical Engineering)

S.No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per week			Total Credits
				Theory Slot			Practical Slot			L	T	P	
				End Sem.	Mid Sem.	Quiz/Assignment	End Sem.	Lab work & Sectional					
1.	100101	BSC	Engineering Chemistry (BSC-1)	70	20	10	30	20	150	3	-	2	4
2.	100102	BSC	Engineering Mathematics-I (BSC-2)	70	20	10	-	-	100	3	1	-	4
3.	100103	HSMC	Technical English (HSMC-1)	70	20	10	30	20	150	3	-	2	4
4.	100104	ESC	Basic Electrical & Electronics Engineering (ESC-1)	70	20	10	30	20	150	3	-	2	4
5.	100105	ESC	Engineering Graphics (ESC-2)	70	20	10	30	20	150	3	-	2	4
6.	100106	ESC	Manufacturing Practices (ESC-3)	-	-	-	30	20	50	-	-	2	1
Total				350	100	50	150	100	750	15	1	10	21
NSS/NCC				Qualifier									
Induction programme of first three weeks (MC): Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations													

GROUP A: (Electrical, Electronics, Computer Science & Engineering, Information Technology, Electronics & Telecommunication)
GROUP B: (Civil, Mechanical, Chemical, Biotech, Automobile)
01 Theory Period=1 Credit; 02 Practical Periods=1 Credit

M - 2019-20

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
(A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV, Bhopal)
Department of Mechanical Engineering

Scheme of Examination: Bachelor of Technology (B.Tech.) Mechanical Engineering
Group B: II Semester
For batches admitted in Session 2019-20
B.Tech. II Semester (Mechanical Engineering)

S.No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per week			Total Credits
				Theory Slot			Practical Slot			L	T	P	
				End Sem.	Mid Sem Exam.	Quiz/Assignment	End Sem.	Lab work & Sectional					
1.	100201	BSC	Engineering Physics (BSC-3)	70	20	10	30	20	150	2	1	2	4
2.	100202	HSMC	Energy, Environment, Ecology & Society (HSMC-2)	70	20	10	-	-	100	3	-	-	3
3.	100203	ESC	Basic Computer Engineering (ESC-4)	70	20	10	30	20	150	3	-	2	4
4.	100204	ESC	Basic Mechanical Engineering (ESC-5)	70	20	10	30	20	150	3	-	2	4
5.	100205	ESC	Basic Civil Engineering & Mechanics (ESC-6)	70	20	10	30	20	150	3	-	2	4
6.	100206	HSMC	Language Lab. & Seminars (HSMC-3)	-	-	-	30	20	50	-	-	4	2
Total				350	100	50	150	100	750	14	1	12	21
NSS/NCC				Qualifier									
Summer Internship Project - I (Institute Level) (Qualifier): Minimum two-week duration													

GROUP A: (Electrical, Electronics, Computer Science & Engineering, Information Technology, Electronics & Telecommunication)
GROUP B: (Civil, Mechanical, Chemical, Biotech, Automobile)
01 Theory Period=1 Credit; 02 Practical Periods=1 Credit

M - 2019-20

REVISED SCHEME (2020-24)

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
(A Govt. Aided UGC Autonomous Institute & NAAC Accredited Institute Affiliated to RGPV, Bhopal, MP)
Department of Mechanical Engineering
Scheme of Evaluation *For batch admitted in Academic Session 2020-2021*

B.Tech. I Semester (Mechanical Engineering)

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted								Total Marks	Contact Hours per week			Total Credits	Mode of Teaching (Offline/Online)	Mode of Exam.
				Theory Slot				Practical Slot					L	T	P			
				End Term Evaluation	Proficiency in subject/course	Mid Sem. Exam	Quiz/Assignment	End Sem.	Lab Work & Sectional	Skill Based Mini Project								
1.	100011	BSC	Engineering Mathematics-I (BSC-1)	50	10	20	20	-	-	-	100	3	1	-	4	Offline (4:0)	PP	
2.	100012	BSC	Engineering Chemistry (BSC-2)	50	10	20	20	60	20	20	200	2	1	2	4	Blended (2:1)	MCQ	
3.	100014	ESC	Engineering Graphics (ESC-1)	50	10	20	20	-	-	-	100	1	2	-	3	Offline (3:0)	A+O	
4.	100015	HSMC	Energy, Environment, Ecology & Society (HSMC-1)	50	10	20	20	-	-	-	100	3	-	-	3	online (3:0)	MCQ	
5.	100016	HSMC	Technical Language (HSMC-2)	50	10	20	20	-	-	-	100	3	-	-	3	Blended (2:1)	PP	
6.	100017	HSMC	Language Lab (HSMC-1)	-	-	-	-	60	20	20	100	-	-	2	1	Offline (1:0)	SO	
7.	100018	ESC	Engineering Graphics Lab (ESC-2)	-	-	-	-	60	20	20	100	-	-	2	1	Offline (1:0)	SO	
Total				250	50	160	160	180	60	60	900	12	4	6	19			
Induction programme of three weeks (MC): Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations.																		

Mode of Teaching				Mode of Examination				Total Credits
Theory		Lab		Theory		Lab		
Offline	Online	Blended	Offline	PP	A+O	MCQ	SO	
7	3	4	2	3	7	7	2	
36.84	15.7	21.0	10.5	15.71	36.84	15.78	36.84	
								19
								19
								100

M - 2020-21

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
(A Govt. Aided UGC Autonomous Institute & NAAC Accredited Institute Affiliated to RGPV, Bhopal, MP)
Department of Mechanical Engineering
Scheme of Evaluation *For batch admitted in Academic Session 2020-2021*

B.Tech. II Semester (Mechanical Engineering)

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted								Total Marks	Contact Hours per week			Total Credits	Mode of Teaching (Offline/Online)	Mode of Exam.
				Theory Slot				Practical Slot					L	T	P			
				End Term Evaluation	Proficiency in subject/course	Mid Sem. Exam.	Quiz/Assignment	End Sem.	Lab Work & Sectional	Skill Based Mini Project								
1.	130111	DC	Material Science (DC-1)	50	10	20	20	-	-	-	100	3	-	-	3	Blended (2:1)	PP	
2.	100026	ESC	Basic Fluid Engineering & Mechanics (ESC-3)	50	10	20	20	-	-	-	100	2	1	-	3	Blended (2:1)	PP	
3.	100021	ESC	Basic Mechanical Engineering (ESC-4)	50	10	20	20	-	-	-	100	2	1	-	3	Blended (2:1)	MCQ	
4.	100022	ESC	Basic Electrical and Electronics Engineering (ESC-5)	50	10	20	20	60	30	30	300	3	1	2	4	Blended (2:1)	MCQ	
5.	100023	ESC	Basic Computer Engineering (ESC-6)	50	10	20	20	60	40	-	300	2	1	2	4	Blended (2:1)	A+O	
6.	100024	ESC	Manufacturing Practices (ESC-7)	-	-	-	-	60	20	20	100	-	-	2	1	Offline (1:0)	SO	
7.	130024	ESC	Basic Mechanical Engineering Lab (ESC-8)	-	-	-	-	60	20	20	100	-	-	2	1	Offline (1:0)	SO	
Total				250	50	160	160	240	180	60	900	11	4	6	19			
Summer Internship Project - I (Institute Level) (Qualifier): Minimum two-week duration; Evaluation in III Semester.																		

Mode of Teaching				Mode of Examination				Total Credits
Theory		Lab		Theory		Lab		
Offline	Online	Blended	Offline	PP	A+O	MCQ	SO	
0	0	10	2	4	4	7	2	
0	0	22.6	24.3	21	12.8	20	36.84	
								19
								100

M - 2020-21

OLD SCHEME (2019-23)

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
(A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV, Bhopal)
Department of Mechanical Engineering

**Scheme of Examination: Bachelor of Technology (B.Tech.) Mechanical Engineering
B.Tech. III Semester (Mechanical Engineering)**

For batches admitted in Session 2019-20

S.No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted				Total Marks	Contact Hours per week			Total Credits	
				Theory Slot			Practical Slot		L	T	P		
				End Sem.	Mid Sem. Exam.	Quiz/ Assignment	End Sem.						Term work
1.	10001	BSC	Engineering Mathematics-II (BSC-4)	70	20	10	-	100	3	1	-	4	
2.	120301	ESC	Material Science (ESC-7)	70	20	10	-	100	3	1	-	4	
3.	120302	DC	Mechanics of Materials (DC-1)	70	20	10	30	150	3	-	2	4	
4.	120303	DC	Theory of Machines -I (DC-2)	70	20	10	30	150	3	-	2	4	
5.	120304	DC	Fluid Mechanics and Hydraulic Machines (DC-3)	70	20	10	30	150	3	-	2	4	
6.	120305	DLC	Software Lab (DLC-1)	-	-	-	30	50	-	-	2	1	
7.	120306	SEMINAR/ SELF STUDY	Self-learning Presentation (SWAYAM/NPTEL/MOOC)	-	-	-	-	25	-	-	2	1	
8.	120307	DLC	Summer Internship Project-I (Institute Level) (Evaluation)	-	-	-	25	-	-	-	4	2	
Total				350	100	50	145	105	15	2	14	24	
NSS/NCC				Qualifier									

*Virtual Lab to be conducted along with the traditional lab

*Compulsory registration for one online course using SWAYAM/NPTEL/ MOOC, evaluation through attendance, assignments and presentation.
GROUP B: (Civil, Mechanical, Chemical, Biotech, Automobile)

M - 3 marks B.T. PL

REVISED SCHEME (2020-24)

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
(A Govt. Aided UGC Autonomous Institute & NAAC Accredited Institute Affiliated to RGPV, Bhopal, MP)
Department of Mechanical Engineering
Scheme of Evaluation

For batch admitted in Academic Session 2020-2021

B.Tech. III Semester (Mechanical Engineering)

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Hours per week			Total Credits	Mode of Teaching (Offline/ Online)	Mode of Exam.
				Theory Slot				Practical Slot				L	T	P			
				End Sem. Evaluation	Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment	End Sem.	Lab Work & Sessional	Skill Based Mini Project							
1.	10002	BSC	Engineering Mathematics-II (BSC-3)	30	10	20	20	-	-	-	100	2	1	-	3	Offline	PP
2.	120311	DC	Manufacturing Processes (DC-2)	50	10	20	20	-	-	-	100	2	1	-	3	Blended	PP
3.	150811	DC	Mechanics of Materials (DC-3)	50	10	20	20	60	20	20	200	2	-	2	3	Offline	PP
4.	120313	DC	Theory of Machines -I (DC-4)	50	10	30	30	60	20	20	300	3	1	2	4	Blended	AO
5.	120314	DC	Fluid Mechanics and Hydraulic Machines (DC-5)	50	10	20	20	60	20	20	200	2	1	2	4	Blended	PP
6.	120315	DLC	Software Lab (DLC-1)	-	-	-	-	60	20	20	100	-	-	2	1	Offline	SO
7.	120316	DLC	Self-learning/ Presentation	-	-	-	-	-	40	-	40	-	-	2	1	Online -Mentoring	SO
8.	200XXX	CLC	Novel Engaging Course	-	-	-	-	50	-	-	50	-	-	2	1	Interactive	SO
9.	120318	DLC	Summer Internship Project-I (Institute Level) (Evaluation)	-	-	-	-	60	-	-	60	-	-	4	2	Offline	SO
Total				250	50	100	100	350	120	80	1050	10	4	16	22		
10	100001	MAC	Indian Constitution and Traditional Knowledge	50	10	20	20	-	-	-	100	2	-	-	Grade	Online	MCQ

*Proficiency in course/subject - includes the weights towards ability/ skill/ competence/ knowledge level/ expertise attained/ attendance etc. in that particular course/subject
*Compulsory registration for one online course using SWAYAM/NPTEL/ MOOC, evaluation through attendance, assignments and presentation

M - 3 marks B.T. PL

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
(A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV, Bhopal)
Department of Mechanical Engineering

**Scheme of Examination: Bachelor of Technology (B.Tech.) Mechanical Engineering
B.Tech. IV Semester (Mechanical Engineering)**

For batches admitted in Session 2019-20

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted				Total Marks	Contact Hours per week			Total Credits	Exam Mode	
				Theory Slot			Practical Slot		L	T	P			
				End Sem.	Mid Sem. Exam.	Quiz/ Assignment	End Sem.							Term work
1.	100003	BSC	Mathematics- III (BSC-5)	70	20	10	-	100	3	1	-	4	PP	
2.	120401	DC	Theory of Machines -II (DC-6)	70	20	10	30	150	2	1	2	4	PP	
3.	120402	DC	Design of Machine Elements (DC-5)	70	20	10	30	150	2	1	2	4	AO	
4.	120403	DC	Manufacturing Process (DC-6)	70	20	10	-	100	3	1	-	4	MCQ	
5.	120404	DC	Engineering Thermodynamics (DC-7)	70	20	10	-	100	3	1	-	4	PP	
6.	100004	MC	Cyber Security (MC)	70	20	10	-	100	2	1	-	3	MCQ	
7.	120405	DLC	Production Lab (DLC-2)	-	-	-	30	50	-	-	4	2		
Total				420	120	60	90	500	15	6	8	25		
8.	100002	Audit Course	Biology for Engineers (Audit Course-I)	70	20	10	-	100	3	-	-	-	MCQ	
NSS/NCC				Qualifier										
Summer Internship Project-II (Soft skills Based) for two weeks duration: Evaluation in V Semester														

*Virtual Lab to be conducted along with the traditional lab

*Course will run for Group A/B in III/IV semester respectively. Passing is optional, however a separate mark sheet will be issued to those who qualify.
GROUP B: (Civil, Mechanical, Chemical, Biotech, Automobile)

M - 3 marks B.T. PL

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
(A Govt. Aided UGC Autonomous Institute & NAAC Accredited Institute Affiliated to RGPV, Bhopal, MP)
Department of Mechanical Engineering
Scheme of Evaluation

For batch admitted in Academic Session 2020-2021

B.Tech. IV Semester (Mechanical Engineering)

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Hours per week			Total Credits	Mode of Teaching (Offline/ Online)	Mode of Exam.
				Theory Slot				Practical Slot				L	T	P			
				End Sem. Evaluation	Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment	End Sem.	Lab Work & Sessional	Skill Based Mini Project							
1.	100003	BSC	Mathematics- III (BSC-5)	30	10	20	20	-	-	-	100	2	1	-	3	Offline	PP
2.	120411	DC	Theory of Machines -II (DC-6)	50	10	20	20	60	20	20	200	2	1	2	4	Blended	AO
3.	120412	DC	Design of Machine Elements (DC-7)	50	10	20	20	60	20	20	200	2	1	2	4	Blended	AO
4.	120413	DC	Metallurgy and Machine Tools (DC-8)	50	10	20	20	-	-	-	100	2	1	-	3	Blended	PP
5.	120414	DC	Engineering Thermodynamics (DC-9)	50	10	20	20	-	-	-	100	2	1	-	3	Blended	PP
6.	100004	MC	Cyber Security (MC)	50	10	20	20	-	-	-	100	2	-	-	2	Online	MCQ
7.	120415	DLC	Production Lab (DLC-2)	-	-	-	-	60	20	20	100	-	-	4	2	Offline	SO
8.	200XXX	CLC	Novel Engaging Course	-	-	-	-	50	-	-	50	-	-	2	1	Interactive	SO
Total				300	60	120	120	230	60	60	950	12	5	11	22		
Summer Internship Project-II (Soft skills Based) for two weeks duration: Evaluation in V Semester																	
9.	100002	MAC	Biology for Engineers	50	10	20	20	-	-	-	100	2	-	-	Grade	Online	MCQ

*Virtual Lab to be conducted along with the traditional lab

*Proficiency in course/subject - includes the weights towards ability/ skill/ competence/ knowledge level/ expertise attained/ attendance etc. in that particular course/subject

M - 3 marks B.T. PL

OLD SCHEME (2019-23)

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV, Bhopal)

Department of Mechanical Engineering

**Scheme of Examination: Bachelor of Technology (B.Tech.) Mechanical Engineering
V Semester**
For batches admitted in Session 2019-20

REVISED SCHEME (2020-24)

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(A Govt. Aided UGC Autonomous Institute & NAAC Accredited Institute Affiliated to RGPV, Bhopal, MP)

Department of Mechanical Engineering

Scheme of Evaluation

For batch admitted in Academic Session 2020-21

B.Tech. V Semester (Mechanical Engineering)

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted						Total Marks	Contact Hours per week			Total Credits	Mode of Teaching (Offline, Online, Blended)	Mode of Exam.		
				Theory Slot			Practical Slot				L	T	P					
				End Term Evaluation		Continuous Evaluation	End Sem. Exam.	Continuous Evaluation									Lab work & Sessional	Skill Based Mini Project
				End Sem. Exam.	Proficiency in subject /course	Mid Sem. Exam.		Quiz/ Assignment										
1.	120501	DC	Industrial Engineering (DC-8)	70	20	10	-	-	100	3	-	-	3	Blended (3/1)	MCQ			
2.	120502	DC	Metal Cutting and Machine Tools (DC-9)	70	20	10	-	-	100	3	1	-	4	Blended (2/1)	PP			
3.	120503	DC	Heat and Mass Transfer (DC-10)	70	20	10	30	20	150	2	1	2	4	Blended (3/1)	PP			
4.	120504	DC	Thermal Engineering (DC-11)	70	20	10	30	20	150	2	1	2	4	Blended (2/1)	PP			
5.	120505	DC	Machine Design (DC-12)	70	20	10	30	20	150	2	1	2	4	Blended (2/1)	AO			
6.	120506*	DLC	Minor Project-I (DLC-3)	-	-	-	30	20	50	-	-	-	2	1	Online - Mentoring	SO		
7.	120507	DLC	Summer Internship Project-II (Evaluation) (DLC-4)	-	-	-	25	-	25	-	-	-	6	3	Offline	SO		
8.	120508†	SEMINAR/ SELF STUDY	Self Learning Presentation (SWAYAM/NPTEL/ MOOC)	-	-	-	-	25	25	-	-	-	2	1	Offline	SO		
Total				350	100	50	145	105	750	12	4	16	24					

Department level activity/workshop/awareness programme to be conducted; certificate of compliance to be submitted by HoD to the Exam Controller through Dean Academic

Additional Courses for obtaining Honours or minor Specialization by desirous student: Permitted to opt for maximum two additional courses for the award of (i) Honours in parent discipline or (ii) Minor Specialization in engineering discipline other than the parent discipline

* The minor project-I may be evaluated by an internal committee for awarding Sessional marks.
 † Compulsory registration for one online course using SWAYAM/NPTEL/ MOOC, evaluation through attendance, assignments and presentation
 GROUP B: (Civil, Mechanical, Chemical, Biotech, Automobile)
 01 Theory Period=1 Credit; 02 Practical Periods=1 Credit

Additional Course for Honours or minor Specialization: Permitted to opt for maximum two additional courses for the award of Honours or Minor specialization
 † Proficiency in course/subject includes the weights towards ability/skill/competence/knowledge level expertise attained etc. in that particular course/subject.
 ‡ MCQ: Multiple Choice Question § AO: Assignment + Oral ¶ PP: Pen Paper †† SO: Submission + Oral
 * The Minor Project-I may be evaluated by an internal committee for awarding sessional marks.
 † Compulsory registration for one online course using SWAYAM/NPTEL/MOOC, evaluation through attendance, assignments and presentation
 Note: Students of 2020-21 admitted batch need to appear and complete an additional MAC course of 30 Hrs. duration on Project Management & Financing. / Other module: related to futuristic technologies (Drones/ Robotics etc.)



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Department of Mechanical Engineering

Scheme of Evaluation

For batch admitted in Academic Session 2020-21

B.Tech. VI Semester (Mechanical Engineering)

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted						Total Marks	Contact Hours per week			Total Credits	Mode of Teaching	Mode of Exam.	Duration of Exam.				
				Theory Slot			Practical Slot				L	T	P								
				End Term Evaluation		Continuous Evaluation	End Sem. Exam.	Continuous Evaluation										Lab work & Sessional	Skill Based Mini Project		
				End Sem. Exam.	Proficiency in subject /course	Mid Sem. Exam.		Quiz/ Assignment													
1.	120615	DC	Mechanical Vibrations (DC-14)	50	10	20	20	60	20	20	-	-	200	2	1	2	4	Blended	PP	2 hr	
2.	120616	DC	Refrigeration and Air-Conditioning (DC-15)	50	10	20	20	60	20	20	-	-	200	2	1	2	4	Blended	PP	2 hr	
3.	120617	MC	Artificial Intelligence & Machine Learning	50	10	20	20	60	20	20	-	-	200	3	-	2	4	Blended	MCQ	1.5 hr	
4.	DE	DE	Departmental Elective* (DE-1)	-	-	-	-	-	-	-	-	25	75	100	3	-	-	3	Online	MCQ	3 hr
5.	OC	OC	Open Category (OC-1)	50	10	20	20	-	-	-	-	-	100	2	1	-	3	Blended	PP	2 hr	
6.	120618	DLC	Minor Project-II	-	-	-	-	60	40	-	-	-	100	-	-	4	2	Offline	SO	-	
7.	200XX XCC	CLC	Novel Enrichment Course (Informal Learning)	-	-	-	-	50	-	-	-	-	50	-	-	2	1	Offline	SO	-	
Total				200	40	80	80	290	100	60	25	75	950	12	3	11	21	-	-	-	
8.	100008	MAC	Intellectual Property Rights (IPR)	50	10	20	20	-	-	-	-	-	100	2	-	-	-	Grade	Online	MCQ	1.5 hr

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Department of Mechanical Engineering

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted						Total Marks	Contact Hours per week			Total Credits	Exam Mode							
				Theory Slot			Practical Slot				MOOCs	L	T			P						
				End Sem. Exam.	Mid Sem. Exam.	Quiz/ Assignment	End Sem. Exam.	Lab work & Sessional	Assign ment								Exam					
1.	100007	HS/MC	HRM: Ethics, Communication, Entrepreneurship & Management (HS/MC-1)	70	20	10	-	-	100	3	-	-	3	MCQ								
2.	120604	DC	Advanced Production Technology (DC-13)	70	20	10	30	20	-	150	2	1	2	4	PP							
3.	DE	DE	Departmental Elective (DE-1)	-	-	-	-	-	-	-	-	-	25	75	100	3	-	-	3	Online	MCQ	3 hr
4.	OC	OC	Open Category (OC-1)	50	10	20	-	-	-	100	2	1	-	3	PP							
5.	100007	MC	Business Management (MC)	70	20	10	-	-	100	3	-	-	3	MCQ								
6.	120605	DC	Minor Project-II (DC-6)	-	-	-	30	20	-	50	-	-	-	4	2	Offline	SO	-				
Total				350	100	50	60	70	25	75	100	12	3	11	21							

DE-1 (Through Practical Marks)				DC-2*				Open Category (OC-1)			
S.No.	Subject Code	Subject Name	Subject Name	S.No.	Subject Code	Subject Name	Subject Name	S.No.	Subject Code	Subject Name	Subject Name
1	120615	Vibrations and Shock Engineering	Fundamentals of Thermal Science and Technology	1	100007	Business	Business	1	120615	Vibrations and Shock Engineering	Product Design
2	120616	Refrigeration and Air-Conditioning	Business Management	2	120616	Business	Business	2	120616	Refrigeration and Air-Conditioning	Product Design
3	120617	Artificial Intelligence and Machine Learning	Artificial Intelligence and Machine Learning	3	120617	Business	Business	3	120617	Artificial Intelligence and Machine Learning	Product Design
4	120618	Minor Project-II	Minor Project-II	4	120618	Business	Business	4	120618	Minor Project-II	Product Design

* Group A,B programmes will offer this course in VI/VII Semester respectively.
 † This course will run through SWAYAM/NPTEL/ MOOC
 ‡ Group A,B programmes will offer this course in VI/VII Semester respectively. Prerequisite is optional; however a separate mark sheet will be issued to those who qualify.

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Departmental Elective (DE-1)						Open Category (OC-1)		
S.No.	Subject Code	Subject Name	Subject Name	S.No.	Subject Code	Subject Name		
1	120615	Fundamentals of Thermal Science and Technology	Product Design	1	120615	Product Design		
2	120616	Business Management	Product Design	2	120616	Product Design		
3	120617	Artificial Intelligence and Machine Learning	Product Design	3	120617	Product Design		

OLD SCHEME (2019-23)

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
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Department of Mechanical Engineering

Scheme of Examination: Bachelor of Technology (B.Tech.) Mechanical Engineering
VII Semester For batches admitted in Session 2019-20

S.No.	Subject Code	Category	Subject Name & Title	Maximum Marks Allotted						Total Marks	Contact Hours per week			Total Credits	
				Theory Slot			Practical Slot		MOOCs		L	T	P		
				End Sem	Mid Sem	Quiz/Assignment	End Sem	Lab Work & Sessional	Assignment						Exam
1.	DE	DE	Departmental Elective-I (DE-3)	70	20	10	-	-	-	100	4	-	-	4	
2.	DE*	DE	Departmental Elective-II (DE-4)	-	-	-	-	25	75	100	2	-	-	2	
3.	OC	OC	Open Category-1(OC-2)	70	20	10	-	-	100	2	1	-	3		
4.	OC	OC	Open Category-3(OC-3)	70	20	10	-	-	100	3	-	-	3		
5.	100008	MC	Intellectual Property Rights (IPR) (AEC)	70	20	10	-	-	100	2	-	-	2		
6.	120701	DLC	Reliability and Vibration Lab (DLC-6)	-	-	-	50	50	-	100	-	-	4	2	
7.	120702	DLC	Summer Internship Project-III (84 weeks Evaluation) (DLC-7)	-	-	-	50	50	-	100	-	-	4	2	
8.	120703	DLC	Creative Problem Solving Evaluation (DLC-8)	-	-	-	25	25	-	50	-	-	2	1	
Total				280	80	40	125	125	25	78	780	13	18	19	

Additional Courses for obtaining Honours or minor Specialization by desirous students: Permitted to opt for maximum two additional courses for the award of (i) Honours in parent discipline or (ii) Minor Specialization in engineering discipline other than the parent discipline

DE-3 (Through Traditional Mode)		DE-4* (Online mode)		Open Category (OC-2)		Open Category (OC-3)		
S.No.	Subject Code	Subject Name	S.No.	Subject Code	Subject Name	S.No.	Subject Code	Subject Name
1	120711	Refrigeration and Air-Conditioning	1	120731	Foundation of Computational Fluid Dynamics	1	900203	Industrial Automation
2	120713	Metology Measurement and Control	2	120752	Introduction to Composites	2	900204	Solar Energy
3	120714	Total Quality Management	3	120753	Advanced Machining Processes			

*This course must be run through SWAYAM/NPTEL/MOOC

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Department of Mechanical Engineering

Scheme of Examination: Bachelor of Technology (B.Tech.) Mechanical Engineering

VIII Semester

For batches admitted in Session 2019-20

S.No.	Subject Code	Category	Subject Name & Title	Maximum Marks Allotted						Total Marks	Contact Hours per week			Total Credits	
				Theory Slot			Practical Slot		MOOCs		L	T	P		
				End Sem	Mid Sem	Quiz/Assignment	End Sem	Lab Work & Sessional	Assignment						Exam
1.	DE*	DE	Departmental Elective - 5* (DE-5)	-	-	-	-	-	25	75	100	4	-	-	4
3.	OC*	OC	Open Category-4* (OC-4)	-	-	-	-	-	25	75	100	2	-	-	2
4.	120801	DLC	Internship/Project (DLC-9)	-	-	-	250	150	-	-	400	-	-	12	6
5.	120802*	PD	Professional Development	-	-	-	50	50	-	-	100	-	-	2	1
Total				-	-	-	250	200	50	150	650	6	-	14	13

Additional Courses for obtaining Honours or minor Specialization by desirous students: Permitted to opt for maximum two additional courses for the award of (i) Honours in parent discipline or (ii) Minor Specialization in engineering discipline other than the parent discipline

(Departmental Elective) DE-5*		Open Category (OC-4)*	
S.No.	Subject Code	Subject Name	Subject Name
1	120851	Quality Design and Control	Waste to Energy Conversion
2	120852	Robotics: Basics and Selected Advanced Concepts	Product Design and Manufacturing
3	120855	Carbon Materials and Manufacturing	Automatic Control

*All of these courses will run through SWAYAM/NPTEL/MOOC
*Evaluation will be based on participation/works brought by the students in the institution in national/state level technical and other events during the complete tenure of the UG program/participation in professional chapter activities, club activities, cultural events, sports, personality development activities, collaborative events, MOOCs and technical events.

REVISED SCHEME (2020-24)

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
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Scheme of Evaluation

For batch admitted in Academic Session 2020-2021

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted								Contact Hours per week			Total Credits	Mode of Teaching (Offline/Online)	Mode of Exam.		
				Theory Slot				Practical Slot			MOOCs		Total Marks	L				T	P
				End Sem. Evaluation	Proficiency in subject/course	Mid Sem. Exam.	Quiz/Assignment	End Sem. Lab Work & Sessional	Skill Based Mini Project	Assignment	Exam.								
1.	DE	DE	Departmental Elective-3 (DE-3)	50	10	20	30	-	-	-	-	-	100	3	-	-	3	Blended (2/1)	PP
2.	DE*	DE	Departmental Elective-4 (DE-4)	-	-	-	-	-	-	25	75	100	4	-	-	4	Online (0/2)	MCQ	
3.	OC	OC	Open Category-2 (OC-2)	50	10	20	30	-	-	-	-	-	100	2	1	-	3	Blended (2/1)	PP
4.	OC	OC	Open Category-3 (OC-3)	50	10	20	30	-	-	-	-	-	100	3	-	-	3	Blended (2/1)	PP
5.	120713	DLC	Reliability and Vibration Lab (DLC-6)	-	-	-	-	-	80	20	20	-	100	-	-	4	2	Offline (1/0)	SO
6.	120714	DLC	Summer Internship Project-II (84weeks) (DLC-7)	-	-	-	-	-	60	40	-	-	100	-	-	4	2	Offline	SO
7.	120717	DLC	Creative Problem Solving (DLC-8)	-	-	-	-	-	90	20	20	-	100	-	-	2	1	Offline	SO
Total				200	40	80	90	180	80	40	25	75	800	9	1	18	15		

Additional Courses for obtaining Honours/Minor Specialization by desirous students: Permitted to opt for maximum two additional courses for the award of Honours or Minor specialization

DE-3 (Through Traditional Mode)		DE-4*		Open Category (OC-2)		Open Category (OC-3)		
S.No.	Subject Code	Subject Name	S.No.	Subject Code	Subject Name	S.No.	Subject Code	Subject Name
1	440744	Renewable energy Sources APT	1	120701	Foundation of Computational Fluid Dynamics	1	900214	Industrial Automation
2	120732	Basic of Finite Element Analysis	2	120752	Introduction to Composites	2	900215	Solar Energy
3	120733	Total Quality Management	3	120753	Advanced Machining Processes			

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Scheme of Evaluation

For batch admitted in Academic Session 2020-2021

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted								Contact Hours per week			Total Credits	Mode of Teaching (Offline/Online)	Mode of Exam.		
				Theory Slot				Practical Slot			MOOCs		Total Marks	L				T	P
				End Sem. Evaluation	Proficiency in subject/course	Mid Sem. Exam.	Quiz/Assignment	End Sem. Lab Work & Sessional	Skill Based Mini Project	Assignment	Exam.								
1	DE*	DE	Departmental Elective - 4* (DE-4)	-	-	-	-	-	-	-	25	75	100	3	-	-	3	Online (0/3)	MCQ
3	OC*	OC	Open Category-4* (OC-4)	-	-	-	-	-	-	-	25	75	100	3	-	-	3	Online (0/3)	MCQ
4.	120811	DLC	Internship/Project (DLC-3)	-	-	-	-	250	130	-	-	-	400	-	-	18	9	Interactive	SO
5.	120812	PD	Professional Development*	-	-	-	-	-	30	-	-	-	50	-	-	4	2	Interactive	SO
Total				-	-	-	-	-	-	30	-	-	650	6	-	22	17		

Additional Courses for obtaining Honours/Minor Specialization by desirous students: Permitted to opt for maximum two additional courses for the award of Honours or Minor specialization

*All of these courses will run through SWAYAM/NPTEL/MOOC/COURSEERA
*Evaluation will be based on participation/works brought by the students in the institution in national/state level technical and other events during the complete tenure of the UG program/participation in professional chapter activities, club activities, cultural events, sports, personality development activities, collaborative events, MOOCs and technical events.

DE-4*		Open Category (OC-4)*		Open Category (OC-3)*	
S.No.	Subject Code	Subject Name	S.No.	Subject Code	Subject Name
1	120861	Quality Design and Control	1		Waste to Energy Conversion
2	120862	Robotics: Basics and Selected Advanced Concepts	2		Product Design and Manufacturing
3	120863	Steam and Gas Power Systems	3		Automatic Control

OLD SYLLABUS (2019-23)

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Department of Mechanical Engineering
For batches admitted in Session 2019-20

120304: Fluid Mechanics and Hydraulic Machines

Category	Title	Code	Credit-4			Theory Paper
			L	T	P	
Departmental Core-DC	Fluid Mechanics and Hydraulic Machines	120304/190304	3	-	2	Max.Marks-70 Min.Marks-22 Duration-3hrs.

Course Objectives: To make the students understand:

1. Fundamentals of Fluid Mechanics, which is used in the applications of Aerodynamics, Hydraulics, Marine Engineering, Gas dynamics etc.
2. And give fundamental knowledge of fluid, its properties and behavior under various conditions of internal and external flows.
3. And develop understanding about hydrostatic law, principle of buoyancy and stability of a floating body and application of mass, momentum and energy equation in fluid flow.

Course Pre-Requirement:

Basic Mechanical Engineering. (Subject Code – 100204)

Syllabus

Unit-I Properties of fluid: Pressure, density, specific weight, viscosity, dynamic and kinematic viscosity Newton's law of viscosity and its applications.

Fluid Static: Pressure variation with depth, pressure measurement, pressure on immersed surface centre pressure, Buoyancy, flotation, stability of floating bodies.

Unit-II Fluid Kinetics: One dimensional flow approximation, control volumes concept, continuity equation in 3-D, its differential and integral form, velocity and acceleration of fluid particle, stream line, path line, Rotation, vorticity and circulation, Stream function and velocity potential function, Flow net, Free and forced vortex flow.

Unit-III Fluid Dynamics: Momentum theorem, Impulse momentum equation and its application, Euler's equation in 3-D, Bernoulli's equation for incompressible fluid flow, engineering applications of energy equation, Pitot -Tube, Venturi meter, Orifice meter.

Unit-IV Flow through Pipes: Critical Reynolds's number, velocity distribution in pipes, friction factor, Moody's chart, Laminar flow through pipe, Hagen-Poiseulli's equation, Turbulent flow through pipe, Hydraulic gradient line and total energy line, Minor head losses in pipes, Pipe Networking and Transmission of power through pipes.

Unit-V Water Turbines: Impulse and Reaction principles, Pelton, Francis and Kaplan turbines, velocity diagrams, Work done by turbines, Draft Tube theory.

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

- CO1: **Define** the fundamental properties of fluids.
CO2: **Relate** the concepts of mechanics with various laws of fluid mechanics.
CO3: **Identify** the laws of fluid mechanics applicable for the body in various fluids under different conditions.
CO4: **Analyse** various forces and their effects, related to fluids mechanics.
CO5: **Measure** and compare losses in different fluid flow conditions.
CO6: **Compare** different turbo machines depending on their behaviour and their merits and demerits

Text & Reference Books:

1. Fluid Mechanics by Streeter & Wylis; McGraw-Hills Pub.
2. Fluid Mechanics by Modi & Seth; Standard publishing house.
3. Fluid Mechanics by D. S. Kumar ;Katson publisher.
4. Fluid Mechanics by R.K. Bansal; Laxmi Publishing House

REVISED SYLLABUS (2020-24)

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Department of Mechanical Engineering

For batches admitted in Academic Session 2020-21

Fluid Mechanics and Hydraulic Machines

Category	Title	Code	Credit-4			Theory Paper
			L	T	P	
Departmental Core-DC	Fluid Mechanics and Hydraulic Machines	120314/190314	2	1	2	Max.Marks-50 Min.Marks-16 Duration-3hrs.

Course Objectives: To make the students understand:

1. Fundamentals of Fluid Mechanics, which is used in the applications of Aerodynamics, Hydraulics, Marine Engineering, Gas dynamics etc.
2. And give fundamental knowledge of fluid, its properties and behavior under various conditions of internal and external flows.

Syllabus

Unit-I Properties of fluid: Pressure, density, specific weight, viscosity, dynamic and kinematic viscosity Newton's law of viscosity and its applications.

Fluid Static: Pressure variation with depth, pressure measurement, pressure on immersed surface centre pressure, Buoyancy, flotation, stability of floating bodies.

Unit-II Fluid Kinetics: One dimensional flow approximation, control volumes concept, continuity equation in 3-D, its differential and integral form, velocity and acceleration of fluid particle, stream line, path line, Rotation, vorticity and circulation, Stream function and velocity potential function, Flow net, Free and forced vortex flow.

Unit-III Fluid Dynamics: Momentum theorem, Impulse momentum equation and its application, Euler's equation in 3-D, Bernoulli's equation for incompressible fluid flow, engineering applications of energy equation, Pitot -Tube, Venturi meter, Orifice meter.

Unit-IV Flow through Pipes: Critical Reynolds's number, velocity distribution in pipes, friction factor, Moody's chart, Laminar flow through pipe, Hagen-Poiseulli's equation, Turbulent flow through pipe, Hydraulic gradient line and total energy line, Minor head losses in pipes, Pipe Networking and Transmission of power through pipes.

Unit-V Water Turbine and Pump: Impulse and Reaction principles, Pelton, Francis and Kaplan turbines, velocity diagrams, Work done by turbines, Draft Tube theory, Application of dimensional analysis, similarity to turbines and pumps, Classification, advantage over reciprocation type, definition of manometric head gross head, static head, vector diagram and work done, Performance and Characteristics of turbines and pumps.

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

- CO1: **Define** the fundamental properties of fluids.
CO2: **Relate** the concepts of mechanics with various laws of fluid mechanics.
CO3: **Identify** the laws of fluid mechanics applicable for the body in various fluids under different conditions.
CO4: **Analyse** various forces and their effects, related to fluids mechanics.
CO5: **Measure** and compare losses in different fluid flow conditions.
CO6: **Compare** different turbo machines depending on their behaviour and their merits and demerits

Text & Reference Books:

1. Fluid Mechanics by Streeter & Wylis; McGraw-Hills Pub.
2. Fluid Mechanics by Modi & Seth; Standard publishing house.
3. Fluid Mechanics by D. S. Kumar ;Katson publisher.
4. Fluid Mechanics by R.K. Bansal; Laxmi Publishing House.
5. Fluid Mechanics by Yunus A Cengel & John M. Cimbala; Tata McGraw Hill Edition.

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Engineering Thermodynamics

Category	Title	Code	Credit-4			Theory Paper
			L	T	P	
Departmental Core-DC	Engineering Thermodynamics	120404/190403	3	1	-	Max.Marks-70 Min.Marks-22 Duration-3hrs.

Course Objective: To make students able to:

- Understand the nature and role of the various thermodynamic properties of matter.
- Represent a thermodynamic system by a control mass or control volume and identify work and/or heat interactions between the system and surroundings.

Syllabus

Unit-I Basic Concepts: Thermodynamics, Property, Equilibrium, State, Process, Cycle, Zeroth law of thermodynamics, Statement and significance, Concept of an Ideal gas, Gas Laws, Avogadro's Hypothesis, Heat and work transfer. First law of thermodynamics –Statement of first law of thermodynamics, first law applied to closed system undergoing a cycle, Process analysis of closed system flow process, Flow energy, Steady flow process analysis of closed system processes, Limitations of first law of thermodynamics.

Unit –II Properties of pure substances :- P-V-T surfaces, h-s, T-S, P-V, P-h, T-V diagrams of pure substance, saturated and sub-cooled liquid, superheated vapour, quality of steam, Mollier diagram, steam table, different processes, measurement of quality of steam

Unit –III Second law of thermodynamics: Heat engine, Heat reservoir, Refrigerator, Heat pump, COP, Carnot's theorem, Carnot's cycle, Efficiency of Carnot's cycle, Statement of second law, Reversible and Irreversible processes, Consequences of Second law.

Unit –IV Availability and Irreversibility: Entropy, Entropy change of Ideal gas, Available energy, T-S diagram, Availability and Irreversibility.

Unit- V Thermodynamics Relations: Thermodynamics relations, e.g Maxwell relations and their applications.

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

CO1: Define energy interactions between system and surroundings.

CO2: Correlate the law of thermodynamics to real life applications

CO3: Apply the laws of thermodynamics to analyze boilers, heat pumps, refrigerators, heat engines, compressors and nozzles

CO4: Investigate the effectiveness of energy conversion device in mechanical power generation

CO5: Analyze air standard cycles applied in prime movers.

CO6: Describe benefits of improvements to thermodynamic systems.

Text & Reference Books:

- Engineering thermodynamics by P.K. Nag
- Thermal engineering by R.K. Rajput
- Thermal engineering by P.L. Ballaney

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Engineering Thermodynamics

Category	Title	Code	Credit-3			Theory Paper
			L	T	P	
Departmental Core-DC	Engineering Thermodynamics	120414/ 190413	2	1	-	Max.Marks-50 Min.Marks-16 Duration-2 hrs.

Course Objective: To make students able to:

- Understand the nature and role of the various thermodynamic properties of matter.
- Represent a thermodynamic system by a control mass or control volume and identify work and/or heat interactions between the system and surroundings.

Syllabus

Unit-I Basic Concepts: Thermodynamics, Property, Equilibrium, State, Process, Cycle, Zeroth law of thermodynamics, Statement and significance, Concept of an Ideal gas, Gas Laws, Avogadro's Hypothesis, Heat and work transfer. First law of thermodynamics –Statement of first law of thermodynamics, first law applied to closed system undergoing a cycle, Process analysis of closed system flow process, Flow energy, Steady flow process analysis of closed system processes, Limitations of first law of thermodynamics.

Unit –II Properties of pure substances: - P-V-T surfaces, h-s, T-S, P-V, P-h, T-V diagrams of pure substance, saturated and sub-cooled liquid, superheated vapour, quality of steam, Mollier diagram, steam table, different processes, measurement of quality of steam

Unit –III Second law of thermodynamics: Heat engine, Heat reservoir, Refrigerator, Heat pump, COP, Carnot's theorem, Carnot's cycle, Efficiency of Carnot's cycle, Statement of second law, Reversible and Irreversible processes, Consequences of Second law.

Unit –IV Availability and Irreversibility: Entropy, Entropy changes of Ideal gas, Available energy, T-S diagram, Availability and Irreversibility.

Unit- V Thermodynamics Relations: Thermodynamics relations, e.g Maxwell relations and their applications.

Air Standard Cycles: Carnot, Sterling, Ericsson, Otto, Diesel, Dual cycles and determination of their air standard efficiencies and their comparison. Brayton cycle, Atkinson cycle, PVT relationship, Mixture of ideal gases Properties of mixture of gases.

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

CO1: Define energy interactions between system and surroundings.

CO2: Correlate the law of thermodynamics to real life applications

CO3: Apply the laws of thermodynamics to analyze boilers, heat pumps, refrigerators, heat engines, compressors and nozzles

CO4: Analyze the thermal efficiency of air standard cycles

CO5: Analyze the entropy concept in thermodynamic systems.

CO6: Describe benefits of improvements to thermodynamic systems.

Text & Reference Books:

- Engineering thermodynamics by P.K. Nag
- Thermal engineering by R.K. Rajput
- Thermal engineering by P.L. Ballaney

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Department of Mechanical Engineering
For batches admitted in Session 2019-20

Industrial Engineering

Category	Title	Code	Credits: 3			Theory Paper
			L	T	P	
Departmental Core-DC	Industrial Engineering	120501/190501	3	-	-	Max.Marks-70 Min.Marks-22 Duration-3hrs.

Course Objectives: To make the students understand:

- Professional, technical managerial, or leadership roles within industrial organizations.
- The knowledge through discovery, synthesis, and integration for the betterment of their organization or society

Syllabus

UNIT-I

Production Systems and Productivity: Production Management: design of production systems (product, job shop and batch). Definition and types of productivity. Measurement of productivity, factors affecting the productivity and productivity improvement programs.

Production Planning and Control: Objective, importance, need and function of production planning and control, planning, routing, scheduling, dispatching, follow up & progress report, production planning and production control.

UNIT-II

Forecasting techniques: Need and type of forecasting, factors affecting forecasting, forecasting in decision making, time series analysis, demand patterns, qualitative methods- measures of forecast accuracy and error analysis in quantitative forecasting.

Capacity and aggregate planning: Capacity planning: capacity measurement, long-term and short-term strategies, aggregate production planning, and graphical method to choose aggregate plan.

UNIT-III

Inventory Control – Objectives and functions, need and classifications- codification and standardization ABC analysis, deterministic inventory models, quantity discount; perpetual and periodic inventory control systems. Probabilistic inventory management, economic ordering quantity procurement cost, carrying charges, lead-time, re-order point.

Project management – PERT and CPM.

UNIT-IV

Product Design and Development: Principles of good product design, tolerance, quality and cost considerations, product life cycle, standardization, simplification, diversification, value engineering and analysis, methodology, applications, concurrent engineering; comparison of production alternatives. **Facility Locations and Plant Layout:** Facility location factors and evaluation of alternate locations; qualitative aspects, quantitative models for layout decisions, types of plant layout and their evaluation; computer aided layout design techniques; assembly line balancing, materials handling systems.

UNIT-V

Master Production Scheduling and MRP: Functions, planning horizon and planning periods for master production schedule, types of master production schedule, Bill of Material, Independent Demand versus dependent demand, Functions of material requirements planning and manufacturing resource planning (MRP I and MRP II), inputs for MRP system, performance characteristics of MRP system, materials requirement planning explosion.

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190511/120511: Industrial Engineering

Category	Title	Code	Credits: 2			Theory Paper
			L	T	P	
Departmental Core-DC	Industrial Engineering	190511/120511/ 190501/120501	2	-	-	Max.Marks-50 Min.Marks-16 Duration-2hrs.

Course Objectives: Industrial engineering is concerned with the design, improvement, installation, and management of integrated systems of men, material, and machine. After completing this course, students will learn a set of skills that includes mathematical modeling, probability and statistics, computer science, human factors, interpersonal skills, project management, and an ability to manage and administer large technical engineering and research projects. Thus, industrial engineering may be thought of as applied problem-solving, from inception to implementation.

Syllabus

UNIT-I

Production Systems and Productivity: Production Management: design of production systems (product, job shop and batch). Definition and types of productivity, Measurement of productivity, factors affecting the productivity and productivity improvement programs.

Production Planning and Control: Aggregate production planning, Capacity planning: capacity measurement, long-term and short-term strategies, aggregate production planning, and graphical method to choose aggregate plan.

UNIT-II

Forecasting techniques: Need and type of forecasting, factors affecting forecasting, forecasting in decision making, time series analysis, demand patterns, qualitative methods- measures of forecast accuracy and error analysis in quantitative forecasting.

UNIT-III

Inventory Control – Objectives and functions, need and classifications- codification and standardization ABC analysis, deterministic inventory models, quantity discount; perpetual and periodic inventory control systems. Probabilistic inventory management, economic ordering quantity procurement cost, carrying charges, lead-time, reorder point.

Unit-IV

Facility Locations and Plant Layout: Facility location factors and evaluation of alternate locations; qualitative aspects, quantitative models for layout decisions, types of plant layout and their evaluation; computer aided layout design techniques; assembly line balancing, materials handling systems.

Project management - Project Scheduling, Network diagram, critical path method (CPM), Project Evaluation and review techniques (PERT), Time cost trade off.

UNIT-V

Master Production Scheduling and MRP: Functions, planning horizon and planning periods for master production schedule, types of master production schedule, Bill of Material, Independent Demand versus dependent demand, Functions of material requirements planning and manufacturing resource planning (MRP I and MRP II), inputs for MRP system, performance characteristics of MRP system, materials requirement planning explosion.

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120504: Thermal Engineering

Category	Title	Code	Credit -4			Theory Paper
			L	T	P	
Departmental Core- DC	Thermal Engineering	120504				Max.Marks-70
			2	1	2	Min.Marks-22 Duration-3hrs.

Syllabus

UNIT I - Air Standard Cycles and Vapor Power Cycles: Carnot, Sterling, Ericsson, Otto, Diesel, Dual cycles and determination of their air standard efficiencies and their comparison, Brayton cycle, Atkinson cycle, PVT relationship, Mixture of ideal gases Properties of mixture of gases, Vapor Carnot cycle and its limitations, Rankine cycle and modified Rankine cycle, actual vapor power cycle, Reheat cycle, ideal regenerative cycle, actual regenerative cycle, Reheat – regenerative cycle, feed water heaters , working fluids in vapor power cycle, binary vapor cycles, efficiency of coupled cycles , process heat, efficiencies in power cycles, Basics of condensers.

UNIT II - Engine Construction, Operation and Performance:

Basics of CI and SI Engines, Valve timing diagram, Firing order and its significance - relative merits and demerits of SI and CI engines, Two stroke engine construction and operation. Comparison of four-stroke and two-stroke engines. Performance parameters, Heat balance, Testing of engine.

UNIT III - Combustion in SI and CI Engines:

Combustion process in IC engines, Stages of combustion, Flame propagation, velocity and area of flame front. Rate of pressure rise - Cycle to cycle variation – Abnormal combustion - Theories of detonation - Effect of engine operating variables on combustion, Combustion chambers for SI and CI engines, Importance of air motion - Swirl, squish and turbulence - Swirl ratio, Fuel air mixing - Stages of combustion - Delay period - Factors affecting delay period, Knock in CI engines - methods of controlling diesel knock.

UNIT IV – Turbines and Pumps

Classification, Pelton, Francis and Kaplan turbines, vector diagrams and work done Draft Tubes, governing or water turbines, Impulse staging, velocity and pressure compounding utilization factor, analysis for optimum U.F. Curtis stage, and Rateau stage, including qualitative analysis. Effect of blade and nozzle losses on Vane efficiency, Stage efficiency, Analysis for optimum efficiency vortex types of flow, flow with constant reaction, Application of dimensional analysis, similarity to turbines and pumps, Classification, advantage over reciprocation type, definition of manometric head gross head, static head, vector diagram and work done. Performance and Characteristics of turbines and pumps.

Unit V Refrigeration and Air Conditioning

Reversed Brayton Cycle, Bell-Coleman Cycle, Air Cycles for Aircraft Refrigeration, Properties Requirement, & Applications of Refrigerants, CFC & HFC Refrigerants, Simple vapour Absorption Systems-Electrolux Refrigerator, Refrigerants, Ozone depleting refrigerants, **Vapour Compression System:** Simple Systems, Multi pressure systems, Compound Compression, Multi Evaporator Systems, Cascade Systems, Vapour absorption system, **Air Conditioning:** Introduction to Psychrometry and Air Conditioning.

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120514: Thermal Engineering

Category	Title	Code	Credits -4			Theory Paper
			L	T	P	
Departmental Core-DC	Thermal Engineering	120514				Max.Marks-50
			2	1	2	Min.Marks-16 Duration-2 hrs.

Course Objectives: To make the students understand:

1. the fundamental principles of IC engines and combustion phenomena
2. the basic principles of nozzles and diffusers
3. the application of basic thermodynamics and fluid mechanics in steam and gas turbine power plants

Syllabus

UNIT I - Vapor Power Cycles: Vapor Carnot cycle and its limitations, Rankine cycle and modified Rankine cycle, actual vapor power cycle, Reheat cycle, ideal regenerative cycle, actual regenerative cycle, Reheat – regenerative cycle, feedwater heaters, cogeneration of power and process heat, working fluids in vapor power cycle, binary vapor cycles, the efficiency of coupled cycles, Basics of condensers.

UNIT II – IC Engine Basics and Combustion in IC Engines

Basics of CI and SI Engines, Basics of two-stroke and four-stroke IC engines, Valve timing diagram, Performance parameters, Heat balance, Testing of the engine. Stages of combustion in SI engine, Flame propagation, Rate of pressure rise, Abnormal combustion, Theory of detonation, Effect of engine operating variables on knock, Stages of combustion in CI engines, Delay period - Factors affecting delay period, Knock in CI engines - methods of controlling diesel knock, Combustion chambers for SI and CI engines.

UNIT III – Gas Turbine

Open cycle and closed cycle arrangements, applications, assumptions in ideal cycle analysis, simple gas turbine cycle, heat exchange cycle, intercooled cycle, various combinations of reheat, heat exchange and intercooling, comparison of various cycles, Combined Brayton and Rankine Cycle and GT-ST plants, Advantages of Combined Cycle

UNIT IV – Steam Turbines

Classification of steam turbine, Impulse and reaction turbines, Staging, Stage and overall efficiency, Reheat factor, Utilization factor, Blading, Velocity diagram & work calculations, Impulse Reaction Turbines, Losses in steam turbines, Governing of turbines.

Unit V Nozzles and Diffusers

Introduction, SFEE and continuity equation for nozzles & diffusers, momentum equation for the steam nozzle, entropy change due to friction in the nozzle, nozzle efficiency, critical pressure, stagnation enthalpy & pressure, Relation between area, velocity & pressure in nozzle, the effect of friction on critical pressure ratio, supersaturated flow in nozzles, the effect of variation of back pressure