Summary of Board of studies (ME) meeting held on 24/05/2022

Detail of program/courses where syllabus revision was carried out

Course/ Subject name	Course Code	Year/Date of introduction	Year/Date of revision	Percentage of content added or replaced	Agenda item No.	Page no.
Industrial Engineering	120511	2017	24/05/2022	10% Added	Item ME9	21-22
Thermal Engineering	120514	2015	24/05/2022	10% replaced	Item ME9	26-27
Maintenance Engineering	900215	2020	24/05/2022	10 % Removed, 10	Item ME5	28-29
				% Replaced		

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Dr. M. K. Gaur

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MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR (A Govt, Aided UCC 1 or BL opal) (A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV, BLopal) Department of Mechanical Engineering

BOARD OF STUDIES (BOS) PROCEEDING DEPARTMENT OF MECHANICAL ENGINEERING (MEETING DATED 24th May 2022)

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MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR (A Govt, Aided UGC Autonomous & NALO A DOLOGY & SCIENCE, Bhopail) (A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV, Bhopal)

MINUTES OF MEETING OF BOARD OF STUDIES (BOS)

An online meeting of following members (external and internal) was held on 24th May, 2022 at 11:00 AM through online mode (Google Meet Link meet.google.com/hno-owxs-xrb)

Following members were present:

(1)	Dr. Marco	
(2)	Dr. M.K. Gaur	Head of the Department and Chairman of the Committee
(3)	Prof. A.K. Agrawal	Professor, IIT BHU, AC Nominee
(4) (5)	Dr. Prashant Kumar Jain Dr. K. K. Jain	Professor, IIITDM, Jabalpur, RGPV Nominee Professor, NITTTR, Bhopal, AC Nominee
	Dr. Pratesh Jayaswal	Member
(6)	Dr. Manish Ku. Sagar	Member
(7)	Dr. C. S. Malvi	Member
(8)	Mr. R. P. Kori	Member
(9)	Mr. Vedansh Chaturvedi	Member
(10)	Dr. Jyoti Vimal	Member
(11)	Mr. Sharad Agrawal	Member
(12)	Mr. Vaibhav Shivhare	Member
(13)	Dr. Amit Aherwar	Member
(14)	Mr. Bhupendra K Pandey	Member
(15)	Dr. Nitin Upadhyay	Member
(16)	Dr. Surendra Ku. Chourasiya	Member
(17)	Dr. Harbhajan Ahirwar	Member
(18)	Dr. Gavendra Norkey	Member
(19)	Dr. Dinesh Kumar Rathore	Member
(20)	Dr. Ashish Agrawal	Member
(21)	Soumya Shrivastava	Student, III-year Mechanical
(22)	Shubham Chhipa	Student, III-year Mechanical
(23)	Somya Kanthariya	Student, III-year Automobile

Following members were absent:

(1) Prof. P. M. V. Subbarao (2) Dr. Pavan Kumar Kankar (3) Mr. Rajesh Dixit (4) Er. Rajiv Singh Bais



Professor, IIT. Delhi Associate Professor, IIT, Indore, AC Nominee Zonal Head, Yuken India Ltd. New Delhi Chief Manager R&D, Siemens Ltd. Gurgaon. Industry Expert

BoS Meeting_24/05/2022

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR (A Govt. Aided UGC Autonomous & NAAC AN OLOGY & SCIENCE, Bhopal) (A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV, Bhopal)

(Approved by Academic Development Cell of the i Agenda of the BoS Meeting ing 23-28, May 2022)

een og the institute	- BoS Meeting Scheduled during	
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Course/ Subject name	Course	Year/Date of	here revision	was carried out			Link of relevant
Industrial Engineering	Code	Internet		Percentage of content added	Agenda item No.	Page no.	documents/minutes
	190511/	09/04/2019		or replaced			
Design of M/c Elements	120511	09/04/2019	24/05/2022	10% Added	Item ME9	24	https://drive.google
hermal Engineering	190514	09/04/2019			nem ME9	3-4	.com/file/d/1B4jLq
faintenance	120514	0.0.00 + 10.00	24/05/2022	8% Removed	Item ME9	10.14	zRNUy4AsTX47Te
naince	900215	7000000000	24/05/2022	10% replaced	The second se	5-7	UR9BSVTeVtJa/vi
ngineering	200213	30/05/2020	24/05/2022	10 % Removed.	Item ME9	8-9	UR9BSVIETO
			and a state of the state of	10 % Replaced	Item ME5	10-11	ew?usp=sharing

6	Cou	irse focusing on employability/entrepreneurship/ski			
Course/ Subject name	Course Code	Activities/content which have a bearing on increasing skill and employability	Agenda	Page	Link of relevant
Foundation of Computational Fluid	120751	Students will be exposed to basics of CFD	item No.	no.	documents/ minutes
Dynamics		the exposed to basiles of CFD	Item ME4	3-4	https://drive.google
Advanced Machining Processes	120753	Aims at bringing the students up-to-date with the	Item ME4	5	com/file/d/1pjUQt SMkc7uAAJSxiDe
Farm Machinery	190751	latest technological Design of horticultural machines and equipment		3	w?usp=sharing
Reliability and	120701	Various vibration monitoring tools	Item ME4	6	
Vibration Lab Automotive	100701		Item ME6	7	
maintenance lab	190701	Maintenance strategy and schedule of different vehicles	Item ME6	8	

		New Course Added			
Course/Subject name	Course Code	Activities/content which have a bearing on increasing skill and employability	Agenda item No.	Page no.	Link of relevant documents/minutes
Applied Thermodynamics for Engineers	M120703	Application of laws of thermodynamics in solving engineering problems	Item ME7	2	https://drive.google.co m/file/d/1VQ5J9TCyX 856P8hzkz0OUwVPW
Data Science	-	develop the ability to build and assess data-based models	Item ME8	3-4	M_SHC7k/view?usp=s haring

Stakeholder	Student	Faculty	Alumni	Employer
No. of responses	264	23	14	66
Link of analysis	https://drive.google.com/f ile/d/IVQ5J9TCvX856P8 hzkz0OUwVPWM_SHC7 k/view?usp=sharing	https://drive.google.com/file/d/1V O5J9TCvX856P8hzkz0OUwVPW M_SHC7k/view?usp=sharing	https://drive.google.com/file/d/1 VO5J9TCvX856P8hzkz0OUwV PWM_SHC7k/view?usp=sharin g	https://drive.google.com/file/d/1V Q5.9TCvN856P8hzkz0OUwVPW M_SHC7k/view?usp=sharing
ATR Link	https://drive.google.com/f ile/d/IVQ5J9TCyX856P8 hzkz0OUwVPWM_SHC7 k/view?usp=sharing	https://drive.google.com/file/d/IV Q5J9TCvN856P8hzk20OUwVPW M_SHC7k/view?usp=sharing	https://drive.google.com/file/d/1 VO5J9TCvX856P8hzkz0OUwV PWM_SHC7k/view?usp=sharin	https://drive.google.com/file/d/1V Q5.J9TCvX856P8hzkz0OUwVPW M_SHC7k/view?usp=sharing
Link showing Excel sheet of google form details of stakeholders	https://drive.google.com/f ile/d/IVQ5J9TCvN856P8 hzkz0OUwVPWM_SHC7 k/view?usp=sharing	https://docs.google.com/spreadshe ets/d/111zJ8mpFS9fzuA1.g1sswF wTwJPOSN1.tu8/edit?usp=shariu g&ouid=108885958461624947473 &rtpof=truc&sd=true	https://docs.google.com/spreads heets/d/lekacl9lewtH w- J4Yeb813yENAyCSnTx/edit?us p=sharing&ouid=108885958461 624947473&rtpof=true&sd=tru £	https://docs.google.com/spreadsheet s/d/1ek.ac191ewtFw- J4Yeh813vFXAvCSnTx/edit/usprs/ harmg&ouid=10888595846162493 7473&rtpof=tme&sd=true

Mechanical Engineering

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MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR (A Govt. Aided UGC Autonomous & NAAC Accordited Institute Affiliated to RGPV, Bhopal)

			and the second second	В	loS Agend	a Item	IN .	
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	To pr Depar	epare a imenial offered S.No.		scheme st	Fineture 6		20 Decembe	ter with the provision of 7 ch one Departmental Elective 2019-20.
	1	1.	DE	DE			Title	
Item		2.	DE*	DE		Depar	tmental Election	ve-3 (DE-3)
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		5.	OC	OC			COLLARGORY	2(OC-2)
		6.	100008 190701/120701	MC	1	ntellectus	en Category -	1(OC-3)
			120701/120701	DLC		Automo	tive Maintena	hts (IPR) (MC)
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	L			DLC		SAULT	ner internshin	Present 111
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				DLC	1 Second	T	and the second se	
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Mechanical Engineering

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

To prepare and finalize the syllabus of courses to be offered (for batch admitted in 2019-20) under the Open Category (OC) Courses (in syllabus of courses to be offered (for batch admitted in 2019-20) under the Open Category (OC) Courses (in traditional mode) for B. Tech. VII semester students of other departments along with their COs.

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	2.	1905	13	ж	Industrial Engineering (DC-10) Heat and Mass Transfer	120511	DC	Title Industrial Engineering (DC-10)
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ME8	4.	1000			Design of Machine Elements (DC-12)	120514	DC	
	5.	1905	15 1)C	Automotive Chassis (DC-13)	120515	DC	Thermal Engineering (DC-12)
	6.	1905		LC	Data Science Minor Project-I		1.K	Machine Design (DC-13) Data Science
	7.	1905		LC	Self-learning/	120516	DLC	Minor Project-I
	8.	200x			Presentation*	120017	DLC	Self-learning/ Presentation*
	9.	-		LC	Novel Engaging Course	20xxx	CLC	Novel Engaging
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	3.	Welding	g of Advanc	ed High Strength Steels Applications	s for Autom	totive	120517/19 120517/19		4
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	2	190313	Automotive chassis		1	Code 120311	Theory o	f Machine-I
		190314	Fluid Mechanics and Machines	Hydraulic	2	120314	EN LA MA	chanics and
	1	ME16.docx						e Machines
	in 2021-;	the second s	ourses from SWAYA ode under Self-Learn	M/NPTEL/Ming/ Present	MOOC Pl tation, in	atforms to be the III Seme	offered (J	or batches admi
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ME17	- Annual Annua	Manufacturi	ng Processes - Casting	and lot		Code		Week
	2	Laws of Ther	modynamics	s and Joinin	8	120316/190	316(7)	-4
	3	Principles of	Vibration Control			120316/190	316 (iii)	4
	200		a control			120316/190	316 (iii)	4
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Item	To review	v the Scheme	& Syllabi, list of expension the batch 2022-23).	rimont.				
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Apart from the above points, the following points were discussed/Suggested in meeting;

- 1. In Industrial Engineering (V Sem) syllabus is revised and some portion is added to unit I, also Course outcomes (COs) revised.
- 2. Thermal Engineering (V Sem) syllabus is too lengthy to cover in scheduled time duration. Therefore, the course has been split and revised for 2020-21 admitted batch, it has been discussed that the gas dynamics portion must be added in the course. Also, some introductory part of refrigeration is added in Engineering thermodynamics IV sem for 2021 admitted batch.

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- Belt and chain drive portion is removed from Design of Machine elements (V sem).
 An and the second sec As maintenance Engineering is open category subjects without lab. Therefore, MATLAB portion may be removed for be removed from the syllabus.
- 5. To meet the current requirement Data Science is added in V sem Mechanical and automobile Engineering.

The meeting was ended with vote of that to the chairperson and committee members. Bed

Dr. Ashish Agrawal (BoS Member)

Dr. Nitin Upadhyay (BoS Member)

Mr. V. Shivhare (BoS Member)

Mr. R. P. Kori

(BoS Member)

online bresent Prof. Prashant K. Jain (RGPV Nominee)

Dr. Dinesh Kumar Rathore (BoS Member)

Dr. Surendra Ku. Chourasiya (BoS Member)

Mr. Sharad Agrawal (BoS Member)

Dr. C. S. Malvi (BoS Member)

on-line Present Dr. K. K. Jain (AC Nominee)

ANDer Dr. Gavendra Norkey (BoS Member)

Dr. Harbhajan Ahirwar

(BoS Member)

M

Monley

Mr. B. K. Pandey (BoS Member)

Dr. Jyoti Vimal (BoS Member)

Dr. M. K. Sagar

(BoS Member)

on-line present Prof. A.K. Agrawal (AC Nominee)

Dr. Amit Ahfrwar (BoS Member)

lin

Mr. V. Chaturvedi (BoS Member)

Dr. Pratesh Jayaswal (Bos Member)

Dr. M. K. Gaur (BoS Chairman)

6

DEAN (ACADEMICS) M.I.T.S GWALIOR

Mechanical Engineering

BoS Meeting_24/05/2022 A Ager G D & g

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

S.	Subject	Category	Subject Name		Ma	ximum Marks A	llotted		Total	Contact	hours p	er week	Total
No.	Code	Code			Theory	Slot	Pr	actical Slot	Marks				Credits
				End	Mid Sem	Quiz/	End	Lab work &		L	Т	Р	
				Sem.	Exam.	Assignment	Sem.	Sessional					
1.	120501	DC	Industrial Engineering (DC-8)	70	20	10	-	-	100	3	-	-	3
2.	120502	DC	Metal Cutting and Machine Tools	70	20	10	-	-	100	3	1	-	4
			(DC-9)										
3.	120503	DC	Heat and Mass Transfer (DC-10)	70	20	10	30	20	150	2	1	2	4
4.	120504	DC	Thermal Engineering (DC-11)	70	20	10	30	20	150	2	1	2	4
5.	120505	DC	Machine Design (DC-12)	70	20	10	30	20	150	2	1	2	4
6.	120506**	DLC	Minor Project-I (DLC-3)	-	-	-	30	20	50	-	-	2	1
7.	120507	DLC	Summer Internship Project-II	-	-	-	25	-	25	-	-	6	3
			(Evaluation) (DLC-4)										
8.	120508#	SEMINAR/	Self-learning/Presentation	-	-	-	-	25	25	-	-	2	1
		SELF STUDY	(SWAYAM/NPTEL/ MOOC)										
			Total	350	100	50	145	105	750	12	4	16	<mark>24</mark>
D	epartment le	vel activity/worl	kshop/awareness programme to be c	onducte	d; certificate	of compliance t	o be sub	mitted by HoD to	o the Exam	Controller	through	Dean Aca	ademics
	tional Course				1 0		(1) T						
	ning Honour		Permitted to opt for maximum two	addition				-	cipline or (ii) Minor Sp	pecializat	tion in eng	gineering
-	alization by (desirous			disc	cipline other tha	n the pai	rent discipline					
stude	nts												

** 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)

01Theory Period=1 Credit; 02 Practical Periods =1 Credit

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

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S.	Subject	Category	Subject Name			mum Marks A			Total		ct Hour	s per	Total
No.	Code	Code			Theory Slo	ot	Pr	actical Slot	Marks		week		Credits
				End Sem.	Mid Sem	Quiz/	End	Lab work &		L	Т	Р	
					Exam.	Assignment	Sem.	Sessional					
1.	190501	DC	Industrial Engineering(DC-8)	70	20	10	-	-	100	3	-	-	3
2.	190502	DC	Metal Cutting and Machine	70	20	10	-	-	100	3	1	-	4
			Tool (DC-9)										
3.	190503	DC	Heat and Mass Transfer(DC-	70	20	10	30	20	150	2	1	2	4
			10)										
4.	190504	DC	Design of Machine Elements	70	20	10	30	20	150	2	1	2	4
			(DC-11)										
5.	190505	DC	Automotive Chassis (DC-12)	70	20	10	30	20	150	2	1	2	4
6.	190506**	DLC	Minor Project-I (DLC-3)	-	-	_	30	20	50	-	-	2	1
7.	190507	DLC	Summer Internship Project-	-	-	-	25	-	25	-	-	6	3
			II (Evaluation) (DLC-4)										
8.	190508#	SEMINAR/	Self-learning/Presentation	-	-	-	-	25	25	-	-	2	1
		SELF STUDY	(SWAYAM/NPTEL/ MOOC)										
			Total	350	100	50	145	105	750	12	4	16	24
		 4 • • 4 /] _]									4		
		-	hop/awareness programme to be	conducted;	certificate of	compliance to	be subm	itted by HoD to t	the Exam C	ontroller t	hrough	Dean A	cademics
Additi	ional Course												
obtain	ing Honours	s or minor 🛛 🛛	Permitted to opt for maximum tw	o additiona	l courses for	the award of (i	i) Honou	rs in parent disci	pline or (ii)	Minor Sp	ecializa	tion in e	ngineering
Specia	lization by c	lesirous			discip	line other than	the pare	nt discipline					
studer	•				•		-	-					
		• · · •		• • • •		a : 1							

** 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)

01Theory Period=1 Credit; 02 Practical Periods =1 Credit

how

Chatum

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

							× ·		0 0		For bat	ches	adm	itted	in Sessi	on 2020-21	
S.	Subject	Category	Subject Name			Maxin	num Marks A	llotted					Conta				
No.	Code	Code			Theory	Slot			Practical Slo	ot			ours p week			Mode of	
					Term uation		ntinuous aluation	End	Contin Evalua		Total Marks	L	Т	Р	Total Credits	Teaching (Online, Offline,	^{\$\$} Mode of Exam.
				End Sem. Exam.	Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment	Sem. Exam.	Lab work & Sessional	Skill Based Mini Project						Blended)	Exam.
1.	120519	MC	Data Science	50	10	20	20	60	20	20	200	3	-	2	4	Blended (2/1)	MCQ
2.	120511	DC	Industrial Engineering (DC-10)	50	10	20	20	-	-	-	100	3	-	-	3	Blended (2/1)	PP
3.	120513	DC	Heat and Mass Transfer (DC-11)	50	10	20	20	60	20	20	200	2	1	2	4	Blended (2/1)	PP
4.	120514	DC	Thermal Engineering (DC-12)	50	10	20	20	60	20	20	200	2	1	2	4	Blended (2/1)	PP
5.	120515	DC	Machine Design (DC-13)	50	10	20	20	60	20	20	200	2	1	2	4	Blended (2/1)	AO
6.	120516	DLC	Minor Project-I**	-	-	-	-	60	40	-	100	-	-	4	2	Offline (2/0)	SO
7.	120517	Seminar/ Self-Study	Self-learning/Presentation (SWAYAM/NPTEL/ MOOC) [#]	-	-	-	-	-	40	-	40	-	-	2	1	Online +Mentoring	SO
8.	200XXX	CLC	Novel Engaging Course (Informal Learning)	-	-	-	-	50	-	-	50	-	-	2	1	Interactive	SO
9.	120518	DLC	Summer Internship Project-II (Evaluation)	-	-	-	-	60	-	-	60	-	-	4	2	Offline	SO
			Total	250	50	100	100	410	160	80	1150	12	3	20	<mark>25</mark>	-	-
10.	1000006	MAC	Disaster Management	50	10	20	20	-	-	-	100	2	-	-	Grade	Online	MCQ
11.	1000005	MAC	Project Management & Financing	50	10	20	20	-	-	-	100	2	-	-	Grade	Online	MCQ
Addit	ional Course f	or Honours	or minor Specialization	Permitted	to opt for max	imum tw	o additional co	ourses for	the award of I	Honours or	Minor speci	alizati	on				

^{\$}proficiency in course/subject-includes the weightage towards ability/skill/competence/knowledge level/ expertise attained etc. in that particular course/subject.

^{\$\$}MCQ: Multiple Choice Question ^{\$\$}AO: Assignment + Oral

^{\$\$}**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 needs to appear and complete an additional MAC course of 30 Hrs. duration on Project Management & Financing. / Other modules related to futuristic technologies (Drones/

Robotics etc.)

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^{\$\$}**PP:** Pen Paper

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Scheme of Examination: Bachelor of Technology (B.Tech.) Automobile Engineering **B.Tech. V Semester (Automobile Engineering)**

For batches admitted in Session 2020-21

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S.	Subject	Category	Subject Name				num Marks A	llotted				-	Contac				
No.	Code	Code			Theory	y Slot			Practical Slo	ot			ours p			Mode of	
					Term luation		ntinuous aluation	End	Contin Evalua		Total Marks	L	T	Р	Total Credits	Teaching (Online, Offline,	^{\$\$} Mode of
				End Sem. Exam.	<pre>\$Proficiency in subject /course</pre>	Mid Sem. Exam.	Quiz/ Assignment	Sem. Exam.	Lab work & Sessional	Skill Based Mini Project						Blended)	Exam.
1.	190519	MC	Data Science	50	10	20	20	60	20	20	200	3	-	2	4	Blended (2/1)	MCQ
2.	190511	DC	Industrial Engineering (DC-10)	50	10	20	20	-	-	-	100	3	-	-	3	Blended (2/1)	PP
3.	190513	DC	Heat and Mass Transfer (DC-11)	50	10	20	20	60	20	20	200	2	1	2	4	Blended (2/1)	PP
4.	190514	DC	Design of Machine Elements (DC-12	50	10	20	20	60	20	20	200	2	1	2	4	Blended (2/1)	AO
5.	190515	DC	Automotive Chassis (DC-13)	50	10	20	20	60	20	20	200	2	1	2	4	Blended (2/1)	PP
6.	190516	DLC	Minor Project-I**	-	-	-	-	60	40	-	100	-	-	4	2	Offline (2/0)	SO
7.	190517	Seminar/ Self-Study	Self-learning/Presentation (SWAYAM/NPTEL/ MOOC) [#]	-	-	-	-	-	40	-	40	-	-	2	1	Online +Mentoring	SO
8.	200xxx	CLC	Novel Engaging Course (Informal Learning)	-	-	-	-	50	-	-	50	-	-	2	1	Interactive	SO
9.	190518	DLC	Summer Internship Project-II (Evaluation)	-	-	-	-	60	-	-	60	-	-	4	2	Offline	SO
			Total	250	50	100	100	410	160	80	1150	12	3	20	<mark>25</mark>	-	-
10.	1000006	MAC	Disaster Management	50	10	20	20	-	-	-	100	2	-	-	Grade	Online	MCQ
11.	1000005	MAC	Project Management & Financing	50	10	20	20	-	-	-	100	2	-	-	Grade	Online	MCQ
Additi	onal Course	for Honours	or minor Specialization	Permitted	to opt for may	kimum tw	o additional co	ourses for	the award of l	Honours or	Minor speci	alizati	on				

^{\$}proficiency in course/subject-includes the weightage 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 needs to appear and complete an additional MAC course of 30 Hrs. duration on Project Management & Financing. / Other modules related to futuristic technologies (Drones/

Robotics etc.)

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

					FOFL				n Session	2020-21							
S.	Subject	Category	Subject Name		Ι	Maximun	n Marks Allo	tted						Iours			
No.	Code	Code			Theory S	lot			Practical Slo	ot		po	er we	ek		Mode of	Mode
				Enc	l Sem.	Mid	Quiz/	End	Lab Work	Skill	Total	L	Т	Р	Total	Teaching	of
				End Term	\$Proficiency in	Sem.	Assignment	Sem	&	Based	Marks				Credits	(Offline/	Exam
				Evaluation	subject /course	Exam.			Sessional	Mini Project						Online)	•
1.	100025	BSC	Engineering Mathematics-II (BSC- 3)	50	10	20	20	-	-	-	100	2	1	-	3	Offline (3/0)	РР
2.	120311	DC	Manufacturing Process (DC-2)	50	10	20	20	-	-	-	100	2	1	-	3	Blended (2/1)	PP
3.	120312	DC	Mechanics of Materials (DC-3)	50	10	20	20	60	20	20	200	2	-	2	3	Offline (3/0)	PP
4.	120313	DC	Theory of Machines –I (DC-4)	50	10	20	20	60	20	20	200	2	1	2	4	Blended (2/1)	AO
5.	120314	DC	Fluid Mechanics and Hydraulic Machines (DC 5)	50	10	20	20	60	20	20	200	2	1	2	4	Blended (2/1)	PP
6.	120315	DLC	Software Lab (DLC-1)	-	-	-	-	60	20	20	100	-	-	2	1	Offline (1/0)	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	<mark>22</mark>		
10	1000001	MAC	Indian Constitution and Traditional Knowledge	50	10	20	20	-	-	-	100	2	-	-	Grade	Online	MCQ

For batches admitted in Session 2020-21

^sProficiency in course/subject – includes the weightage 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

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

						rur	Dutche	es uui	mueu	III Sessio	n 2020-21						
S.	Subject	Category	Subject Name		Ι	Maximum	Marks Allo	tted				Cont	tact H	lours			
No.	Code	Code			Theory S	lot			Practical Slo	t		pe	er we	ek		Mode of	Mode
				Enc	l Sem.	Mid	Quiz/	End	Lab Work	Skill	Total	L	Т	Р	Total	Teaching	of
				End Term Evaluation	<pre>\$Proficiency in subject /course</pre>	Sem. Exam.	Assignmen t	Sem	& Sessional	Based Mini	Marks				Credits	(Offline/ Online)	Exam.
				Evaluation	j					Project							
1.	100025	BSC	Engineering Mathematics-II (BSC-3)	50	10	20	20	-	-	-	100	2	1	-	3	Offline (3/0)	PP
2.	190311	DC	Automotive Materials (DC-2)	50	10	20	20	-	-	-	100	2	1	-	3	Blended (2/1)	PP
3.	190312	DC	Mechanics of Materials (DC-3)	50	10	20	20	60	20	20	200	2	-	2	3	Offline (3/0)	PP
4.	190313	DC	Automotive Engines (DC-4)	50	10	20	20	60	20	20	200	2	1	2	4	Blended (2/1)	рр
5.	190314	DC	Fluid Mechanics & Hydraulic Machines (DC-5)	50	10	20	20	60	20	20	200	2	1	2	4	Blended (2/1)	PP
6.	190315	DLC	Software lab (DLC-1)	-	-	-	-	60	20	20	100	-	-	2	1	Offline (1/0)	SO
7.	190316	DLC	Self-learning/ Presentation [#]	-	-	-	-	-	40	-	40	-	-	2	1	Online +Mentoring	SO
8.	200XX X	CLC	Novel Engaging Course	-	-	-	-	50	-	-	50	-	-	2	1	Interactive	SO
9.	190318	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	<mark>22</mark>		
10	1000001	MAC	Indian Constitution and Traditional Knowledge	50	10	20	20	-	-	-	100	2	-	-	Grade	Online	MCQ

For batches admitted in Session 2020-21

⁸Proficiency in course/subject – includes the weightage 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

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

							,		0	U,	For b	atch	es ad	mittea	l in Sessio	n 2021-22	
2S.	Subject	Categor	Subject Name			Maxi	mum Mark	s Allotte	1				Conta	nct			
No.	Code	y Code			Theor	y Slot			Practical S	lot		H	lours	-		Mode	
				-	1.00						_		wee			of	ው ው
					nd Term valuation		tinuous luation	- End		nuous 1ation	Total Marks	L	Т	Р	Total Credits	Teaching (Online,	^{\$\$} Mode of
				End Sem.	^{\$} Proficiency in subject	Mid Sem.	Quiz/ Assign-	Sem. Exam.	Lab Work &	Skill Based					Creatis	Offline, Blended)	Exam.
				Exam	/course	Exam.	ment		Sessional	Mini Project							
1.	100025	BSC	Engineering Mathematics-II (BSC-3)	50	10	20	20	-	-	-	100	2	1	-	3	Offline (3/0)	PP
2.	120311	DC	Manufacturing Process (DC-2)	50	10	20	20	-	-	-	100	2	1	-	3	Blended (2/1)	PP
3.	120319	DC	Mechanics of Materials (DC-3)	50	10	20	20	60	20	20	200	2	1	2	4	Blended (2/1)	PP
4.	120313	DC	Theory of Machines –I (DC-4)	50	10	20	20	60	20	20	200	2	1	2	4	Blended (2/1)	AO
5.	120314	DC	Fluid Mechanics and Hydraulic Machines (DC-5)	50	10	20	20	60	20	20	200	2	1	2	4	Blended (2/1)	PP
6.	120315	DLC	Software lab (DLC-1)	-	-	-	-	60	20	20	100	-	-	2	1	Offline (1/0)	SO
7.	120316	DLC	Self-learning/Presentation (SWAYAM/NPTEL/MOOC)	-	-	-	-	-	40	-	40	-	-	2	1	Online +Mentoring	SO
8.	200XXX	CLC	Novel Engaging Course (Informal Learning)	-	-	-	-	50	-	-	50	-	-	2	1	Interactive	SO
9.	120318	DLC	Summer Internship Project–I (Institute Level) (Evaluation)	-	-	-	-	60	-	-	60	-	-	4	2	Offline	SO
		Т	otal	250	50	100	100	350	120	80	1050	10	5	16	<mark>23</mark>	-	-
10.	1000005	MAC	Project Management & Financing	50	10	20	20	-	-	-	100	2	-	-	Grade	Online	MCQ

* proficiency in course/subject-includes the weightage 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

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

For batches admitted in Session 2021-22

S.	Subject	Catagar	Subject Nome			Mori	num Mark	a A 11 atta	J		IUIDUU		Conta				
5. No.	Subject Code	Categor y Code	Subject Name		Theor	y Slot	num Marks		u Practical S	Slot			Jonta ours weel	per		Mode of	
					nd Term valuation		tinuous luation	End		nuous 1ation	Total Marks	L	Т	Р	Total Credits	Teaching (Online,	^{\$\$} Mode of
				End Sem. Exam	^{\$} Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assign- ment	Sem. Exam.	Lab Work & Sessional	Skill Based Mini Project					creans	Offline, Blended)	Exam.
1.	100025	BSC	Engineering Mathematics-II (BSC-3)	50	10	20	20	-	-	-	100	2	1	-	3	Offline (3/0)	PP
2.	190319	DC	Manufacturing Process (DC-2)	50	10	20	20	-	-	-	100	2	1	-	3	Blended (2/1)	PP
3.	190317	DC	Mechanics of Materials (DC-3)	50	10	20	20	60	20	20	200	2	1	2	4	Blended (2/1)	PP
4.	190313	DC	Automotive Engines (DC-4)	50	10	20	20	60	20	20	200	2	1	2	4	Blended (2/1)	рр
5.	190314	DC	Fluid Mechanics & Hydraulic Machines (DC-5)	50	10	20	20	60	20	20	200	2	1	2	4	Blended (2/1)	PP
6.	190315	DLC	Software lab (DLC-1)	-	-	-	-	60	20	20	100	-	-	2	1	Offline (1/0)	SO
7.	190316	DLC	Self-learning/Presentation (SWAYAM/NPTEL/MOOC)	-	-	-	-	-	40	-	40	-	-	2	1	Online +Mentorin g	SO
8.	200XX X	CLC	Novel Engaging Course (Informal Learning)	-	-	-	-	50	-	-	50	-	-	2	1	Interactive	SO
9.	190318	DLC	Summer Internship Project–I (Institute Level) (Evaluation)	-	-	-	-	60	-	-	60	-	-	4	2	Offline	SO
		Т	otal	250	50	100	100	350	120	80	1050	10	5	16	<mark>23</mark>	-	-
10.	1000005	MAC	Project Management & Financing	50	10	20	20	-	-	-	100	2	-	-	Grade	Online	MCQ

* proficiency in course/subject-includes the weightage towards ability/skill/competence/knowledge level/ expertise attained etc. in that particular course/subject.
\$\$MCQ: Multiple Choice Question \$\$AO: Assignment + Oral \$\$PP: Pen Paper\$\$CO: Submission + Oral

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Course where revision was carried out

BoS_ 24/05/2022

		Details of Courses	
S.No.	Subject Code	Subject Name	Semester
2	190511/120511	Industrial Engineering	v
3	190514	Design of Machine Elements	V
4	120514	Thermal Engineering	V
5	900215	Maintenance Engineering	VII



For batch admitted in Academic Session 2020-21

Industrial Engineering

Category	Title	Code	Cre	edits: 3	;	Theory Paper
Departmental	Industrial	120511/190511	L	Т	Р	Max.Marks-50
Core-DC	Engineering					Min.Marks-
	6 6		2	1		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. (Added)

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.

Course outcomes: After learning the course the students should be able to:

CO1. Define and measure productivity.

CO2. Understand Production planning and control required for industry to analyze the engineering problems.

CO3. Apply engineering design to produce solutions that meet specified needs of manufacturing industry

CO4. Analyze practice through various Management and Operation Tools for Improving Quality and Quantity.

CO5. Evaluate various kinds of problems or issues faced by service and manufacturing industries like Inventory control, sales forcasting economic consideration, optimum utilization of resources, productivity.

CO6. Create new mathematical models for efficient production planning and control.

Text Books:

- 1. Industrial Engineering and Production Management, Martand Telsang, S. Chand
- 2. Production and Operation Management by R. Panneerselvam, PHI, Latest Edition
- 3. Manufacturing planning and control for SCM by Vollmann; TMH, Latest Edition.
- 4. Purchasing & Materials Management by Dobler & Lee, PHI, Latest Edition

Reference Books:

1. Operations Management by Krajewski, L. J., Ritzman, L. P. and Malhotra, M. K., Prentice Hall, New Delhi; Latest Edition.

2. Production/Operations Management by Ebert, J and Adams, D.J., Prentice Hall of India, New Delhi; Latest Edition.

3. Production and Operations Management: manufacturing and services by Chase, R. B., Aquilano, N. J. and Jacob, F. R., TMH, New Delhi; Latest Edition .

4. Modern Production/Operations Management by Buffa and Sarin, Wiley India; Latest Edition.

List of Open Source Software/learning website:

1. Operation Management, IIT Roorkee, Dr. Inderdeep singh, <u>https://nptel.ac.in/courses/112107238</u>

2. Operation and Supply chain Management, IIT Madras, Prof. G. Srinivasan

https://nptel.ac.in/courses/110106045



For batch admitted in Academic Session 2020-21

190514: Design of Machine Elements

Category	Title	Code	(Credit	-4	Theory Paper
Departmental	Design of Machine Elements	190514/	L	Т	Р	Max.Marks-50 Min.Marks-16
Core-DC	Liements	190504	2	1	2	Duration-2 hrs.

Note: Use of PSG Design Data book is permitted in exam.

Course Pre-Requisites:

Engineering Mathematics-I Mechanics of Materials

Course Objectives:

To make the students to understand:

- 1. develop an ability to apply knowledge of mathematics, science and engineering.
- 2. develop an ability to design a system, component or process to meet desired needs within realistic constraints.
- 3. develop an ability to identify, formulate, and solve engineering problems.
- 4. develop an ability to use techniques, skills and modern engineering tools.

Syllabus:

Unit I - Design Philosophy: Principles of mechanical design; Factor of safety, Limits and fits; Standardization; Selection of materials, Theory of failures.(Removed: strength, rigidity, fracture, wear and material consideration; Stress concentration; Design for fatigue)

Unit II- Design of Keys, Shafts and Couplings: Definitions, classifications and applications design of rigid and pin bushed flexible couplings.

Unit III- Design of Permanent and Temporary Joints: Cotter and knuckle joints; screwed fastenings, bolted and riveted joints under direct and eccentric loads. Welded joints: Welded joints, strength of welded joints, eccentrically loaded welded joints, welded joints subjected to bending moments and torsion.

Unit IV- Design of Mechanical Gears: Design of spur, helical, bevel and worm gears. (Removed: , Belt and chain drives and Automotive Gear box assembly.)

Unit V- Design of Bearings: Rolling contact bearing: Types of rolling contact bearing, static and dynamic load capacities, Stribeck's equation, equivalent bearing load, load life relationship, bearing life, bearing life, load factor, selection of bearing from manufacturing catalogue. Sliding contact bearing: Bearing material and their properties, bearing types and their constructional details. Design consideration in hydrodynamic bearings. (Removed: Lubrication and mountings, dismounting and preloading of bearings, oil seals and packing.)



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Course Outcomes:

After successful completion of this course students will able to:

- CO1: Illustrate the design Philosophy and Principles of mechanical design.
- CO2: Identify appropriate bearing for a given application.
- CO3: Use design data books in designing various mechanical components.
- CO4: Select appropriate drive for power transmission on the basis of load and speed.
- **CO5: Analyze** the stresses and strain induced in basic mechanical components.
- CO6: Design the machine elements against static as well as fatigue load.

Text Books:

- 1. V.B. Bhandari, "Design of Machine Elements, Tata McGraw-Hill Education.
- 2. R.K. Jain, "Machine Design", Khanna Publishers, New Delhi, 1997.
- 3. R C Juvinall Fundamental of Machine Components Design, 4/e, Wiley.
- 4. P C Gope, Machine Design: Fundamental and Applications, 1/e PHI.
- 5. R L NORTON, Machine Design an Introduction, Pearson.
- 6. E J Hearn, Mechanics of Material, BH.

References Books:

- 1. P.M. Heldt "High speed combustion Engine", Oxford-IBH Publishing Co., Calcutta, 1965.
- 2. A.Kolchin and V.Demidov, "Design of automotive engine", MIR Publisher, Moscow, 1984.
- 3. Sundararaja Murthy, T.V. "Machine Design", Khanaa publisher, New delhi.
- 4. "Design Data book", PSG College of technology, Coimbatore, 2000.

NPTEL Link for Design of Machine Elements

http://nptel.ac.in/courses/112105124/

List of Experiments

- 1. Design and drawing of Single, double and triple riveted joint
- 2. Design and drawing of Single and double strap butt joint
- 3. Design and drawing of Welded joint
- 4. Design and drawing of Socket and Spigot cotter joint
- 5. Design and drawing of Gib and Cotter joint.
- 6. Design and drawing of Knuckle joint
- 7. Study of Theories of failure
- 8. Design and drawing of Solid and hollow shaft
- 9. Design and drawing of Rigid coupling
- 10. Design and drawing of Flexible coupling

Laboratory Course Outcomes:

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

- CO1: List out the various 2D and 3D CATIA commands
- CO2: Describe construction details to draft the different design of machine elements

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MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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Department of Mechanical Engineering

- CO3: Demonstrate the concept of machine elements based on different material
- CO4: Distinguish various types of Temporary and Permanent joints.
- CO5: Select and choose the right strategy to draft the machine elements
- CO6: Design and create the machine elements under various loading condition

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For batch admitted in Academic Session 2020-21

120514: Thermal Engineering

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

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.

<mark>UNIT III – Gas Turbine</mark>

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. (Replaced)

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.

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

CO1: analyze the performance of steam power plant



- **CO2: describe** the working principles of internal combustion engines and combustion phenomena
- **CO3: analyze** the performance of gas turbine power plant
- CO4: describe the working of various types of steam turbine

CO5: solve analytical problems of nozzles and diffusers

Text Books:

- 1. P K Nag, "Power Plant Engineering", Latest Edition, Tata McGraw Hill Publishing Company Limited,
- 2. Ganesan V, "Internal combustion engines", Latest Edition, Tata McGraw Hill Education Private Limited,
- 3. Ganesan V, "Gas Turbines", Latest edition, Latest Edition, Tata McGraw Hill Education Private Limited,
- 4. P. L. Ballaney, "Thermal Engineering", Latest Edition, Khanna Publishers

References Books:

- 1. John. B, Heywood, "Internal Combustion Engine Fundamentals", Latest edition, McGraw Hill Publishing Co., New York,
- 2. Sharma S. P, Chandramohan, "Fuels and Combustion", Latest edition, Tata McGraw Hill Publishing Co.
- 3. Mathur and Sharma, "A course on Internal combustion Engines", Latest edition, Dhanpat Rai& Co.
- 4. Rajput R. K, "A textbook of Thermal Engineering", Latest edition, Laxmi Publications
- 5. B.K. Venkanna, "Fundamentals of Turbomachinery", PHI Learning Private Limited

List of Experiments:

- 1. Introduction to Computational Fluid Dynamics and its methodology.
- 2. Perform CFD analysis on flow through pipe with varying Reynolds Number.
- 3. Performance test of two stoke diesel engine and four stroke diesel engines.
- 4. Study of compounding of Steam turbine.
- 5. Study of combined steam and gas turbine plant.

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

CO1: Describe the process involved and advantages in solving a fluid problem using computational fluid dynamics

CO2: Solve the Fluid flow problem using CFD technique.

CO3: Estimate energy distribution by conducting heat balance test on IC engines.

CO4: Determine performance parameters of impulse steam turbine

CO5: Evaluate the performance of steam turbine with compounding.

9 hr A - 5 word

For batch admitted in Academic Session 2019-20

900215: Maintenance Engineering

Category	Title	Code	Credit-3			Theory Paper
Open Course- OC3	Maintenance Engineering	900215	L	Т	Р	Max.Marks-70
			3	-	-	Min.Marks-22
						Duration-3hrs.

Course Outcomes: Through this course, student should be able to

• Identify different maintenance categories

• Understand the principles, functions and practices adopted in industry for the successful management of maintenance activities

• Implement the maintenance function and different practices in industries for the successful management of maintenance activities.

- The Condition Monitoring & Non-Destructive Testing.
- The fault Identification, Computerized Maintenance Systems.
- The Maintenance strategies and overall configuration and Maintenance of Machines, structure

and System.

UNIT I

Evolution of maintenance, objective of maintenance, maintenance policies and philosophies, maintenance concept, importance of maintenance, elements of good maintenance classification of maintenance programs, corrective preventive and predictive maintenance, comparison of maintenance programs, preventive maintenance-concept, functions, benefits and limitations, training and safety aspects in maintenance. (Replaced: FMECA, Fault Diagnostics and Prognostics, Machine Learning in CBM)

UNIT II

Condition monitoring, objectives and benefits of condition based monitoring, what to monitor, when to monitor, principles, condition based maintenance techniques: visual/manual monitoring, temperature monitoring, thermography, lubricant monitoring, debris and spectroscopy, performance monitoring, vibration monitoring, current monitoring, and corrosion monitoring, odour monitoring, noise and sound monitoring, Time Domain Analysis, Frequency Domain Analysis, Non Stationary Signal Analysis, Practical Examples of Vibration. (Replaced: Modulation and Beats, Orbit and Order Analysis, Computer aided data acquisition, Orbit and Order Analysis, Data Recording, Cepstrum Analysis, Hilbert Transform in Condition Monitoring.)

UNIT III

Tribology in Maintenance, Friction wear and lubrication, friction & wear mechanisms, prevention of wear, types of lubrication mechanisms, lubrication processes, lubricants and its types, general and special purpose, additives, testing of lubricants, degradation of lubricants, seal & packings, repair methods for basic machine elements: failure analysis, failures and their development. (MATLAB portion removed)

Unit- IV:

Accelerometers, Rotational Speed Measurements, Introduction to Faults in Rotating Machines, Unbalance Detection, Field Balancing, Misalignment, Gears, Pumps and Cavitation, IC Engines,



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Department of Mechanical Engineering

machinery Diagnostic Chart, Basics of Instrumentation, Signal Conditioning and Filtering, Errors In Measurements, Dynamic Range And Frequency Response.

Unit- V: Non-Destructive Testing, Ultrasonics, Eddy Current and Acoustic Emission, Radiography, Dye Penetrant Tests, Tool Condition Monitoring, Experimental Modal Analysis, Introduction to Failure Analysis, Railway Locomotive Noise and Vibration Monitoring, Paper Mill Vibration Monitoring, Overview of CBM facilities at SKF Reliability Lab, Artificial Intelligence in Maintenance Engineering, Expert Systems for fault Diagnosis. IoT in Maintenance Engineering.

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

- ^{1.} **Describe** the fundamental concepts of maintenance engineering noise and vibration, measurement techniques of Condition Monitoring.
- ^{2.} **Show** skills of fault diagnosis.
- ^{3.} **Demonstrate** the need of instrumentation and signal processing for condition monitoring
- ^{4.} Examine the condition of machine parts through Failure analysis of plant machineries
- ^{5.} Apply correct usage of a method or procedure of maintenance.

Text & Reference books:

- A. R. Mohanty, Machinery Condition Monitoring: Principles and Practices, CRC Press, 2014
- Bikash Bhadury. 'Total Productive Maintenance". Allied Publisher Ltd. New Delhi.
- BC langlay. "Plant Maintenance". Prentice-Hall International. New Jersey.
- P Gopalakrishnan and AK Banerji, "Maintenance and Spare Parts Management". Prentice-Hall of India (P) Ltd. New Delhi.
- Kelly, "Maintenance Planning & Control"
- Industrial Maintenance by HP Garg. S. Chand & Company Ltd., New Delhi.
- Srivastava S.K., "Industrial Maintenance Management", S. Chand and Co., 1981
- Bhattacharya S.N., "Installation, Servicing and Maintenance", S. Chand and Co., 1995
- White E.N., "Maintenance Planning", I Documentation, Gower Press, 1979.
- Garg M.R., "Industrial Maintenance", S. Chand & Co., 1986.
- Higgins L.R., "Maintenance Engineering Hand book", McGraw Hill, 5th Edition, 1988.
- Armstrong, "Condition Monitoring", BSIRSA, 1988.
- Davies, "Handbook of Condition Monitoring", Chapman & Hall, 1996.

