MIT | Academy of Engineering

MIT ACADEMY OF ENGINEERING, ALANDI

Savitribai Phule Pune University

Curriculum for

Bachelor of Technology in

Mechanical Engineering

(Choice Based Credit System)

2019-2023

BoS Chairman	Member Secretary	Chairman
Dean, School of Mechanical & Civil Engineering	Academic Council Dean Academics	Academic Council Director MITAOE

MIT Academy of Engineering, Alandi, Pune

An Autonomous Institute affiliated to Savitribai Phule Pune University

CURRICULUM FRAMEWORK (2019 PATTERN)

MECHANICAL ENGINEERING

The Bachelor of Technology Program shall be based on the following type of courses.

COURSE DISTRIBUTION : SEMESTER WISE										
S.N.	**TYPE OF COURSE**	**NO. OF COURSES/SEMESTER**								**TOTAL**
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	
1.	Natural Science (NSC)	2	2	1						**5**
2.	Engineering Science (ESC)	3	2		1					**6**
3.	Discipline Core (DC)			3	3	3	3	1	1	**14**
4.	Discipline Elective (DE)							1	1	**2**
5.	Open Elective (OE)					1	1	1		**3**
6.	Humanities and Social Science (HSS)		1		1	1	1		2	**6**
7.	Skill Development and Project (SDP)	1	1	3	2	2	2	3	1	**15**
TOTAL		**6**	**6**	**7**	**7**	**7**	**7**	**6**	**5**	**51**
Audit Course			1	1	2		1			**5**

CREDIT DISTRIBUTION: SEMESTER WISE											
1 Lecture hour = 1 Credit		**2 Lab Hours = 1 Credit**				**1 Tutorial Hour = 1 Credit**					
S.N.	**TYPE OF COURSE**	**NO. OF CREDITS/SEMESTER**								**TOTAL**	**%**
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**		
1.	Natural Science (NSC)	8	8	4						**20**	**12.5**
2.	Engineering Science (ESC)	11	7		4					**22**	**13.75**
3.	Discipline Core (DC)			12	12	11	11	4	4	**54**	**33.75**
4.	Discipline Elective (DE)							3	3	**6**	**3.75**
5.	Open Elective (OE)					4	4	4		**12**	**7.5**
6.	Humanities and Social Science (HSS)	0	2		2	2	2		4	**12**	**7.5**
7.	Skill Development and Project (SDP)	2	2	5	3	4	4	10	4	**34**	**21.25**
TOTAL		**21**	**19**	**21**	**21**	**21**	**21**	**21**	**15**	**160**	**100**

CREDITS				
1 Lecture Hour = 1 Credit, 2 Lab Hours = 1 Credit, 1 Tutorial Hour = 1 Credit				
SL. NO.	YEAR	SEMESTER		TOTAL
		1	2	
1.	First Year	21	19	**40**
2.	Second Year	21	21	**42**
3.	Third Year	21	21	**42**
4.	Final Year	21	15	**36**
TOTAL				**160**

CONTACT HOURS				
SL. NO.	YEAR	SEMESTER		TOTAL
		1	2	
1.	First Year	29/27	28/30	**57**
2.	Second Year	31	31	**62**
3.	Third Year	27	30	**57**
4.	Final Year	25	20	**45**
TOTAL				**221**

ABBREVATIONS		
1.	MSE	Mid Semester Exam
2.	ESE	End Semester Exam
3.	IA	Internal Assessment
4.	T/P	Term Work / Practical
5.	DM	Demonstration
6.	L	Lecture
7.	P	Practical
8.	T	Tutorial
9.	Lab	Laboratory

MIT | Academy of Engineering An Autonomous Institute Affiliated to SPPU	**COURSE STRUCTURE (2019 - 2023)**		
SCHOOL OF HUMANITIES AND ENGINEERING SCIENCES	**W.E.F**	**:**	**2019-2020**
FIRST YEAR BACHLEOR OF TECHNOLOGY	**RELEASE DATE**	**:**	**01/07/2019**
	REVISION NO.	**:**	**1.0**

SEMESTER: I (Version I)

INDUCTION PROGRAM: 3 WEEKS

COURSE			TEACHING SCHEME			EXAMINATION SCHEME AND MARKS						CREDIT
			Hour/Week			THEORY			PRACT		TOTAL	
TYPE	CODE	NAME	L	P	T	MSE	ESE	IA	T/P	DM		
NSC1	AS105	Calculus and Differential Equations	3	-	1	20	40	40	50	-	150	4
NSC2	AS106	Engineering Physics	3	2	-	20	40	40	50	-	150	4
ESC1	EX102	Electrical and Electronics Engineering	3	2	-	20	40	40	50	-	150	4
ESC2	ME104	Engineering Graphics	2	4	-	-	60	40	100	-	200	4
ESC3	CS101	Logic Development-C Programming	1	4	-	-	40	-	100	-	140	3
SDP1	ME105	Experimental Tools and Techniques	-	4	-	-	-	-	40	60	100	2
TOTAL			**12**	**16**	**1**	**60**	**220**	**160**	**390**	**60**	**890**	**21**

SEMESTER: II (Version I)

COURSE			TEACHING SCHEME			EXAMINATION SCHEME AND MARKS						CREDIT
			Hour/Week			THEORY			PRACT		TOTAL	
TYPE	CODE	NAME	L	P	T	MSE	ESE	IA	T/P	DM		
NSC3	AS107	Statistics and Integral Calculus	3	-	1	20	40	40	50	-	150	4
NSC4	CH101	Science of Nature	3	2	-	20	40	40	50	-	150	4
ESC4	CV102	Applied Mechanics	3	2	-	20	40	40	50	-	150	4
HSS1	HP103/4/5	English for Engineers /(German/Japanese)	0	4	-	-	-	-	100	-	100	2
ESC5	CS102	Applications Programming -Python	1	4	-	-	40	-	100	-	140	3
SDP2	ME106	Design Thinking	-	4	-	-	-	-	40	60	100	2
HSS2	HP106	Indian Constitution	1	-	-	-	-	-	-	-	Audit	
TOTAL			**11**	**16**	**1**	**60**	**160**	**120**	**390**	**60**	**790**	**19**

MIT | Academy of Engineering An Autonomous Institute Affiliated to SPPU	**COURSE STRUCTURE (2019 - 2023)**		
SCHOOL OF HUMANITIES AND ENGINEERING SCIENCES	**W.E.F**	**:**	**2019-2020**
FIRST YEAR BACHLEOR OF TECHNOLOGY	**RELEASE DATE**	**:**	**01/07/2019**
	REVISION NO.	**:**	**1.0**

SEMESTER: I (Version II)												
INDUCTION PROGRAM: 3 WEEKS												
COURSE			**TEACHING SCHEME**			**EXAMINATION SCHEME AND MARKS**						**CREDIT**
TYPE	**CODE**	**NAME**	**Hour/Week**			**THEORY**			**PRACT**		**TOTAL**	
			L	P	T	MSE	ESE	IA	T/P	DM		
NSC1	AS105	Calculus and Differential Equations	3	-	1	20	40	40	50	-	150	4
NSC4	CH101	Science of Nature	3	2	-	20	40	40	50	-	150	4
ESC4	CV102	Applied Mechanics	3	2	-	20	40	40	50	-	150	4
HSS1	HP103/4/5	English for Engineers /(German/Japanese)	0	4	-	-	-	-	100	-	100	2
ESC3	CS101	Logic Development-C Programming	1	4	-	-	40	-	100	-	140	3
SDP2	ME106	Design Thinking	-	4	-	-	-	-	40	60	100	2
TOTAL			**10**	**16**	**1**	**60**	**160**	**120**	**390**	**60**	**790**	**19**

SEMESTER: II (Version II)												
COURSE			**TEACHING SCHEME**			**EXAMINATION SCHEME AND MARKS**						**CREDIT**
PE	**CODE**	**NAME**	**Hour/Week**			**THEORY**			**PRACT**		**TOTAL**	
			L	P	T	MSE	ESE	IA	T/P	DM		
NSC3	AS107	Statistics and Integral Calculus	3	-	1	20	40	40	50	-	150	4
NSC2	AS106	Engineering Physics	3	2	-	20	40	40	50	-	150	4
ESC1	EX102	Electrical and Electronics Engineering	3	2	-	20	40	40	50	-	150	4
ESC2	ME104	Engineering Graphics	2	4	-	-	60	40	100	-	200	4
ESC5	CS102	Applications Programming -Python	1	4	-	-	40	-	100	-	140	3
SDP1	ME105	Experimental Tools and Techniques	-	4	-	-	-	-	40	60	100	2
HSS2	HP106	Indian Constitution	1	-	-	-	-	-	-	-	Audit	
TOTAL			**13**	**16**	**1**	**60**	**220**	**160**	**390**	**60**	**890**	**21**

MIT | Academy of Engineering Autonomous Institute Affiliated to SPPU	COURSE STRUCTURE (2019 - 2023)		
SCHOOL OF MECHANICAL & CIVIL ENGINEERING	W.E.F	:	2020-2021
SECOND YEAR BACHLEOR OF TECHNOLOGY IN MECHANICAL ENGINEERING	RELEASE DATE	:	01/06/2020
	REVISION NO.	:	1.0

SEMESTER: III

SUMMER INTERNSHIP (Audit: ME200**)**

COURSE			TEACHING SCHEME			EXAMINATION SCHEME AND MARKS						CREDIT
TYPE	CODE	NAME	Hour/Week			THEORY			PRACT		TOTAL	
			L	P	T	MSE	ESE	IA	T/P	DM		
ESC5	AS203	Applied Mathematics	3	2	-	35	35	30	50	0	150	4
DC01	ME231	Strength of Materials	3	2	-	35	35	30	50	0	150	4
DC02	ME232	Thermal Engineering	3	2	-	35	35	30	50	0	150	4
DC03	ME233	Manufacturing Technology	3	2	-	35	35	30	50	0	150	4
SDP3	ET224	Digital Prototyping	0	4	-	0	0	25	0	50	75	2
SDP4	ME230	Minor Project Design	0	2	-	0	0	0	0	50	50	1
SDP5	ME241	Skill Development Course (Industrial Measurements & Instrumentation)	0	4	-	0	0	25	0	50	75	2
ESC7	CV203	Environmental Sciences	1	0	-	-	-	-	-	-	Audit	
TOTAL			**13**	**18**	**0**	**140**	**140**	**170**	**200**	**150**	**800**	**21**

SEMESTER: IV

COURSE			TEACHING SCHEME			EXAMINATION SCHEME AND MARKS						CREDIT
TYPE	CODE	NAME	Hour/Week			THEORY			PRACT		TOTAL	
			L	P	T	MSE	ESE	IA	T/P	DM		
ESC8	ME221	Materials Engineering	3	2	-	35	35	30	50	0	150	4
DC04	ME222	Engineering Informatics	3	2	-	35	35	30	50	0	150	4
DC05	ME234	Machines & Mechanisms	3	2	-	35	35	30	50	0	150	4
DC06	ME235	Fluid Mechanics	3	2	-	35	35	30	50	0	150	4
SDP6	ET235	Rapid Prototyping	0	4	-	0	0	25	0	50	75	2
SDP7	ME240	Minor Project Implementation	0	2	-	0	0	0	0	50	50	1
HSS3	HP202	Professional Skill	0	4	-	0	0	25	0	50	75	2
HSS4	HP203	Liberal Learning	1	0	-	-	-	-	-	-	Audit	
TOTAL			**13**	**18**	**0**	**140**	**140**	**170**	**200**	**150**	**800**	**21**

MIT | Academy of Engineering Autonomous Institute Affiliated to SPPU	COURSE STRUCTURE (2019 - 2023)		
SCHOOL OF MECHANICAL & CIVIL ENGINEERING	W.E.F	:	2021-2022
THIRD YEAR BACHLEOR OF TECHNOLOGY IN MECHANICAL ENGINEERING	RELEASE DATE	:	01/06/2020
	REVISION NO.	:	1.0

SEMESTER: V

SUMMER INTERNSHIP (Audit: ME300**)**

COURSE			TEACHING SCHEME			EXAMINATION SCHEME AND MARKS						CREDIT
TYPE	CODE	NAME	Hour/Week			THEORY			PRACT		TOTAL	
			L	P	T	MSE	ESE	IA	T/P	DM		
DC07	ME341	Machine Design	3	2	-	35	35	30	50	0	150	4
DC08	ME342	Turbomachines	3	2	-	35	35	30	50	0	150	4
DC09	ME343	Hydraulics & Pneumatics	3	0	-	35	35	30	0	0	100	3
OE01	ME35#	Open Elective	3	2	-	35	35	30	50	0	150	4
HSS5	CS361	Project Management	2	0	-	0	50	25	0	0	75	2
SDP8	ME37#	Skill Development Course (Computer Aided Product Design)	0	4	-	0	0	25	50	0	75	2
SDP9	ME350	Project Design	0	4	-	0	0	25	0	50	75	2
TO0TAL			**15**	**12**	**0**	**140**	**190**	**195**	**200**	**50**	**775**	**21**

SEMESTER: VI

COURSE			TEACHING SCHEME			EXAMINATION SCHEME AND MARKS						CREDIT
TYPE	CODE	NAME	Hour/Week			THEORY			PRACT		TOTAL	
			L	P	T	MSE	ESE	IA	T/P	DM		
DC10	ME344	Design of Transmission Systems	3	2	-	35	35	30	50	0	150	4
DC11	ME346	Heat Transfer	3	2	-	35	35	30	50	0	150	4
DC12	ME347	Quality Assurance	3	0	-	35	35	30	0	0	100	3
OE02	ME36#	Open Elective	3	2	-	35	35	30	50	0	150	4
SDP10	ME38#	Skill Development Course (Mechanical Simulations)	0	4	-	0	0	25	50	0	75	2
SDP11	ME360	Project Implementation	0	4	-	0	0	25	0	50	75	2
HSS6	HP305	Employability Skills	0	4	-	0	0	25	0	50	75	2
TOTAL			**12**	**18**	**0**	**140**	**140**	**195**	**200**	**100**	**775**	**21**

MIT | Academy of Engineering Autonomous Institute Affiliated to SPPU	COURSE STRUCTURE (2019 - 2023)		
SCHOOL OF MECHANICAL & CIVIL ENGINEERING	W.E.F	:	2022-2023
FINAL YEAR BACHLEOR OF TECHNOLOGY IN MECHANICAL ENGINEERING	RELEASE DATE	:	01/06/2020
	REVISION NO.	:	1.0

SEMESTER: VII												
COURSE			TEACHING SCHEME			EXAMINATION SCHEME AND MARKS						CREDIT
TYPE	CODE	NAME	Hour/Week			THEORY			PRACT		TOTAL	
			L	P	T	MSE	ESE	IA	T/P	DM		
DC13	ME461	Refrigeration & Air Conditioning	3	2	-	35	35	30	50	0	150	4
DE01	ME47#	Discipline Elective	3	-	-	35	35	30	0	0	100	3
OE03	ME49#	Open Elective	3	2	-	35	35	30	50	0	150	4
SDP12	ME46#	Skill Development Course (Industrial Skills/ Programming Skills)	-	4	-	0	0	25	50	0	75	2
SDP13	ME470	Project Evaluation	-	8	-	0	0	50	0	100	150	4
SDP14	ME400	Summer Internship	-	-	-	-	-	-	-	150	150	4
TOTAL			**9**	**16**	**0**	**105**	**105**	**165**	**150**	**250**	**775**	**21**

SEMESTER: VIII (PART A)												
COURSE			TEACHING SCHEME			EXAMINATION SCHEME AND MARKS						CREDIT
TYPE	CODE	NAME	Hour/Week			THEORY			PRACT		TOTAL	
			L	P	T	MSE	ESE	IA	T/P	DM		
DC14	ME462	Machine Dynamics	3	2	-	35	35	30	50	0	150	4
DE02	ME48#	Discipline Elective	3	-	-	35	35	30	0	0	100	3
SDP15	ME480	Capstone Work	-	8	-	0	0	75	0	75	150	4
HSS7	HP405	Engineering Economics	2	-	-	0	50	25	0	0	75	2
HSS8	HP406	Psychology	2	-	-	0	50	25	0	0	75	2
TOTAL			**10**	**10**	**0**	**70**	**170**	**160**	**50**	**75**	**550**	**15**

SEMESTER: VIII (PART B SEMESTER LONG INTERNSHIP)												
COURSE			TEACHING SCHEME			EXAMINATION SCHEME AND MARKS						CREDIT
TYPE	CODE	NAME	Hour/Week			THEORY			PRACT		TOTAL	
			L	P	T	MSE	ESE	IA	T/P	DM		
DC14	ME462	Machine Dynamics	3	2	-	35	35	30	50	0	150	4
DE02	ME48#	Discipline Elective	3	-	-	35	35	30	0	0	100	3
SDP16	ME467	Semester Long Internship Design	-	-	-	-	-	-	-	150	150	4
SDP17	ME468	Semester Long Internship Implementation	-	-	-	-	-	-	-	150	150	4
TOTAL			**6**	**2**	**0**	**70**	**70**	**60**	**50**	**300**	**550**	**15**

Discipline Elective (DE) : 2 Courses		
Sl. No.	**Course Code**	**Course Name**
1.	ME471	Operations Research
	ME472	Mechanical Control Systems
	ME473	Mechanical System Design
	ME474	Power Plant Engineering
	ME475	Operations Management
	ME476	Artificial Intelligence
2.	ME481	Optimization Tools & Techniques
	ME482	Product Lifecycle Management
	ME483	Non-Conventional Machining
	ME484	Reliability Engineering
	ME485	Supply Chain Management
	ME486	Machine Learning

Natural Science (NSC) : 5 Courses		
Sl. No.	**Course Code**	**Course Name**
1.	AS105	Calculus and Differential Equations
2.	AS106	Engineering Physics
3.	CH101	Science of Nature
4.	AS107	Statistics and Integral Calculus
5.	AS203	Applied Mathematics

Humanities and Social Science (HSS) : 6 Courses		
Sl. No.	**Course Code**	**Course Name**
1.	HP103	English for Engineers
	HP104	German
	HP105	Japanese
Audit	HP106	Indian Constitution
2.	HP202	Professional Skills 1
Audit	HP203	Liberal Learning
3.	CS361	Project Management
4.	HP305	Professional Skills 2
5.	HP405	Engineering Economics
6.	HP406	Psychology

Engineering Science (ESC): 6 Courses		
Sl. No.	**Course Code**	**Course Name**
1.	EX102	Electrical and Electronics Engineering
2.	CV102	Applied Mechanics
3.	ME104	Engineering Graphics
4.	CS101	Logic Development - C Programming
5.	CS102	Application Programming - Python
6.	ME221	Material Engineering
	IT221	Engineering Informatics
Audit	CV203	Environmental Sciences

Discipline Core (DC): 14 Courses		
Sl. No.	**Course Code**	**Course Name**
1.	ME231	Strength of Materials
2.	ME232	Thermal Engineering
3.	ME233	Manufacturing Technology
4.	ME222	Engineering Informatics
5.	ME234	Machines & Mechanisms
6.	ME235	Fluid Mechanics
7.	ME341	Machine Design
8.	ME342	Turbomachines
9.	ME343	Hydraulics & Pneumatics
10.	ME344	Design of Transmission Systems
11.	ME346	Heat Transfer
12.	ME347	Quality Assurance
13.	ME461	Refrigeration & Air Conditioning
14.	ME462	Machine Dynamics

Skill Development and Project (SDP): 15 Courses		
Sl. No.	**Course Code**	**Course Name**
1.	ME105	Experimental Tools and Techniques
2.	ME106	Design Thinking
3.	ET224	Digital Prototyping
4.	ME230	Minor Project Design
5.	ME225	Skill Development Course 1
6.	ET235	Rapid Prototyping
7.	ME240	Minor Project Implementation
8.	ME344	Skill Development Course 2
9.	ME350	Project Design
10.	ME371	Skill Development Course 3
11.	ME360	Project Implementation
12.	ME381	Skill Development Course 4
13.	ME470	Project Evaluation
14.	ME400	B. Tech Summer Internship
15.	ME480	Capstone Work
16.	ME467	Semester Long Internship Design
17.	ME468	Semester Long Internship Implementation
Audit	ME200	SY Summer Internship
Audit	ME300	TY Summer Internship

Programme Name	Skill Development Course 1	Skill Development Course 2	Skill Development Course 3	Skill Development Course 4
Chemical Engineering	CFD	ASPEN ONE	Aspen EDR	Plant Design and Piping
Civil Engineering	REVIT/ EXCEL	ETABS	VISSIM / STADDPRO	WMS / QGIS
Computer Engineering (and IT)	CPP/Core Java	Red Hat Linux/ Web Technology	Adv. Java/ .Net Core/Red Hat Linux	AWS cloud services/ Android App Development
Mechanical Engineering	Industrial Measurements & Instrumentation	Computer Aided Product Design	Mechanical Simulations (Ansys/ LsDyna)	Industrial Skills (Six Sigma/ Energy Audit) / Programming Skills (C++/Python)
Electronics Engineering (and ENTC)	Data Structures and Algorithms	OOP JAVA / C++	Networking	EMB Linux
Certification Courses				

Open Electives (OE): 03 Courses							
Programme Name	**Open Track Name**	**Semester V**		**Semester VI**		**Semester VII**	
		Course Code	**Course Name**	**Course Code**	**Course Name**	**Course Code**	**Course Name**
Chemical Engineering	Process Engineering	CH351	Process Engineering	CH371	Process Modeling and Simulation	CH471	Process Intensification and Integration
	Piping Design and engineering	CH352	Piping Engineering	CH372	Piping Layout	CH472	Piping Design & Engineering
Civil Engineering	Construction Project Management	CV325	Construction Planning and Management	CV332	Operation Research	CV422	Financial Management
	Environmental Engineering	CV326	Solid Waste Management	CV333	Unit Operations for Liquid Waste/Effluent Treatment	CV423	Environmental Impact assessment and Climate Change
	Structural Engineering	CV327	Advanced mechanics of Solids	CV334	Advanced Structural Analysis	CV424	Advanced RC structures
Computer Engineering	Data science	CS351	Descriptive Analytics	CS353	Predictive Analysis	CS461	Big Data Analytics
	Artificial Intelligence and Machine Learning	CS352	Artificial Intelligence	CS354	Machine Learning	CS462	Deep Learning
Electronics Engineering	Robotics and Automation	EX351	Fundamentals of Robotics	EX371	Robot Dynamics and Control	EX471	Robotics Vision

Open Electives (OE)							
Programme Name	**Open Track Name**	**Semester V**		**Semester VI**		**Semester VII**	
		Course Code	**Course Name**	**Course Code**	**Course Name**	**Course Code**	**Course Name**
Electronics & Telecommuni-cation	Embedded Systems	ET351	Embedded System Programming (ESP)	ET371	Embedded Processor	ET471	RTOS
	Internet of Things	ET352	IoT Architecture and Sensors	ET372	IoT Network & Protocols	ET472	Data Management and Analytics
Information Technology	Computer Security	IT351	Cryptography and System Security	IT352	Cyber Security and Forensics	IT461	Ethical Hacking & Cyber Laws
Mechanical Engineering	Computer Aided Engineering	ME351	Finite Element Analysis	ME361	Computational Fluid Dynamics-1	ME491	Computational Fluid Dynamics-2
	Robotics and Automation	ME352	Robot Fundamental & Kinematics	EX371	Robot Dynamics and Control	EX471	AI in Robotics /Cognitive Robotics
	Automobile Engineering	ME353	Automobile System Design	ME363	Vehicle Dynamics	ME493	Autotronics and e-Vehicles
Entrepreneur-ship Cell	Innovation, Entrepreneurship & Venture Development	HP311	Foundational Course in Entrepreneurship	HP312	Advanced Course in Entrepreneurship	HP411	Startup and Incubation

Honors/Minor Elective Tracks: 5 Courses (Additional 18 to 20 Credit, Eligibility: SY B. Tech CGPA more than 7.5)					
Sl. No.	**Honors / Minor Track**	**Semester**	**Course Code**	**Course Name**	**Credits**
1	Entrepreneurship	V	HP311	Foundation Course in Entrepreneurship	4
2		VI	HP312	Advanced Course in Entrepreneurship	4
3		VII	HP411	Startup and Incubation	4
4		VIII	HP412	Project: Startup/Venture Development	6
1	Product Design	V	PD301	Fundamental of Design Elements	4
2		VI	PD302	Packaging Design	5
3		VII	PD401	Ergonomics & Human - Product Interface	4
4		VIII	PD402	Product / Systems Design Project	5

Honors/Minor Elective Tracks: 5 Courses (Additional 18 to 20 Credit)					
Sl. No.	**Honors / Minor Track**	**Semester**	**Course Code**	**Course Name**	**Credits**
1		V			2
2		V			4
3		VI			4
4		VII			4
5		VIII			4
1		V			2
2		V			4
3		VI			4
4		VII			4
5		VIII			4
1		V			2
2		V			4
3		VI			4
4		VII			4
5		VIII			4

MIT | Academy of Engineering An Autonomous Institute Affiliated to SPPU	COURSE STRUCTURE (2019 - 2023)		
SCHOOL OF ENGINEERING SCIENCES AND HUMANITIES	W.E.F	:	2019-2020
FIRST YEAR BACHLEOR OF TECHNOLOGY	RELEASE DATE	:	01/07/2019
	REVISION NO.	:	1.0

SEMESTER: I (Version I)

INDUCTION PROGRAM: 3 WEEKS

COURSE			TEACHING SCHEME			EXAMINATION SCHEME AND MARKS						CREDIT
			Hour/Week			THEORY			PRACT		TOTAL	
TYPE	CODE	NAME	L	P	T	MSE	ESE	IA	T/P	DM		
NSC1	AS105	Calculus and Differential Equations	3	-	1	20	40	40	50	-	150	4
NSC2	AS106	Engineering Physics	3	2	-	20	40	40	50	-	150	4
ESC1	EX102	Electrical and Electronics Engineering	3	2	-	20	40	40	50	-	150	4
ESC2	ME104	Engineering Graphics	2	4	-	-	60	40	100	-	200	4
ESC3	CS101	Logic Development-C Programming	1	4	-	-	40	-	100	-	140	3
SDP1	ME105	Experimental Tools and Techniques	-	4	-	-	-	-	40	60	100	2
TOTAL			**12**	**16**	**1**	**60**	**220**	**160**	**390**	**60**	**890**	**21**

SEMESTER: II (Version I)

COURSE			TEACHING SCHEME			EXAMINATION SCHEME AND MARKS						CREDIT
			Hour/Week			THEORY			PRACT		TOTAL	
PE	CODE	NAME	L	P	T	MSE	ESE	IA	T/P	DM		
NSC3	AS107	Statistics and Integral Calculus	3	-	1	20	40	40	50	-	150	4
NSC4	CH101	Science of Nature	3	2	-	20	40	40	50	-	150	4
ESC4	CV102	Applied Mechanics	3	2	-	20	40	40	50	-	150	4
HSS1	HP103/4/5	English for Engineers /(German/Japanese)	0	4	-	-	-	-	100	-	100	2
ESC5	CS102	Applications Programming -Python	1	4	-	-	40	-	100	-	140	3
SDP2	ME106	Design Thinking	-	4	-	-	-	-	40	60	100	2
HSS2	HP106	Indian Constitution	1	-	-	-	-	-	-	-	Audit	
TOTAL			**11**	**16**	**1**	**60**	**160**	**120**	**390**	**60**	**790**	**19**

MIT | Academy of Engineering An Autonomous Institute Affiliated to SPPU	COURSE STRUCTURE (2019 - 2023)		
SCHOOL OF ENGINEERING SCIENCES AND HUMANITIES	W.E.F	:	2019-2020
FIRST YEAR BACHLEOR OF TECHNOLOGY	RELEASE DATE	:	01/07/2019
	REVISION NO.	:	1.0

SEMESTER: I (Version II)

INDUCTION PROGRAM: 3 WEEKS

COURSE			TEACHING SCHEME			EXAMINATION SCHEME AND MARKS						CREDIT
TYPE	CODE	NAME	Hour/Week			THEORY			PRACT		TOTAL	
			L	P	T	MSE	ESE	IA	T/P	DM		
NSC1	AS105	Calculus and Differential Equations	3	-	1	20	40	40	50	-	150	4
NSC4	CH101	Science of Nature	3	2	-	20	40	40	50	-	150	4
ESC4	CV102	Applied Mechanics	3	2	-	20	40	40	50	-	150	4
HSS1	HP103/4/5	English for Engineers /(German/Japanese)	0	4	-	-	-	-	100	-	100	2
ESC3	CS101	Logic Development-C Programming	1	4	-	-	40	-	100	-	140	3
SDP2	ME106	Design Thinking	-	4	-	-	-	-	40	60	100	2
TOTAL			**10**	**16**	**1**	**60**	**160**	**120**	**390**	**60**	**790**	**19**

SEMESTER: II (Version II)

COURSE			TEACHING SCHEME			EXAMINATION SCHEME AND MARKS						CREDIT
PE	CODE	NAME	Hour/Week			THEORY			PRACT		TOTAL	
			L	P	T	MSE	ESE	IA	T/P	DM		
NSC3	AS107	Statistics and Integral Calculus	3	-	1	20	40	40	50	-	150	4
NSC2	AS106	Engineering Physics	3	2	-	20	40	40	50	-	150	4
ESC1	EX102	Electrical and Electronics Engineering	3	2	-	20	40	40	50	-	150	4
ESC2	ME104	Engineering Graphics	2	4	-	-	60	40	100	-	200	4
ESC5	CS102	Applications Programming -Python	1	4	-	-	40	-	100	-	140	3
SDP1	ME105	Experimental Tools and Techniques	-	4	-	-	-	-	40	60	100	2
SS2	HP106	Indian Constitution	1	-	-	-	-	-	-	-	Audit	
TOTAL			**13**	**16**	**1**	**60**	**220**	**160**	**390**	**60**	**890**	**21**

MIT Academy of Engineering (An Autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2019 – 2023)	
SCHOOL OF HUMANITIES AND ENGINEERING SCIENCES	**W.E.F**	2019 - 2020
FIRST YEAR BACHELOR OF TECHNOLOGY	**COURSE NAME**	Calculus and Differential Equations
	COURSE CODE	AS105
	COURSE CREDITS	4
RELEASED DATE : 01/07/2019	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		**EXAMINATION SCHEME AND MARKS**					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA	PRACTICAL	DEMONSTRATION	
3	1	20	40	40	50	NIL	150

PRE-REQUISITE : NIL

COURSE OBJECTIVES :

AS105.CEO.1: Classify and solve first order and first degree ordinary differential equations.
AS105.CEO.2: Categorize and inspect the applications of first order differential equations.
AS105.CEO.3: Inspect and solve linear differential equations of second and higher order.
AS105.CEO.4: Apply the concepts of partial differentiation.
AS105.CEO.5: Demonstrate an understanding towards the applications of partial differentiation.
AS105.CEO.6: Identify and classify first order linear and nonlinear partial differential equations.

COURSE OUTCOMES :

The students after completion of the course will be able to,

AS105.CO.1: Solve first order and first degree ordinary differential equations.
AS105.CO.2: Analyze and solve real world phenomenon governed by first order ordinary differential equations.
AS105.CO.3: Apply concepts of linear differential equations of second and higher order to solve different systems in engineering world.
AS105.CO.4: Infer the problems based on properties of partial differentiation.
AS105.CO.5: Examine the applications of partial differentiation.
AS105.CO.6: Solve and examine the solution of partial differential equations by theoretical methods.

THEORY COURSE CONTENT		
UNIT 1	**Ordinary Differential Equations of First Order and First Degree**	**6 HOURS**
Exact differential equations, Differential equations reducible to exact form-Integrating factors, Linear differential equations, Differential equations reducible to linear form.		
UNIT 2	**Applications of Ordinary Differential Equations of First Order and First Degree**	**6 HOURS**
Orthogonal Trajectories, Newtons law of cooling, Growth & Decay, Electric circuits, Chemical applications- Mixing problems.		
UNIT 3	**Linear Differential Equation of Second Order and Higher Order**	**7 HOURS**
General solutions of linear differential equations with constant coefficients, Method of variation of parameters, Equations reducible to linear differential equations with constant coefficients: Cauchy and Legendres linear differential equation, Simultaneous linear differential equations, Applications.		
UNIT 4	**Partial Differentiation**	**7 HOURS**
Partial Differentiation: Introduction, Chain rule, Total derivative, Change of variables, Homogeneous functions, Eulers Theorem, Differentiation of Implicit functions.		
UNIT 5	**Applications of Partial Differentiation**	**6 HOURS**
Jacobian, Jacobian of Implicit functions, Partial derivative of an implicit function using Jacobians, Functional dependence, Maxima and Minima of functions of two variables.		
UNIT 6	**Partial Differential Equations**	**7 HOURS**
Introduction and formation of partial differential equation, solution of a partial differential equation, equations solvable by direct integration, Linear differential equations of first order, Non-linear differential equations of first order, Charpit's method.		

TUTORIAL		
TUTORIAL NO.01		**1 HOURS**
Exact differential equations, Differential equations reducible to exact form-Integrating factors.		
TUTORIAL NO.02		**1 HOURS**
Linear differential equations, Differential equations reducible to linear form.		
TUTORIAL NO.03		**1 HOURS**
Orthogonal Trajectories, Newtons law of cooling, Growth & Decay		
TUTORIAL NO.04		**1 HOURS**
Electric circuits, Chemical applications- Mixing problems.		

TUTORIAL NO.05		**1 HOURS**
General solutions of linear differential equations with constant coefficients, Method of variation of parameters.		
TUTORIAL NO.06		**1 HOURS**
Cauchy and Legendres linear differential equation, Simultaneous linear differential equations, Applications.		
TUTORIAL NO.07		**1 HOURS**
Partial Differentiation: Introduction, Chain rule, Total derivative, Change of variables.		
TUTORIAL NO.08		**1 HOURS**
Homogeneous functions, Eulers Theorem, Differentiation of Implicit functions.		
TUTORIAL NO.09		**1 HOURS**
Jacobian, Jacobian of Implicit functions, Partial derivative of an implicit function.		
TUTORIAL NO.10		**1 HOURS**
Functional dependence, Maxima and Minima of functions of two variables.		
TUTORIAL NO.11		**1 HOURS**
Introduction and formation of partial differential equation, solution of a partial differential equation, equations solvable by direct integration.		
TUTORIAL NO.12		**1 HOURS**
Linear differential equations of first order, Non-linear differential equations of first order, Charpits method.		

TEXT BOOK

1. Dr. B.V. Ramana, Higher Engineering Mathematics, 5 th edition, Tata McGraw Hill, 2017, ISBN: 978-0-07-063419-0
2. B.S. Grewal, Higher Engineering Mathematics, 44 th edition, Khanna Publications, 2018, ISBN: 978-81-933284-9-1

REFERENCE BOOK

1. G.B. Thomas, Maurice D. Weir, Joel R. Hass, Thomas Calculus, 12 th edition, Pearson Education, 2002, ISBN: 9789332519091
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10 th edition, Wiley Eastern Ltd., 2015, ISBN: 13: 9788126554232
3. R.K. Jain & S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publishing house , 2010, ISBN: 8173194203.
4. Peter V. ONeil, Advanced Engineering Mathematics, 7 th edition, Cenage Learning, 2012, ISBN: 13: 9788131503102.

MIT Academy of Engineering (An Autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2019 – 2023)	
SCHOOL OF HUMANITIES AND ENGINEERING SCIENCES	**W.E.F**	2019 - 2020
FIRST YEAR BACHELOR OF TECHNOLOGY	**COURSE NAME**	Engineering Physics
	COURSE CODE	AS106
	COURSE CREDITS	4
RELEASED DATE : 01/07/2019	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA	PRACTICAL	DEMONSTRATION	
3	1	20	40	40	50	NIL	150

PRE-REQUISITE : NIL

COURSE OBJECTIVES :

AS106.CEO.1: Make students identify the basic concept of measurements and to formulate problems in physical and mathematical terms.

AS106.CEO.2: Analyze and understand the behavior of light as a wave and get acquaint with different applications in Physics.

AS106.CEO.3: Apply the concept of behavior of light and understand the polarization phenomena.

AS106.CEO.4: Classify and understand the difference of classical mechanics and quantum mechanics.

AS106.CEO.5: Derive the basic laws governing the motion of quantum particles.

AS106.CEO.6: Apply the concept of quantum mechanics to different applications and supplement the reasoning.

COURSE OUTCOMES :

The students after completion of the course will be able to,

AS106.CO.1: Evaluate the importance of order of all physical quantities and compare the order of size of different objects.

AS106.CO.2: Apply the theoretical knowledge of optics to understand the physics behind engineering applications.

AS106.CO.3: Apply that light is transverse in nature.

AS106.CO.4: Demonstrate the necessity of quantum mechanics and the distinction between the domains of classical and quantum mechanics.

AS106.CO.5:	Evaluate and apply the Schrdingers equation to the motion of an electron orbiting round the shell.
AS106.CO.6:	Apply the concepts of Quantum Physics in different branches of engineering.

THEORY COURSE CONTENT		
UNIT 1	**Measurement and importance of span (order) of physical quantities**	**6 HOURS**
Concept of (i)significant numbers, (ii) accuracy versus precision (iii)error versus uncertainty (iv)systematic error versus random error (v) quantifying the uncertainty. Least-count of an apparatus, Methods to measure least-count with specific examples of vernier-calipers, screw-gauge, travelling microscope and spectrometer. Span (orders of magnitude) of prominent physical parameters. Length-scale and time-scale of specific physical phenomenon.		
UNIT 2	**Optics (Interference and Diffraction of Light)**	**7 HOURS**
Particle nature and wave-nature with examples of wave and particle behavior of light, Introduction to wave nature, Concept of thin film, Stokes law of phase-change on reflection from a thin film, Thin film interference, Coating of lenses as an application of thin film interference, Interference in films of uniform and non-uniform thickness (with derivation), Applications of thin-film interference, Newton Ring Experiment and its applications, Diffraction as a particular case of interference.		
UNIT 3	**Polarization of Electromagnetic wave**	**6 HOURS**
Polarization of electromagnetic wave, Production and analysis of polarized electromagnetic wave, Optical Activity, Specific Rotation due to optically active solutions, Application of Polarized light.		
UNIT 4	**Quantum Mechanics-I**	**7 HOURS**
Shortcomings or failure of Classical Mechanics with specific example of blackbody radiation, Plancks quantum law of blackbody radiation, Matter-waves, De-Broglies concept of matter waves, Heisenbergs Uncertainty Principle, Wave-function, Physical significance of wave function.		
UNIT 5	**Quantum Mechanics-II**	**8 HOURS**
Schrodingers equations, Time Dependent and Time Independent forms of Schrodinger Equations, Applications of Schrodinger Equation, Electron in an infinite potential well (rigid box), Electron in a finite deep potential well (non-rigid box) and concept of quantum mechanical tunneling, Application of electron in a potential well in case of Bohrs atomic model.		
UNIT 6	**LASER and Optical Fiber**	**5 HOURS**
Stimulated Absorption, Stimulated Emission of light and its comparison with spontaneous emission, Probabilities of stimulated absorption and emission of light (Einsteins coefficients), Principle and working of LASER (Ruby Laser), Application of LASER in optical fiber communication.		

PRACTICAL		
PRACTICAL NO.01	**Significant Figures**	**2 HOURS**
Determination of the mass of electron (me) upto specified significant numbers.		
PRACTICAL NO.02	**Interference of Light Waves**	**2 HOURS**
Calculate the refractive index of a given liquid using Newton Rings' Experiment.		
PRACTICAL NO.03	**Diffraction of Light Waves**	**2 HOURS**
Determination of the line density of a diffraction grating using Laser.		
PRACTICAL NO.04	**Interference of Light Waves**	**2 HOURS**
Calculate the wavelength of Sodium light source using Michelson Interferometer.		
PRACTICAL NO.05	**Phase and Phase Difference**	**2 HOURS**
Determination of the phase-difference between two given positions on the path of simple pendulum in periodic motion.		
PRACTICAL NO.06	**Bohr's Atomic Model**	**2 HOURS**
Verification of Bohr's atomic model using Frank and Hertz experiment.		
PRACTICAL NO.07	**Polarization**	**2 HOURS**
Determination of the specific rotation of a sugar solution of a given concentration.		
PRACTICAL NO.08	**Stoke's Law**	**2 HOURS**
Calculation of wavelength of a laser beam using Lloyds mirror arrangement.		
PRACTICAL NO.09	**Division of Amplitude of Light Waves**	**2 HOURS**
Determination of Radius of Curvature of a given planoconvex lens using Newton's Rings apparatus.		
PRACTICAL NO.10	**Diffraction as a Particular Case of Interference**	**2 HOURS**
Calculation of wavelength of different colors present in a white light.		

TEXT BOOK

1. Richard. P. Feynman, R.B. Leighton, M.Sands, The Feynman Lectures on Physics: Volume-1-ISBN:978-81-85015-82-8
2. The Feynman Lectures on Physics: Volume-3-Richard. P. Feynman, R.B. Leighton, M.Sands,ISBN:978-81-85015-84-2

REFERENCE BOOK

1. Alan S Morris, Butterworth Heinemann, Measurement and Instrumentation Principles,3rd Edition, Butterworth-heinmann,2001, ISBN 0750650818
2. Ajoy Ghatak ,Optics, 6th Edition Tata Mc Graw Hill Publishing Company. Ltd., 2016, ISBN-10-9339220900

3. Jenkins & White, Fundamentals of Optics, 4th Edition,Mc Graw Hill Science,2016, ISBN-0070853460.

4. Arthur Beiser, Shobit Mahajan, S. Rai. Choudhary ,Concepts of Modern Physics-,6th Edition, Mc Graw Hill Education (India) Pvt. Ltd., 2009, ISBN-10- 0070151555.

5. L I Schiff ,Quantum Mechanics,3rd Edition, Tata Mc Graw Hill Education (India) Pvt. Ltd.,ISBN-10- 0070856435, ISBN- 13- 9780070856431.

6. PAM Dirac,Principles of Quantum Mechanics,4th Edition, CBS publishers and Distributors,2004, ISBN-10- 0195671074, ISBN- 13- 978019567107

7. D J Griffiths, Introduction to Quantum Mechanics,2nd Edition,Cambridge India ,2016,ISBN-9781316646513.

MIT Academy of Engineering (An Autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2019 – 2023)	
SCHOOL OF HUMANITIES AND ENGINEERING SCIENCES	**W.E.F**	2019 - 2020
FIRST YEAR BACHELOR OF TECHNOLOGY	**COURSE NAME**	Science of Nature
	COURSE CODE	CH101
	COURSE CREDITS	4
RELEASED DATE : 01/07/2019	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA	PRACTICAL	DEMONSTRATION	
3	2	20	40	40	50	NIL	150

PRE-REQUISITE : NIL

COURSE OBJECTIVES :

CH101.CEO.1: Make students conversant with basic Biology regarding the life processes.
CH101.CEO.2: Study biology and engineering as biologically inspired technologies like designs in nature, bioenergetics, bioprocesses, biomaterials, biomechanics, bioinstrumentation.
CH101.CEO.3: Outline the technology involved in improving quality of water for its industrial use.
CH101.CEO.4: Illustrate the basic principles, instrumentation & applications of analytical techniques.
CH101.CEO.5: Get familiarize with the new concepts of Nano Science and Technology.
CH101.CEO.6: Define the basic aspects and applications of polymers, biomaterials & composites.

COURSE OUTCOMES :

The students after completion of the course will be able to,

CH101.CO.1: Explain natural biological processes and their technical aspects in view of optimizing Engineering solutions.
CH101.CO.2: Explain important biological inventions that changed the human life and their impact on engineering.
CH101.CO.3: Identify different methodologies for water quality analysis for industrial application.
CH101.CO.4: Apply basic concepts of analytical techniques for analysis of various chemical compounds.
CH101.CO.5: Apply the knowledge of nano science for betterment of the society.
CH101.CO.6: Categorize the different engineering materials and to solve engineering problems.

THEORY COURSE CONTENT		
UNIT 1	**Introduction to Science of Nature**	**7 HOURS**
The basics of science of nature. Exploring science in nature, specially symmetry, spiral, golden ratio, pattern and fractal. The phenomenon observed in nature viz., Physical, Chemical and Biological. Case studies and Applications. The diversity and commonality of cells, protein structure and function, basic molecular genetic mechanisms, bio membranes and cell architecture, transport of ions and small molecules across Cell membranes, cellular energetics, cell birth, lineage and death.		
UNIT 2	**Applications of Biology**	**6 HOURS**
Physiologic Systems - An Outline of Cardiovascular Structure and Function, Endocrine System, Nervous System, Vision System, Defense mechanisms in plants and animals. Introduction to Bio Sensors, Performance Factors, Factors Affecting the Performance of Sensors, Areas of Application. Biological Sensing Elements, Biological transducers. Discovery and Innovations in applications of Biology.		
UNIT 3	**The Role of Chemistry for Engineers**	**7 HOURS**
(A) **Introduction:** This section is an introduction to chemistry and chemical methods for engineering students. It describes how chemistry is used in engineering and how chemical principles aid engineers in the choice of materials for a particular application. Principles of Green chemistry are reviewed. The classification of separation methods used for mixtures. (B) **Periodic Table:** This section covers the names and symbols of the elements. The basic structure of the atom is reviewed including an explanation of isotopes. A discussion of the atomic structure describes electronic shells, subshells, their quantum numbers, orbital shapes, electron filling order, and the determination of the complete electron configuration of the elements. General description of the modern periodic table. Correlation between the valence electron configurations and the chemical properties of the elements. The periodic trends according to the position of the elements in the periodic table.		
UNIT 4	**Chemical Bonding - The Formation of Materials**	**8 HOURS**
(A) **The Formation of Materials:** This section covers chemical bonding and its effect on the chemical properties of the elements. Ionic bonding & covalent bonding are compared in terms of the octet rule and valence bond theory. Polar and non-polar covalent bonds. Molecular orbital theory is introduced to explain magnetism, bond order and hybridization helpful in Carbon chemistry. Intermolecular forces, including hydrogen bonding, are discussed with a special Case Study focusing on the special properties of water. (B) **Engineering Materials:** This section covers the Resources of Natural Materials, Introduction to Material Sciences viz. Polymers, Specialty polymers, Biomaterials, Nano materials and Smart materials with their examples and applications.		
UNIT 5	**Chemical Analysis and Instrumentation**	**6 HOURS**
Schrodingers equations, Time Dependent and Time Independent forms of Schrodinger Equations, Applications of Schrodinger Equation, Electron in an infinite potential well (rigid box), Electron in a finite deep potential well (non-rigid box) and concept of quantum mechanical tunneling, Application of electron in a potential well in case of Bohrs atomic model.		

UNIT 6	Water Treatment and Effluent Management	5 HOURS
This chapter covers types of impurities in water & the conventional water treatment methods. Hardness, Alkalinity and Chloride content of water, its causes, types and volumetric methods for their determinations are reviewed along with numerical. Various water softening & treatment methods which includes filtration methods by Carbon adsorption, ion-exchange methods and membrane techniques are explained		

PRACTICAL: Any 8 Experiments		
PRACTICAL NO.01	**Distillation**	**2 HOURS**
Separation of two miscible liquids using distillation process		
PRACTICAL NO.02	**Polymerization**	**2 HOURS**
Synthesis by condensation polymerization reaction		
PRACTICAL NO.03	**Nano Particle**	**2 HOURS**
Synthesis of nano particles using reduction method		
PRACTICAL NO.04	**pH Metry**	**2 HOURS**
Determination of the dissociation constant of a weak acid using pH meter		
PRACTICAL NO.05	**Paper Chromatography**	**2 HOURS**
Separation of inorganic cations by paper chromatography		
PRACTICAL NO.06	**TLC**	**2 HOURS**
Separation of organic compounds by TLC		
PRACTICAL NO.07	**Conductometry**	**2 HOURS**
Conductometric titration for mixture of acids.		
PRACTICAL NO.08	**Colorimetry / Spectrophotometry**	**2 HOURS**
Absorption studies		
PRACTICAL NO.09	**Hardness of Water**	**2 HOURS**
Determination of Hardness of water by EDTA method		
PRACTICAL NO.10	**Alkalinity**	**2 HOURS**
Determination of alkalinity of water by neutralization titration		
PRACTICAL NO.11	**Adsorption Studies**	**2 HOURS**
Water purification by activated charcoal		

PRACTICAL NO.12	Physical Phenomenon	2 HOURS
Case Studies of Physical Phenomenon		
PRACTICAL NO.13	**Chemical Phenomenon**	**2 HOURS**
Case Studies of Chemical Phenomenon		
PRACTICAL NO.14	**Biological Phenomenon**	**2 HOURS**
Case Studies of Biological Phenomenon		

TEXT BOOK

1. Jain & Jain, Engineering Chemistry, 16th Edition, Dhanpat Rai Publications company,2015, ISBN: 978-93-5216-000-6
2. S.M. Khopkar , Basic Concept of Analytical Chemistry,3rd edition, New Age International (P) Ltd., 2008, ISBN-10: 81-224-2092-3; ISBN-13: 978- 81-224-2092-0
3. Dr. B. S. Chauhan , Engineering Chemistry, 3rd Edition, University Science Press (Laxmi Publications Pvt. Ltd).,2009, ISBN: 978-81-318-0579-4.
4. Lodish H, Berk A, Zipursky SL, et al., Molecular Cell Biology, 5th Ed., W. H. Freeman publications, 2000.
5. Palsson B.O. and Bhatia S.N., Tissue Engineering, Pearson, 2009,
6. Brian R. Eggins, "CHEMICAL SENSORS AND BIOSENSORS", JOHN WILEY & SONS, LTD, 2004.

REFERENCE BOOK

1. Jeffrey S. Gaffney and Nancy A. Marley General Chemistry for Engineers, Elsevier, 2018, ISBN: 978- 0-12-810425-5
2. Skoog, West, Holler, Crouch, Fundamentals of Analytical Chemistry, 8th Edition Cengage Learning, 2009, ISBN-13: 97881-315-0051-4, ISBN-10: 81-315-0051-9
3. Willard, Merritt, Dean and Settle, Instrumental Methods of analysis (Chemistry), 6th edition, Wadsworth Publishing Co., 1988, ISBN-10: 0534081428, ISBN-13: 978-0534081423.
4. Donald R. Askeland, Pradeep Fulay, W. J. Wright, The Science & Engineering of Materials, 6th Edition, Cengage Learning, 2010, ISBN: 0495668028.
5. O. G. Palanna, Engineering Chemistry, 1st Edition, Tata McGraw Hill education Pvt. Ltd., 2009, ISBN-13: 978-0-07-014610-5, ISBN (10): 0-07-014610-1.
6. Pradeep T., A Text Book of Nanoscience and Nanotechnology, Tata McGraw Hill, New Delhi, 2012.
7. Reece, J. B., Taylor, M. R., Simon, E. J. and Dickey, J. L. (2013) Campbell Biology: Concepts and Connections (Seventh Edition) (Pearson) ISBN 1292026359

MIT Academy of Engineering (An Autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2019 – 2023)	
SCHOOL OF HUMANITIES AND ENGINEERING SCIENCES	**W.E.F**	2019 - 2020
FIRST YEAR BACHELOR OF TECHNOLOGY	**COURSE NAME**	Electrical and Electronics Engineering
	COURSE CODE	EX102
	COURSE CREDITS	4
RELEASED DATE : 01/07/2019	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA	PRACTICAL	DEMONSTRATION	
3	2	20	40	40	50	NIL	150

PRE-REQUISITE : NIL

COURSE OBJECTIVES :

EX102.CEO.1: Impart knowledge of single-phase AC circuit and use of renewable energy systems.
EX102.CEO.2: Explain relations in three-phase systems and study power measurement methods.
EX102.CEO.3: Explain power supply components, electronic devices.
EX102.CEO.4: Summarize various Digital systems and application.
EX102.CEO.5: Build the knowledge of measuring system and signal conditioning circuits.
EX102.CEO.6: Get acquainted with different electrical machines.

COURSE OUTCOMES :

The students after completion of the course will be able to,

EX102.CO.1: Develop Renewable energy system (PV) & power factor improvement circuits.
EX102.CO.2: Distinguish behavior of three phase circuits & power measurement methods.
EX102.CO.3: Analyze analog circuits.
EX102.CO.4: Design Digital circuits.
EX102.CO.5: Demonstrate the use of Instrumentation system in various fields.
EX102.CO.6: Identify electrical machines used in typical domestic and industrial sector Application.

THEORY COURSE CONTENT		
UNIT 1	**AC Circuits**	**7 HOURS**
Energy Scenario, General structure of electrical power systems, A.C. fundamentals, RMS and average value, R-L,R-C,RLC series and parallel circuits, phasor diagram, power triangle and power factor, measures to improve power factor and its effects on Power system and consumer. Work, Power & Energy, costing of electricity, Application of Renewable Energy Systems, Design of PV system (offgrid), Battery selection and its series parallel connections		
UNIT 2	**Three Phase Circuit and Power Measurement**	**7 HOURS**
Three phase voltage generation and its waveform, Star and delta balanced systems, Relationship between phase and line quantities, phasor diagram, power in a three phase circuits, three phase 4 wire system, Difference between neutral and ground conductors, Safety measures in electrical system, types of wiring, Active and Reactive Power measurement in single and three phase balanced system.		
UNIT 3	**Power Supply and Electronics Devices**	**7 HOURS**
Rectifiers and Power Supplies, Elements of IC Regulated Power Supply, Clipper, Clamper. BJT - Structure and operation, CE, CB, CC configurations, biasing methods, DC Load Line, Transistor as a switch and Amplifier. Opto-electronic devices Photo conductive cell, Photo Voltaic cell.		
UNIT 4	**Digital Systems**	**7 HOURS**
Logic gates, Boolean algebra, KMap, SOP representation. Combinational circuit Design: Adder, Subtractor, MUX, DMUX, Comparator, Code converter Sequential circuit: Flip-Flop, Registers and Synchronous & Asynchronous Counters. Microprocessor and Microcontroller based systems.		
UNIT 5	**Measuring System**	**7 HOURS**
Elements of measuring system, Sensors & Transducers Temperature, Flow, Pressure, Level, IR, Speed & LVDT, Op-Amp IC 741 pin configuration, Op-amp parameters, Inverting, Non- Inverting & Differential configuration. Applications: Summing & Difference amplifier, Comparator, Voltage follower.		
UNIT 6	**Electrical Machines**	**7 HOURS**
Construction of Transformer, principle of operation, EMF equation, VA Rating, Efficiency and Voltage regulation, OC/SC Test on Transformer. Construction, principle of operation and types of DC motor, Speed Control, characteristics equation, PMDC, BLDC, Universal motor, Single phase Induction Motor, Stepper motor, Application of Electrical Motors in domestic and Industrial sector.		

PRACTICAL:		
PRACTICAL NO.01	**Kirchhoffs laws and Superposition theorem**	**2 HOURS**
To develop a circuit for Kirchhoffs laws and Superposition theorem. To build and test both theorems.		
PRACTICAL NO.02	**Single Phase Energy (Watt-hour) Measurement.**	**2 HOURS**
To measure energy and power factor. To examine improvement in the power factor. To estimate and compare energy consumption with energy meter.		
PRACTICAL NO.03	**R-L-C series A.C. Circuit**	**2 HOURS**
To calculate exact values of R, L and C for variations in X_L and X_C (3 cases) To justify the lagging and Leading nature for the three cases. To find power losses in total R, L and C and verify with total power consumed.		
PRACTICAL NO.04	**Verification of relation between Line and Phase quantities in Star and Delta Circuits.**	**2 HOURS**
To understand Line & Phase quantities and types of connection along with Three phase supply To connect Bulb load in Star connection and verify the relation between Line and Phase Quantities. To connect Bulb load in Delta connection and verify the relation between Line and Phase Quantities.		
PRACTICAL NO.05	**Power Measurement in Three Phase Balanced Circuit and Single Phase Circuit.**	**2 HOURS**
To measure active and reactive power by Two wattmeter method in three phase circuit. To measure reactive power by One wattmeter method in three phase circuit.		
PRACTICAL NO.06	**Open Circuit & Short Circuit Test on a Single Phase Transformer**	**2 HOURS**
To find iron losses and no load circuit parameters To find full load copper losses and Equivalent circuit parameters To determine efficiency and regulation of transformer at various different loading conditions.		
PRACTICAL NO.07	**Speed Control of D.C. Shunt Motor**	**2 HOURS**
To vary field current and measure speed To vary armature voltage and measure speed Draw conclusion from both the methods through graphs.		
PRACTICAL NO.08	**Step Angle Measurement of Stepper Motor.**	**2 HOURS**
To become familiar with the properties of Stepper Motor. To calculate the step angle of motor.		
PRACTICAL NO.09	**Electronics Components and Measuring Instruments**	**2 HOURS**
To study Passive components - Resistors, Capacitors & Inductor. To test semi-conducting components - Diode, BJT To measure various electronic quantities using CRO, Function generator, DMM		

PRACTICAL NO.10	D.C. Regulated Power Supply	2 HOURS
To design 12V/ 9V/ 5V IC based DC regulated power supply (Theoretically). To test and observe waveforms at various stages on CRO and measure the voltage using DMM.		
PRACTICAL NO.11	**BJT as a Switch and Amplifier**	**2 HOURS**
To adapt BJT as a switch On/Off the LED at the output by switching BJT. To adapt BJT as an Amplifier Measure voltages and observe waveforms at input and output of the single stage CE amplifier.		
PRACTICAL NO.12	**Combinational Digital Circuits**	**2 HOURS**
To design and implement Half adder and Full adder (using Half adder). To design and implement 8:1 MUX using IC-74LS153 and verify its truth table.		
PRACTICAL NO.13	**Sequential Digital Circuits**	**2 HOURS**
To design and implement Half adder and Full adder (using Half adder). To design and implement 8:1 MUX using IC-74LS153 and verify its truth table.		
PRACTICAL NO.14	**OP-AMP Applications**	**2 HOURS**
To verify operations of inverting and non-inverting amplifier for various gain factors. To verify application of OP-AMP as summing and difference amplifier. To verify the application of OP-AMP as voltage follower.		
PRACTICAL NO.15	**Sensors and Transducer**	**2 HOURS**
To study and verify operation of LVDT. To study and verify the operation of Temperature sensors. (PT100, LM35)		
PRACTICAL NO.16	**Design and Simulate using MULTISIM (Min.2)**	**2 HOURS**
To design a counter to display 2-digit Decimal Number (00 to 99) on 7-Segment Display. To design a Flashing LED Display for a specific Pattern using MUX. To design of Inverting/Non-Inverting Amplifier using Op-Amp IC-741 for a specific gain.		

In addition to total 8 Experiments, two case study reports must be attached with Laboratory Course Record.

TEXT BOOK

1. Edward Hughes, Electrical and Electronic Technology 10th Edition, Pearson India, 2011, ISBN-13: 978-8131733660
2. Thomas L. Floyd, Electronics Devices & Circuits, 5th Edition, Pearson Education India, 1998, ISBN-13: 978-0136491385.
3. A. Anand Kumar, Fundamentals of Digital Circuits, 4th Edition, Prentice Hall of India, 2016, ISBN-13: 978-8120352681

REFERENCE BOOK

1. V. N. Mittle and Arvind Mittal, Basic Electrical Engineering, 2nd Edition, McGraw Hill Education, 2005, ISBN-13: 978-0070593572.
2. D. P. Kothari, I. J. Nagrath, Electric Machines, 4th Edition, McGraw Hill, 2010, 978-0070699670.
3. Paul Horowitz, Winfield Hill, The Art of Electronics, 3rd Edition, Cambridge University press, ISBN-13: 978-0521809269.
4. Thomas E. Kissell, Industrial Electronics, 3rd Edition, Prentice Hall of India, 2003, ISBN-13:9788120322608
5. B. H. Khan, Non-Conventional Energy Resources, 2nd Edition, Tata McGraw Hill, 2009, ISBN-13: 978-0070142763.

MIT Academy of Engineering (An Autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2019 – 2023)	
SCHOOL OF HUMANITIES AND ENGINEERING SCIENCES	**W.E.F**	2019 - 2020
FIRST YEAR BACHELOR OF TECHNOLOGY	**COURSE NAME**	Applied Mechanics
	COURSE CODE	CV102
	COURSE CREDITS	4
RELEASED DATE : 01/07/2019	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA	PRACTICAL	DEMONSTRATION	
3	2	20	40	40	25	25	150

PRE-REQUISITE : NIL

COURSE OBJECTIVES :

CV102.CEO.1: Classify force systems and explain the conditions of equilibrium.
CV102.CEO.2: Illustrate laws of friction.
CV102.CEO.3: Demonstrate the concepts of Centroid and moment of inertia.
CV102.CEO.4: Describe kinematic parameters of motion.
CV102.CEO.5: Make use of laws of motion for kinetics.
CV102.CEO.6: Explain energy and momentum methods.

COURSE OUTCOMES:

The students after completion of the course will be able to,

CV102.CO.1: Determine the resultant and support reactions.
CV102.CO.2: Equilibrium Analysis of bodies involving frictional forces.
CV102.CO.3: Evaluate Centroid of bodies and moment of inertia of sections.
CV102.CO.4: Identify the type of motion and its kinematic parameters.
CV102.CO.5: Analyze the motion under action of constant and variable forces.
CV102.CO.6: Apply energy and momentum methods for kinetics problems.

THEORY COURSE CONTENT		
UNIT 1	**Fundamentals of Statics**	**8 HOURS**
Basic concepts in mechanics, Fundamental principles/laws of mechanics, Force, moment of a force and couple, Resolution and composition of forces, Resultant of coplanar forces, Free body diagrams, Equilibrium of coplanar forces, Applications to simple beams and cables. **Further Reading:** *Self study-Application to jib crane.		
UNIT 2	**Friction**	**6 HOURS**
Introduction to friction, Types of friction, Laws of friction- coefficient of friction, Theory of friction- angle of friction, angle of repose, cone of friction, Engineering applications - Block and wedge friction, ladder friction, Belt Friction. **Further Reading:** *Self study-Screw friction.		
UNIT 3	**Properties of Surfaces**	**6 HOURS**
Concept of Centroid and centre of gravity. Centroid of standard objects, Centroid of composite 1D and 2D objects, Concept of area moment of inertia, Radius of gyration and its significance, Parallel and perpendicular axis theorems, Moment of inertia of standard and composite 2D figures. **Further Reading:** *Self study- Mass moment of Inertia.		
UNIT 4	**Kinematics of Planar Motions**	**7 HOURS**
Basic concepts in kinematics, Rectilinear motion with uniform and variable acceleration, Motion under Gravity, Motion curves, Curvilinear Motion in Rectangular and path coordinates, Projectile motion. **Further Reading:** *Self study- Curvilinear motion in polar coordinates.		
UNIT 5	**Kinetics- Force and Acceleration**	**6 HOURS**
Newton's second laws of Motion, Free body diagram equation- Rectilinear motion, Concept of dynamic equilibrium. Motion of connected bodies, Equations of motion in rectangular and path coordinates for curvilinear motion. **Further Reading:** *Self study- Free Vibrations.		
UNIT 6	**Kinetics Energy and Momentum**	**6 HOURS**
Concepts of Work, power and energy, Work done by gravity, spring and frictional forces, Principle of work and Energy, Conservation of mechanical energy, Concept of Impulse and linear momentum, Impulse-momentum theorem, Conservation of linear momentum, Collisions- Types of collisions, Coefficient of restitution, Applications to vehicles and sports. **Further Reading:** *Self study- Space mechanics.		

PRACTICAL: Any 8 Experiments		
PRACTICAL NO.01	**Basic Principles/Laws**	**2 HOURS**
To verify basic laws of mechanics.		
ACTIVITY NO.01	**Exploring Scientific Calculator**	**2 HOURS**
To complete the given task of calculations in a stipulated time with desired accuracy using a scientific calculator.		
PRACTICAL NO.02	**Friction**	**2 HOURS**
To determine coefficient of friction for a given surfaces		
ACTIVITY NO.02	**Presentations**	**2 HOURS**
To prepare and deliver a PPT presentation on engineering application of friction.		
PRACTICAL NO.03	**Centroid**	**2 HOURS**
To determine Centroid of a given 1D object		
ACTIVITY NO.03	**Act of Balancing**	**2 HOURS**
To cut a 2D figure precisely and locate a balancing point on it.		
PRACTICAL NO.04	**Motions**	**2 HOURS**
To study and analyze a given set of motion.		
ACTIVITY NO.04	**Graphing the Motion**	**2 HOURS**
To draw x-t, v-t, a-t graphs for given description of motion in stipulated time.		
PROJECT		**10 HOURS**
To fabricate a model of simple structure or mechanism from low cost materials.		

TEXT BOOK

1. A. Nelson "Engineering Mechanics: Statics and Dynamics", 1st edition ,Tata McGraw-Hill Education, 2009, ISBN: 978-0-07-014614-3
2. R.C Hibbeler "Engineering Mechanics: Statics and Dynamics ",12th edition, Pearson Education, 2010, ISBN: 978-0136077909

REFERENCE BOOK

1. F. P. Beer and E. R. Johnston "Vector Mechanics for Engineers Vol.I and II",10th edition, Tata Mc-Graw-Hill Education, 2012, ISBN: 978-0077402327
2. Ferdinand Singer, "Engineering Mechanics Statics and Dynamics", 3rd edition Harper and Row, 1994 ISBN:0063506610
3. Manoj K Harbola "Engineering Mechanics",1st edition, Cengage Learning, 2009, ISBN:8131509907

MIT Academy of Engineering (An Autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2019 – 2023)	
SCHOOL OF HUMANITIES AND ENGINEERING SCIENCES	**W.E.F**	2019 - 2020
FIRST YEAR BACHELOR OF TECHNOLOGY	**COURSE NAME**	Engineering Graphics
	COURSE CODE	ME104
	COURSE CREDITS	4
RELEASED DATE : 01/07/2019	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA	PRACTICAL	DEMONSTRATION	
2	4	NIL	60	40	60	40	200

PRE-REQUISITE : NIL

COURSE OBJECTIVES:

ME104.CEO.1: To impart knowledge about principles/methods related to projections of one, two and three-dimensional objects.
ME104.CEO.2: To develop & apply visualization skills to simple Objects.
ME104.CEO.3: To expose students to computer aided drafting tools.

COURSE OUTCOMES:

The students after completion of the course will be able,

ME104.CO.1: Develop and/or comprehend a simple engineering drawing in both First and Third angle orthographic projections.
ME104.CO.2: Interpret engineering drawings.
ME104.CO.3: Apply visualization skills to development of surfaces.
ME104.CO.4: Analyze engineering drawings.
ME104.CO.5: Decide annotations for two dimensional drawings.
ME104.CO.6: Create manual drawing & CAD data using SP46 standards.

THEORY COURSE CONTENT		
UNIT 1	**Visual Thinking and Solid Geometry**	**12 HOURS**
Essentials of engineering graphics including technical sketching, Projection of Line, Plane, Solid.		
UNIT 2	**Orthographic Projections and Sectional Views**	**4 HOURS**
Reference Planes, Types of Orthographic Projections, Sectional Orthographic Projections, Sectional Views, Missing views.		
UNIT 3	**Isometric Projections**	**4 HOURS**
Isometric View, Isometric Scale, Non-isometric Lines, construction of Isometric View from the given orthographic view and construction of isometric View of Pyramid, Cone, Sphere.		
UNIT 4	**Development of Surfaces**	**2 HOURS**
Development of lateral surfaces of simple and sectioned solids Prisms, pyramids cylinders and cones.		
UNIT 5	**Auxiliary Projections**	**2 HOURS**
Auxiliary Planes- Auxiliary Vertical Plane, Auxiliary Inclined Plane, Symmetrical Auxiliary View, Unilateral Auxiliary View, bilateral Auxiliary View		
UNIT 6	**Freehand Sketching and Technical Drawing**	**4 HOURS**
Free hand sketching- FV & TV of standard machine part- Hexagonal headed nut and bolt, foundation bolts, shafts, keys, couplings, springs, screw thread forms, welded joints, riveted joints, nozzles.		

PRACTICAL: **Each Assignment carries 2 questions to be draws on A2 Size Drawing Sheet**		
ASSIGNMENT NO.1	Projection of Lines	**4 HOURS**
Two Questions on line inclined to both planes		
ASSIGNMENT NO.2	Projection of Planes	**2 HOURS**
Two Questions on plane inclined to both planes		
ASSIGNMENT NO.3	Projection of Solids	**2 HOURS**
Two Questions on solid inclined to both planes		
ASSIGNMENT NO.4	Orthographic Projections	**4 HOURS**
Two Questions on Orthographic Projection of Simple Mechanical Element		
ASSIGNMENT NO.5	Development of surface	**4 HOURS**
Two Questions on Development of regular Solids		
ASSIGNMENT NO.6	Isometric View	**6 HOURS**
Two Questions on Isometric view of Mechanical Element		

ASSIGNMENT NO.7	Auxiliary View	**4 HOURS**
Two Questions on auxiliary view of Mechanical Element		
PRACTICAL: **Each Assignment carries 2 questions to be drawn on 2D CAD software package**		
PRACTICAL NO. 1	Absolute & incremental drafting	**4 HOURS**
Drawing of two sketches using absolute and incremental commands		
PRACTICAL NO. 2	Draw commands, Modify commands, Array, fillet, offset commands	**6 HOURS**
Drawing of four sketches using draw & modify commands		
PRACTICAL NO. 3	Project Drafting	**2 HOURS**
Drafting of a small project using all drafting standards		
PRACTICAL: **Each Assignment carries 2 questions to be drawn on 3D CAD software package**		
PRACTICAL NO. 4	Sketching, Solid Modeling, Assembly	**12 HOURS**
Modeling of five Mechanical models using 3D Software package		
PRACTICAL NO. 5	Project Modeling	**4 HOURS**
Modeling of small Mechanical Project of Minimum three components		

TEXT BOOK

1. Dhanajay A. Jolhe, Engineering Drawing with an introduction to AutoCAD, TMH Publishing Co Ltd, 5th Edition, 2012, (ISBN 13: 9780070648371)
2. Basant Agarwal and C M Agarwal, Engineering Drawing, TMH Publishing co Ltd, 2nd Edition 2013, (ISBN13: 978-1-259-06288-9)
3. K C John, Engineering Graphics for Degree, PHI learning pvt. Ltd. New Delhi,2009, (ISBN: 97881-203-3788-6)
4. R. K. Dhavan, A TextBook of Engineering Drawing, S Chand and co ltd., New Delhi India, 5Th Edition, 2012, ISBN 13: 9788121914314

REFERENCE BOOK

1. Luzadder, Warren J., Duff, John M, Fundamentals of Engineering, Prentice Hall of India,11th Edition, 2010, (ISBN: 978-81-203-0885-5)
2. Basudev Bhattacharya, Machine Drawing includes Autocad Supplements, Oxford University Press India, First Edition, 2011, (ISBN 13: 9780198070771)
3. K. Venugopal, Prabhu Raja V., Engineering Drawing and Graphics, New age Publications, First Edition, 2008, (ISBN: 978-81-224-2457-7)
4. N B Shaha and B C Rana, Engineering Drawing, Pearson Education, 2012, (ISBN: 9788131798058)

MIT Academy of Engineering (An Autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2019 – 2023)	
SCHOOL OF HUMANITIES AND ENGINEERING SCIENCES	**W.E.F**	2019 - 2020
FIRST YEAR BACHELOR OF TECHNOLOGY	**COURSE NAME**	English for Engineers
	COURSE CODE	HP103
	COURSE CREDITS	2
RELEASED DATE : 01/07/2019	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME & MARKS						
		THEORY			PRACTICAL			TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA	MSE	ESE	CA	
NIL	4	NIL	NIL	NIL	NIL	60	40	100

PRE-REQUISITE : NIL

COURSE OBJECTIVES :

HP103.CEO.1: Introduce a variety of English texts to the students.
HP103.CEO.2: Teach basic English grammar.
HP103.CEO.3: Enrich the vocabulary of the students with AWL and NAWL
HP103.CEO.4: Guide the students to write in English coherently and formally.
HP103.CEO.5: Improve the students overall communicative competence in English through activities like group discussions and debates.
HP103.CEO.6: Develop the students reading and listening skills with the use of written audio and video texts.

COURSE OUTCOMES :

The students after completion of the course will be able to,

HP103.CO.1: Interpret texts written in English.
HP103.CO.2: Apply English grammar rules correctly.
HP103.CO.3: Choose and employ appropriate words from AWL and NAWL in communication.
HP103.CO.4: Develop sentence and text in English coherently and formally.
HP103.CO.5: Demonstrate overall improvement in communication skills.
HP103.CO.6: Analyze and infer from written, audio and video texts.

PRACTICAL:		
PRACTICAL NO.01	**Pronunciation and Phonemic Transcription**	**4 HOURS**
Identification of correct pronunciation of words by decoding phonemic scripts; writing phonemic transcriptions of the given words		
PRACTICAL NO.02	**Parts of Speech**	**3 HOURS**
Use of parts of speech in a sentence composition		
PRACTICAL NO.03	**Tenses**	**5 HOURS**
Use of tenses in day to day communication and academic writing		
PRACTICAL NO.04	**Vocabulary Enrichment and Common Errors**	**8 HOURS**
Online exercises on AWL and NAWL using web-based applications; Dictionary Skills and Common errors in grammar while speaking and writing English		
PRACTICAL NO.05	**Letter and Email Writing**	**4 HOURS**
How to write an email, characteristics and essentials of a good email, formal letter writing and layout of business letters		
PRACTICAL NO.06	**Essay Writing**	**4 HOURS**
What is an essay? Tips to write a good essay, Types of essays		
PRACTICAL NO.07	**Report Writing and Summarizing**	**4 HOURS**
Types of reports, format and writing a report, what is summarizing? Rules of summarizing		
PRACTICAL NO.08	**Group Discussion**	**4 HOURS**
Concept of GD, Criteria for evaluation, types of GD General, Creative and Technical, Dos and Donts, Guidelines for participation and success, Group Dynamics, Expression of thoughts and ideas, body language and interpersonal and analytical skills		
PRACTICAL NO.09	**Presentation Skills**	**4 HOURS**
Essentials of effective presentations; Data collection and compilation; Preparation of outlines; PPT and Prezi		
PRACTICAL NO.10	**Role Play**	**4 HOURS**
Role-play for verbal communication, team building and group dynamics, decision making, leadership, analytical and creative thinking, group presentation		
PRACTICAL NO.11	**Debate**	**4 HOURS**
Concept, Dos and Donts, Guidelines for participation and success, Expression of thoughts and ideas, body language and interpersonal and analytical skills		
PRACTICAL NO.12	**Listening Skills**	**4 HOURS**
Active listening; Conversations, audio and video clips; Listening with comprehension		

PRACTICAL NO.13	Reading Comprehension	4 HOURS
Techniques of reading- Intensive, Extensive, Skimming and Scanning; Reading Comprehensions		

REFERENCE BOOK

1. Ashok Thorat and Munira Lokhandwala: Enriching Oral and Written Communication in English, ISBN 9788125037446
2. Michael Swan: Practical English Usage, Oxford, 3rd Edition, ISBN-13: 978-0194420983
3. Dutt et.al. : A Course in Communication Skills, Foundation, 1 edition
4. Peter Roach: English Phonetics and Phonology, 4th Edition, Cambridge, ISBN-0521149215
5. Lynch: Listening, Cambridge, 1st edition, ISBN- 0521707757
6. Malcom Goodale: Professional Presentations, Cambridge, ISBN- 8175962577
7. S. Aggarwal: Essential Communication Skills, Ane Books pvt. Ltd, ISBN- 8180522806
8. Jennings: Communication Basics, Cengage Learning, 1st edition, ISBN- 8131515206

MIT Academy of Engineering (An Autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2019 – 2023)	
SCHOOL OF HUMANITIES AND ENGINEERING SCIENCES	**W.E.F**	2019 - 2020
FIRST YEAR BACHELOR OF TECHNOLOGY	**COURSE NAME**	German Language
	COURSE CODE	HP104
	COURSE CREDITS	2
RELEASED DATE : 01/07/2019	**REVISION NO**	0.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA	PRACTICAL	DEMONSTRATION	
2	NIL	NIL	NIL	30	20	NIL	50

PRE-REQUISITE : NIL

COURSE OBJECTIVES :

HP104.CEO.1: To introduce German as a foreign language and enhance knowledge, communication and intellectual capabilities which helps to improve cognitive skills and creativity vital for problem solving and innovation.

HP104.CEO.2: To develop an awareness of German culture along with providing better career opportunities later in life.

COURSE OUTCOMES:

The students after completion of the course will be able to,

HP104.CO.1: Participant will study the foundational aspects of grammar, develop comprehension of low to medium difficulty text and practice speaking about every day basic topics

HP104.CO.2: Develop basic communication and comprehension skills for conducting day-to-day business effectively

HP104.CO.3: Use simple, familiar expressions to interact with native speakers or when visiting Germany

HP104.CO.4: Enhance their knowledge of German culture and society

THEORY COURSE CONTENT		
UNIT 1		**2 HOURS**
Introduction- Alphabets, Numbers 0-20, Self Introduction and Introducing third person. Grammar- wh Questions(w-frage), pronouns.		
UNIT 2		**4 HOURS**
Greetings, Speaking about different Languages and Countries, numbers above 20, seasons Grammar- Yes or no Questions, Sentence Construction verbs and conjugations of regular verbs		
UNIT 3		**4 HOURS**
Speaking about hobbies and interests, different professions, weekdays, months Grammar- Nouns, Articles, conjugations of irregular verbs		
UNIT 4		**6 HOURS**
Vocabulary related to food, different places in the city, transport Grammar- Imperative sentence		
UNIT 5		**4 HOURS**
Relations, understanding clock timings Grammar- Cases, Nominative case, nominative verbs pronouns and articles		
UNIT 6		**6 HOURS**
Body parts, directions, asking for the address email address and telephone number Grammar- Accusative case, accusative verbs pronouns and articles		

TEXT BOOK

1. Netzwerk Deutsch als Fremdsprache- Kursbuch A1(Stefanie Dengler), Goyal Publications.

REFERENCE BOOK

1. https://www.klett-sprachen.de , https://www.duolingo.com/

MIT Academy of Engineering (An Autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2019 – 2023)	
SCHOOL OF HUMANITIES AND ENGINEERING SCIENCES	**W.E.F**	2019 - 2020
FIRST YEAR BACHELOR OF TECHNOLOGY	**COURSE NAME**	Japanese Language
	COURSE CODE	HP105
	COURSE CREDITS	2
RELEASED DATE : 01/07/2019	**REVISION NO**	0.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA	PRACTICAL	DEMONSTRATION	
2	NIL	NIL	30	20	NIL	NIL	50

PRE-REQUISITE : NIL

COURSE OBJECTIVES :

HP105.CEO.1: To perform daily basic activities including below mentioned.
HP105.CEO.2: Self Introduction, Greetings in Japanese.
HP105.CEO.3: Introduction to Japanese scripts- Hiragana, Katakana, Kanji.
HP105.CEO.4: Develop basic vocabulary throughgroup activities, videos.
HP105.CEO.5: Develop an understanding business etiquette.
HP105.CEO.6: Introduce topics related daily conversation, listening skills, cultural awareness.

COURSE OUTCOMES:

The students after completion of the course will be able to,

HP105.CO.1: Participant will study the foundational aspects of grammar, develop comprehension of low to medium difficulty text and practice speaking about every day basic topics.
HP105.CO.2: Develop basic communication and comprehension skills for conducting day-to-day business effectively.
HP105.CO.3: Use simple, familiar expressions to interact with native speakers or when visiting Japan.
HP105.CO.4: Enhance their knowledge of Japanese culture and society.

THEORY COURSE CONTENT		
UNIT 1		**4 HOURS**
How to give self-Introduction in Japanese, Greetings in Japanese.		
UNIT 2	**Hiragana, vocabulary and listening.**	**4 HOURS**
How to give self-Introduction in Japanese, Greetings in Japanese.		
UNIT 3		**4 HOURS**
Hiragana and Katakana, and Japanese games.		
UNIT 4		**4 HOURS**
Family Members understanding in Japanese. and Vocab.		
UNIT 5		**5 HOURS**
Japanese cultures study, and business etiquette.		
UNIT 6		**5 HOURS**
Daily conversation and cultural study.		

TEXT BOOK

1. Minna Na Nihongo, Goyal Publications.

REFERENCE BOOK

1. Nil

MIT Academy of Engineering (An Autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2019 – 2023)	
SCHOOL OF HUMANITIES AND ENGINEERING SCIENCES	**W.E.F**	2019 - 2020
FIRST YEAR BACHELOR OF TECHNOLOGY	**COURSE NAME**	Logic Development-C Programming
	COURSE CODE	CS101
	COURSE CREDITS	3
RELEASED DATE : 01/07/2019	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		**EXAMINATION SCHEME & MARKS**						
		THEORY			PRACTICAL			TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA	MSE	ESE	IA	
1	4	NIL	40	NIL	30	30	40	140

PRE-REQUISITE : NIL

COURSE OBJECTIVES :

CS101.CEO.1: Develop programming skills using the fundamentals and basics of C Language.

CS101.CEO.2: Enable effective usage of arrays, structures, functions, pointers and to implement the memory management concepts.

CS101.CEO.3: Teach the issues in file organization and the usage of file systems.

COURSE OUTCOMES:

The students after completion of the course will be able to,

CS101.CO.1: List the various data types, control structures and looping structures supported by C language.

CS101.CO.2: Differentiate between various data types supported by C language.

CS101.CO.3: Implement the solutions for various algorithms in C language.

CS101.CO.4: Analyze various parameter passing methods to functions in C language.

THEORY COURSE CONTENT		
UNIT 1	**Fundamentals of C Language**	**2 HOURS**
Overview of C, Character set, Constants, Variables and Keywords, Data types (Primitive and Derived), Operators (arithmetic, relational and logical operators, increment and decrement operators, conditional operator, bit-wise operators, assignment operators) and Expressions (Type Conversion, precedence and order of evaluation), C Storage Classes, Managing Input and Output Operations, A structure of C Program, C Preprocessor, C Macro, Compilation, Execution, Debugging and Testing of C program.		
UNIT 2	**Control Structures**	**2 HOURS**
Decision Control Structure-If statement, if-else statement, Nested if-else statement, Ternary operator, Case Control structure- Switch Case Statements, GOTO statement, Loop Control Structure- while statement, do while statement, for statement, odd loop, nesting of loops, break and continue statement, finite & infinite Loop.		
UNIT 3	**Arrays and Functions**	**3 HOURS**
Arrays: Array Declaration and Initialization, Bounds Checking, Array arithmetic, One dimensional arrays and multi-dimensional Arrays, Strings - Standard Library String Functions, Array of strings. **Functions:** Function definition and prototype, Scope Rule of Functions, Calling Conventions, Passing Values between Functions - Call by Values and Call by References, Recursive functions, Passing Array Elements to a Function.		
UNIT 4	**Pointers**	**3 HOURS**
Pointers and Addresses, Pointer Notation & Arithmetic, Pointer to array, Array of pointers, Pointer to a function, Passing pointers as function arguments, Strings and Pointers, Structures and Pointers.		
UNIT 5	**User Defined Data Types**	**1 HOURS**
Structures & Union: Declaration of Structure and Union, Difference between Structure and Union, Accessing Structure Elements, How Structure Elements are Stored, Array of Structures.		
UNIT 6	**File Handling**	**2 HOURS**
File Operations-open, read, write, append, delete, Error Handling, File Opening Modes Using command line argument(argc and argv), line input and output operations, Miscellaneous Functions.		

PRACTICAL:		
PRACTICAL NO.01		**2 HOURS**
• Write a program in C to display "Hello World" • Write a menu driven program in C to display addition, subtraction, multiplication, division of two numbers		
PRACTICAL NO.02		**2 HOURS**
• Write a program in C to display the quotient and remainder after the division of two numbers • Write a menu driven program in C to demonstrate the use of left shift, right shift, and, or, xor operators		
PRACTICAL NO.03		**2 HOURS**
• Write a menu driven program in C to demonstrate the use of mathematical functions supported by math.h library • Write a program in C to display the grade obtained by the student in a course. The input will be the marks obtained and the output will be the grade obtained		
PRACTICAL NO.04		**2 HOURS**
• Write a program in C to display first N numbers on the screen using while, do while and for loop • Write a program in C to display first N number in reverse order on the screen using while, do while and for loop		
PRACTICAL NO.05		**2 HOURS**
Write a program in C display various patterns using *		
PRACTICAL NO.06		**2 HOURS**
• Write a program in C to display the addition of N numbers stored in an array • Write a program in C to copy the array of N numbers into another array in reverse order • Write a program in C to display the minimum and maximum element in an array		
PRACTICAL NO.07		**2 HOURS**
• Write a program in C to display the prime numbers within a given range • Write a program in C to display the fibonacci series within a given range		
PRACTICAL NO.08		**2 HOURS**
Write a menu driven program in C to perform addition, subtraction, division and transpose of matrices		

PRACTICAL NO.09		**2 HOURS**
• Write a program in C to convert every lowercase letter to uppercase letter and vice versa in a given string • Write a program in C to implement the string functions using the standard library functions supported by string.h like: string length, string copy, string reverse, string concatenate, string compare, sub string		
PRACTICAL NO.10		**2 HOURS**
• Write a program in C using functions to display addition, subtraction, multiplication, division of two numbers • Write a program in C using functions to display the minimum and maximum element in an array		
PRACTICAL NO.11		**2 HOURS**
Write a program in C using functions to implement the string functions without using the standard library functions supported by string.h like: string length, string copy, string reverse, string concatenate, string compare, string palindrome		
PRACTICAL NO.12		**2 HOURS**
• Write a program in C using functions and pointers to display addition, subtraction, multiplication, division of two numbers • Write a program in C using function and pointers to swap two numbers		
PRACTICAL NO.13		**2 HOURS**
Write a program in C using function and pointers to demonstrate the use of pointer arithmetic by taking input in an array		
PRACTICAL NO.14		**2 HOURS**
• Write a program in C using recursion to display the factorial of a number • Write a program in C using recursion to display fibonacci series within a given range		
PRACTICAL NO.15		**2 HOURS**
• Write a program in C to accept the information of single student and store it in structure and display the same • Write a program in C to accept the information of students and store it in array of structure and display the same		

PRACTICAL NO.16		**2 HOURS**
• Write a program in C to display Semester Grade Point Average (SGPA). Input will be stored in array of structure • Write a program in C to demonstrate the concept of union		
PRACTICAL NO.17		**2 HOURS**
Write a program in C to read a single line from the file using functions like fgetc, fgets, fscanf, and fread		
PRACTICAL NO.18		**2 HOURS**
Write a program in C to write a single string in a file using functions like fputc, fputs, fprintf and fwrite		
PRACTICAL NO.19		**2 HOURS**
Write a program in C to display contents of whole file on the screen		
PRACTICAL NO.20		**2 HOURS**
Write a program in C to read and write the record stored in structure from file		
PRACTICAL NO.21		**2 HOURS**
Write a program in C to implement student information system using array of structures		
PRACTICAL NO.22		**2 HOURS**
Write a program in C to implement Linear Search and Binary Search		
PRACTICAL NO.23		**2 HOURS**
Write a program in C to check whether a given matrix contains a saddle point		
PRACTICAL NO.24		**2 HOURS**
Write a program in C to implement union and intersection of two sets		

TEXT BOOK

1. E. Balguruswamy , "Programming in ANSI C" , Tata Mc-Graw Hill
2. Yashvant Kanitkar, "Let Us C" BPB Publication
3. "Programming With C", Schaum Series

REFERENCE BOOK

1. Kernighan and Ritchie , "The 'C' programming language" , Prentice Hall
2. V. Rajaraman , "Computer Programming in 'C' " , Prentice Hall
3. R.G. Dromey , "How to solve it by Computer", Pearson Education

MIT Academy of Engineering (An Autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2019 – 2023)	
SCHOOL OF HUMANITIES AND ENGINEERING SCIENCES	**W.E.F**	2019 - 2020
FIRST YEAR BACHELOR OF TECHNOLOGY	**COURSE NAME**	Experimental Tools and Techniques
	COURSE CODE	ME105
	COURSE CREDITS	2
RELEASED DATE : 01/07/2019	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA	PRACTICAL	DEMONSTRATION	
NIL	4	NIL	NIL	40	60	NIL	100

PRE-REQUISITE : NIL

COURSE OBJECTIVES :

ME105.CEO.1: Introduce different tools and study various measurement techniques.
ME105.CEO.2: Study different parts of the system along with its functions and applications.
ME105.CEO.3: List various tools used for the said application.
ME105.CEO.4: Identify the function of various parts of the system.
ME105.CEO.5: Impart comprehensive knowledge for selection of appropriate techniques to the said application.
ME105.CEO.6: Apply the knowledge to find the solution for basic engineering problems.

COURSE OUTCOMES :

The students after completion of the course will be able to,

ME105.CO.1: Recall the tools required for the measurements.
ME105.CO.2: Summarize the application of various engineering tools used.
ME105.CO.3: Identify the right tools for selected purpose.
ME105.CO.4: Inspect various parts of the system.
ME105.CO.5: Justify the most appropriate technique which can be compatible with the existing environment.
ME105.CO.6: Develop the system which will give appropriate solution to the identified problem.

PRACTICAL:		
PRACTICAL NO.01	**Information Technology/Computer Engineering (Any 6 Practicals from the following list)**	**12 HOURS**

1. Study and analysis of various components on the motherboard of a standard desktop computer
2. Installation of various components like hard disk drive on the motherboard and check the system setup for verification
3. Formatting the hard disk drive and installation of Windows and Linux operating system making the system dual boot
4. Study of various network components like switch, Router and configure the devices.
5. Crimping of Unshielded Twisted Pair cable. (Cat-6)
6. Study of TCP/IP Stack, and configure as well as develop a Local Area Network.
7. Configuration of Network Monitoring tool and checking the results
8. Installation of DHCP server and checking the results.
9. Installation of web server and checking the results.
10. Configuration of MS Access and Deploying Access 2007 Runtime-Based Solutions.
11. Study and usage of Google Tools (creating Forms, Blog).
12. Using the Google form with add on, create a PDF file of the form.
13. Designing a static HTML page
14. Uploading the pages using FTP server on a web site
15. Deploy a simple web site using LAMP server
16. Creation of a web site using Google sites.

PRACTICAL NO.02	**Electronics Engineering (Any 06 practicals from the following list)**	**12 HOURS**

1. Study of basic electronics component and Switches.
2. PCB and Soldering Tools and Technique.
3. Relay and application.
4. Domestic wiring for Extension Board and Inverter.*
5. Load test of D.C. series motor.*
6. Brake test on D.C. Shunt motor.*
7. Load test on 3-phase induction motor.
8. V-I Characteristics of Thyristor & measurement of holding & latching current
9. V-I Characteristics of MOSFET.
10. V-I Characteristics of IGBT.
11. V-I Characteristics of TRIAC.
12. Solar cell and application (Generation of Energy).
13. Speed control of DC Motor (Toy Motor)
14. Actuators and application (Electrical and Mechanical).

15 Study of Virtual Instrumentation.

16 Open IT : Optical Mouse, Cathode Ray Oscilloscope, Study of Power Supply PA System, CD Player, TV, Microwave oven (Any Two)

PRACTICAL NO.03	**Mechanical Engineering (Any 6 practicals from the following list)**	**12 HOURS**

1. Linear and angular measurements.
2. Measurement of transmission ratio in Belt drive, Chain drive, and Gear drive.
3. Measurement of RPM of rotating machine using contact and non-contact type tachometer.
4. Types of mechanism and making any one mechanism containing four links using cardboard.
5. Measurement of Barometric pressure, introduction to pressure measuring devices like bourdon tube pressure gauge and manometer. Fabrication of simple type manometer.
6. Introduction to temperature measuring devices. Making and calibration of thermo couple and using it with temperature indicator.
7. Measurement of Relative humidity of air in the lab.
8. Measurement of hardness of Steel and Aluminum.
9. Measurement of stiffness of helical spring (compression or tension)
10. Servicing of 2 wheeler and 4 wheeler system.
11. Study of various components of automobile system.
12. Open IT: Mixer or kitchen machine, Refrigerator, Boiler and accessories thermal power plant (Mini), Two stroke and four stroke engine, Introduction to threaded fasteners and joints using threaded fasteners. Bearing and its lubrication, Bicycle /Two wheeler/ 4 wheeler(Any Two)

PRACTICAL NO.04	**Chemical Engineering (Any 3 practicals from the following)**	**6 HOURS**

1. Determination of specific gravity of liquid
2. Study of molecular diffusion
3. Liquid liquid extraction: Separation of one liquid component from the solution.
4. Solid-liquid separation from filtration
5. Membrane Separation process
6. Fuel from Plastic
7. Demonstration of mechanical operation models.
8. Plate type heat exchanger
9. Water purifier (Household)

PRACTICAL NO.05	Civil Engineering (Any 3 Practicals from the following)	6 HOURS

1. To find the area and included angle of given plot and fix boundary from given plan.
2. To determine the level difference between 5 points with level tube and determine height of tower with trigonometry.
3. To draw the plan of given parcel of land to a given scale.
4. To draw line diagram of household water supply line and sewage line with list of materials used.
5. To draw line diagram of rain water harvesting unit with all details and its importance.
6. To make report on daily water requirement in public building and its waste water disposal, and reuse.
7. To identify and make report on the earthquake resisting structural members of building and its role.
8. To demonstrate the life saving do s and donts during the different natural calamities.
9. To demonstrate the dos and donts after different natural calamities.

Assessment	Common to all branches	4 HOURS

TEXT BOOK

1. Bruce Hallberg, Networking A Beginners Guide , 4th edition, Tata McGraw-Hill,2005, ISBN 0-07-060791-5
2. R.S. Khandpur, Printed Circuit Boards: Design, Fabrication, Assembly and Testing, Tata McGraw-Hill Education, 2005, ISBN 0070588147, 9780070588141.
3. S R Dara, Engineering Chemistry, 5th edition, S.Chand , ISBN 81-219-0359-9

REFERENCE BOOK

1. Mackenzie L. Davis, Water and Wastewater Engineering, 13th edition, Tata McGraw- Hill, ISBN 978-1-25-906483-8.
2. R. S. Khurmi, J. K. Gupta, Theory of Machines, 14th edition, S. Chand, ISBN 81-219-2524-X.
3. Philip Wankat, Seperation Process Engineering , 3rd edition, Pearson, ISBN 978-93-325-2484-2.
4. N.V. Ragvendra, L. Krishnamurthy, Engineering Metrology and Measurements, Oxford University Press, ISBN 978-0-19-808549-2.
5. . Dr. Vinod Hosur, Earthquake- Resistant Design of Building Structures, Wiley, ISBN 978-81265-3859-1.
6. M. S. Shetty, Concrete Technology, S. Chand, 2008, ISBN 9788121900034.

MIT Academy of Engineering (An Autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2019 – 2023)	
SCHOOL OF HUMANITIES AND ENGINEERING SCIENCES	**W.E.F**	2019 - 2020
FIRST YEAR BACHELOR OF TECHNOLOGY	**COURSE NAME**	Design Thinking
	COURSE CODE	ME106
	COURSE CREDITS	2
RELEASED DATE : 01/07/2019	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA	PRACTICAL	DEMONSTRATION	
NIL	4	NIL	NIL	40	NIL	60	100

PRE-REQUISITE : NIL

COURSE OBJECTIVES :

ME106.CEO.1: Disseminate the philosophy of design thinking.
ME106.CEO.2: Impart the information regarding User centric approach.
ME106.CEO.3: Give exposure to information collection tools to clearly define user centric problem.
ME106.CEO.4: Enhance thinking in order to inspect diverse solutions.
ME106.CEO.5: Sensitize about the feasibility, desirability and viability criterias for selection of Appropriate solution.
ME106.CEO.6: Educate about different types of prototyping.

COURSE OUTCOMES:

The students after completion of the course will be able to,

ME106.CO.1: Recall fundamental principles of design thinking.
ME106.CO.2: Explain all the dimensions of user and his needs using design thinking approach.
ME106.CO.3: Outline user centric problem by using information gathering techniques.
ME106.CO.4: Compare multiple solutions through ideation process.
ME106.CO.5: Interpret most appropriate solution for defined user centric problem.
ME106.CO.6: Develop the most optimum solution.

PRACTICAL:		
PRACTICAL NO.01	**Human Centred Design**	**2 HOURS**
Introduction to Human Centred Design, Human Centred Design Phases, Human Centred Design Process, Human Centred Design case study		
PRACTICAL NO.02	**Research Methodology (Problem Definition, Information Gathering)**	**4 HOURS**
Design thinking Models & Methodology - General Problem Statement, Random check list, mind mapping Categorization of random check list. Brainstorming of problem areas, Research Methodology - Information gathering - Primary, Secondary Sources, data presentation, Preparation of survey forms, Survey Analysis, Drawing Inference.		
PRACTICAL NO.03	**Ideation**	**4 HOURS**
SWOT analysis, Vein Diagram (User Desirability, Feasibility, Viability check) Drawing inferences, Translation of inferences into design criteria, specific problem statement, Ideation free hand sketching drawing of simple form of products (Isometric views, layout, circuit diagram, Ideation sketches), Ergonomic and aesthetic consideration in design.		
PRACTICAL NO.04	**Prototyping**	**2 HOURS**
Concept validation, evaluation and detailing, Different methods of Prototyping, selection of right method of prototyping.		
PROJECT		**40 HOURS**
PRACTICAL NO.05	**Phase 1 : General Problem Statement and problem background**	**4 HOURS**
PRACTICAL NO.06	**Phase 2 : Research methodology**	**4 HOURS**
PRACTICAL NO.07	**Phase 3 : Product Specification**	**4 HOURS**
PRACTICAL NO.08	**Phase 4 : Ideation**	**6 HOURS**
PRACTICAL NO.09	**Phase 5 : Concept Evaluation, Validation and Concept detailing**	**8 HOURS**
PRACTICAL NO.10	**Phase 6 : Prototyping**	**10 HOURS**
PRACTICAL NO.11	**Phase 7 : Documentation**	**4 HOURS**

TEXT BOOK

1. Emrah Yayici, Design Thinking Methodology Book, Amazon Digital Services LLC - Kdp Print Us, 2016, ISBN: 6058603757, 9786058603752
2. Idris Mootee, Design Thinking for Strategic Innovation, Wiley (2017), ISBN-13: 978-8126572694
3. Thomas Lockwood, Design Thinking: Integrating Innovation, Customer Experience, and Brand Value, Allworth Press; Original edition (10 November 2009), ISBN-13: 978-1581156683

REFERENCE BOOK

1. Harper Perennial, Lateral Thinking: Creativity Step by Step; Reissue edition, 2015 (Perennial Library).
2. John Chris Jones, Design Methods, John Wiley & Sons, David Fulton Publishers, London, 1980, ISBN 0-471-28496-3.
3. Nigel Cross, Design Thinking: Understanding How Designers Think and Work, Berg Publishers (May 15, 2011), ISBN-13: 978-1847886361
4. Tim Brown, Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation, Published September 29th 2009 by Harper Business, ISBN 0061766089

MIT Academy of Engineering (An Autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2019 – 2023)	
SCHOOL OF HUMANITIES AND ENGINEERING SCIENCES	**W.E.F**	2019 - 2020
FIRST YEAR BACHELOR OF TECHNOLOGY	**COURSE NAME**	Statistics and Integral Calculus
	COURSE CODE	AS107
	COURSE CREDITS	4
RELEASED DATE : 01/07/2019	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA	PRACTICAL	DEMONSTRATION	
3	1	20	40	40	50	NIL	150

PRE-REQUISITE : NIL

COURSE OBJECTIVES :

AS107.CEO.1: Study different statistical methods for solving problems.
AS107.CEO.2: Analyze different probability distribution functions.
AS107.CEO.3: Extend the basic concepts of integration for evaluation of complex integration problems.
AS107.CEO.4: Categorize and use equation of curves to trace the given curve.
AS107.CEO.5: Demonstrate an understanding towards evaluating multiple integrals.
AS107.CEO.6: Relate and examine the applications of multiple integrals.

COURSE OUTCOMES:

The students after completion of the course will be able to,

AS107.CO.1: Assess statistical problems.
AS107.CO.2: Solve the probability distribution problems.
AS107.CO.3: Evaluate complex integrals.
AS107.CO.4: Sketch curves by analyzing the given equation of curves.
AS107.CO.5: Evaluate the multiple integrals.
AS107.CO.6: Apply the knowledge of multiple integrals to solve engineering problems.

THEORY COURSE CONTENT		
UNIT 1	**Statistics**	**6 HOURS**
Measures of central tendency, standard deviation, coefficient of variation, moments, skewness and kurtosis, correlation(Karl Pearsons coefficient of correlation) and regression		
UNIT 2	**Probability**	**6 HOURS**
Probability, probability density function, probability distribution: Binomial, Poisson, Normal		
UNIT 3	**Integral Calculus**	**7 HOURS**
Reduction formulae, Gamma function, Beta function, Differentiation under integral sign.		
UNIT 4	**Curve Tracing and Rectification**	**7 HOURS**
Tracing of Curves: Cartesian curves, Parametric curves, Polar curves. Rectification: Rectification of Cartesian, Parametric and Polar curves		
UNIT 5	**Multiple Integrals**	**7 HOURS**
Double Integration, Evaluation of Double Integration, Change of order of integration, Integration by transforming Cartesian to Polar Coordinate system, Triple integration, Integration by transforming to spherical and cylindrical polar coordinates		
UNIT 6	**Applications of Multiple Integrals**	**6 HOURS**
Applications of multiple integrals to find Area, Volume, Centre of Gravity, and Moment of Inertia		

TUTORIAL: Problem solving session		
TUTORIAL NO.01		**1 HOURS**
Measures of central tendency, standard deviation, coefficient of variation		
TUTORIAL NO.02		**1 HOURS**
Moments, skewness and kurtosis		
TUTORIAL NO.03		**1 HOURS**
Correlation and regression		
TUTORIAL NO.04		**1 HOURS**
Probability, probability density function, Probability distribution: Binomial		
TUTORIAL NO.05		**1 HOURS**
Probability distribution: Poisson, Normal. Reduction formulae, Gamma function		
TUTORIAL NO.06		**1 HOURS**
Beta function, DUIS Rule1 & 2.		

TUTORIAL NO.07		**1 HOURS**
Tracing of Cartesian, Polar and Parametric curves.		
TUTORIAL NO.08		**1 HOURS**
Rectification of Cartesian, Polar and Parametric curves.		
TUTORIAL NO.09		**1 HOURS**
Double Integration, Evaluation of Double Integration, Change the order of integration, Integration by transforming Cartesian to Polar Coordinate system		
TUTORIAL NO.10		**1 HOURS**
Triple integration, Integration by transforming to spherical and cylindrical polar coordinates. Applications of multiple integrals: To find Area, Volume		
TUTORIAL NO.11		**1 HOURS**
Applications of multiple integrals: To find Centre of Gravity of an arc, plane lamina and a solid.		
TUTORIAL NO.12		**1 HOURS**
Applications of multiple integrals: To find Moment of Inertia about an arc, plane and solid		

TEXT BOOK

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10 th edition, Wiley Eastern Ltd, 2015, ISBN: 9788126554232, 8126554231,
2. B.S. Grewal ,Higher Engineering Mathematics ,39th edition, Khanna Publications,2005 , ISBN: 81-7409- 195-5

REFERENCE BOOK

1. G.B. Thomas & R.L.Finney, Calculus, 9th edition, Pearson Education, 2002, ISBN: 81-7758-325-5.
2. Dr. B.V. Ramana ,Higher Engineering Mathematics,4 th edition, Tata McGraw Hill,2016, ISBN: 978-0-07-063419-
3. R.K. Jain & S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publishing house,2002,ISBN No.0849324173
4. Peter V. ONeil , Advanced Engineering Mathematics,7th Edition , Cenage Learning ,2012, ISBN-13: 9788131503102.
5. Dennis G. Zill & Warren S. Wright ,Advanced Engineering Mathematics ,4th edition ,Jones and Bartlett Publishers, 2011, ISBN-10: 0-7637-7966-0, ISBN 13: 978-0-7637-7966-5.
6. Douglas C. montgomery , George C runger ,Applied statistics and probability for engineers, 5 th edition, wiley ,2012, ISBN No: 9788126537198, 8126537191 .
7. Richard A Johnson, Irwin Miller,John freund ,Miller & Freunds Probability and statistics for engineers 8th edition, Pearson, 2011,ISBN no:978-93325-5041-4.

MIT Academy of Engineering (An Autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2019 – 2023)	
SCHOOL OF HUMANITIES AND ENGINEERING SCIENCES	**W.E.F**	2019 - 2020
FIRST YEAR BACHELOR OF TECHNOLOGY	**COURSE NAME**	Applications Programming-Python
	COURSE CODE	CS102
	COURSE CREDITS	3
RELEASED DATE : 01/07/2019	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME & MARKS						
		THEORY			PRACTICAL			TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA	MSE	ESE	IA	
1	4	NIL	40	NIL	30	30	40	140

PRE-REQUISITE : NIL

COURSE OBJECTIVES :

CS102.CEO.1: Get familiar with basics of Python programming.
CS102.CEO.2: Understand usage of conditional and looping statements in Python.
CS102.CEO.3: Learn different simple data structure supported in Python.
CS102.CEO.4: Acquire knowledge and skills of strings and dictionary.
CS102.CEO.5: Implement Object Oriented Programming concepts using Python.
CS102.CEO.6: Introduce the concepts of Pandas & NumPy.

COURSE OUTCOMES :

The students after completion of the course will be able to,

CS102.CO.1: Debug syntax and semantics in Python programs.
CS102.CO.2: Demonstrate proficiency in handling strings and file system.
CS102.CO.3: Implement the programs using core data structures like Lists and Dictionaries.
CS102.CO.4: Interpret the concepts of Object Oriented Programming in Python
CS102.CO.5: Develop solution for real life problems using Python.

THEORY COURSE CONTENT		
UNIT 1	**Python Fundamentals and Data Handling**	**2 HOURS**
Introduction, Features of Python, History and Future of Python, Writing and executing Python program, Literal constants, variables and identifiers, Data Types ,Mutable and immutable types, Input output operation , Comments, Reserved words, Indentation, Operators and expressions.		
UNIT 2	**Decision and Iterative Statements**	**2 HOURS**
Introduction to Decision Statements: Decision control statements, Selection/conditional branching Statements: if, if-else, nested if, if-elif-else statements. **Introduction to Iterative Statements:** Basic loop Structures/Iterative statements: while loop, for loop, selecting appropriate loop. Nested loops, break, continue, pass, else statement used with loops.		
UNIT 3	**List manipulation, Tuples and Python Function**	**2 HOURS**
List: Introduction, creating & accessing lists, list operations, working with lists, list functions & methods. **Tuples:** Introduction, creating & accessing tuples, tuples operations, tuples functions & methods. **Functions:** Need for functions, definition, call, variable scope and lifetime, the return statement. Defining functions, Lambda or anonymous function, documentation string, good programming practices. Introduction to modules, Introduction to packages in Python, Introduction to standard library modules.		
UNIT 4	**Strings and Dictionary**	**3 HOURS**
Strings: Introduction, string operations- concatenation, appending, multiplication and slicing. Strings are immutable, strings formatting operator, built in string methods and functions. Slice operation, ord() and chr() functions, in and not in operators, comparing strings, Iterating strings, the string module. **Dictionary:** Introduction, working with dictionaries, dictionary functions and methods		
UNIT 5	**Object Oriented Programming**	**2 HOURS**
Programming Paradigms-monolithic, procedural, structured and object oriented, Features of Object oriented programming-classes, objects, methods and message passing, inheritance, polymorphism, containership, reusability, delegation, data abstraction and encapsulation. Classes and Objects: classes and objects, class method and self-object, class variables and object variables, public and private members, class methods		
UNIT 6	**Data Structure and Libraries in Python**	**2 HOURS**
Introduction to data structure, pandas, NumPy.		

PRACTICAL:		
PRACTICAL NO.01		**2 HOURS**
To accept an object mass in kilograms and velocity in meters per second and display its momentum. Momentum is calculated as e=mc2 where m is the mass of the object and c is its velocity.		
PRACTICAL NO.02		**2 HOURS**
Write a Python program for following conditions. • If n is single digit print square of it. • If n is two digit print square root of it. • If n is three digit print cube root of it.		
PRACTICAL NO.03		**4 HOURS**
Solve the Fibonacci sequence using recursive function in Python.		
PRACTICAL NO.04		**4 HOURS**
Write a Python program to print different patterns.		
PRACTICAL NO.05		**2 HOURS**
To accept students five courses marks and compute his/her result. Student is passing if he/she scores marks equal to and above 40 in each course. If student scores aggregate greater than 75%, then the grade is distinction. If aggregate is 60>= and <75 then the grade if first division. If aggregate is 50>= and <60, then the grade is second division. If aggregate is 40>= and <50, then the grade is third division.		
PRACTICAL NO.06		**4 HOURS**
To check whether input number is Armstrong number or not. An Armstrong number is an integer with three digits such that the sum of the cubes of its digits is equal to the number itself. Ex. 371.		
PRACTICAL NO.07		**2 HOURS**
Write a program in Python to enter two unequal nos. if first no. is greater than display square of the smaller no. and cube of the greater no. otherwise vice-versa. If no. are equal display the message both no. are equal find square, square root and cube root of a number.		
PRACTICAL NO.08		**4 HOURS**
Write a Python program to perform following string operations. a) String concatenation b) String Reverse c) String compare d) String length e) Palindrome f) Case change.		
PRACTICAL NO.09		**2 HOURS**
Select the number from the entered list and find its position in Python (use Linear Search).		
PRACTICAL NO.10		**4 HOURS**
Choose cricket team of eleven players find the captain of the team (consider tallest person as a captain) using dictionary.		

PRACTICAL NO.11		6 HOURS

1. Write Python class for bank customer with withdraw and deposit operations (use inheritance) (Introduce class, object concepts).
2. Using concepts of polymorphism write Python application program.

Write a Python program to perform addition and multiplication of 2 matrices.

PRACTICAL NO.12		4 HOURS

Write a Python program to convert a Panda module Series to Python list and it's type.

PRACTICAL NO.13		4 HOURS

Write a NumPy program for Plotting and analyzing data.

Mini Project:

1. Project is for a period of 2 weeks.
2. Group of two or three has to choose project topic from the list designed by concerned faculty of particular division.
3. Each group has to collect requirements for project and get approved by concerned teachers in first weeks.
4. implementation and testing need to be performed in second week.
5. Demonstration along with presentation need to be given as final project submission.
6. Project carries 20 Marks.

TEXT BOOK

1. Charles R. Severance, Python for Everybody: Exploring Data Using Python 3, 1st Edition, Create Space Independent Publishing Platform, 2016. (http://do1.drchuck.com/pythonlearn/EN_us/pythonlearn.pdf) (Chapters 1 13, 15)
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist, 2ndEdition, Green Tea Press, 2015. http://greenteapress.com/thinkpython2/thinkpython2.pdf) (Chapters 15, 16, 17) (Download pdf files from the above links)

REFERENCE BOOK

1. Charles Dierbach, "Introduction to Computer Science Using Python", 1st Edition, Wiley India Pvt Ltd. ISBN-13: 978-8126556014.
2. Mark Lutz, Programming Python, 4th Edition, OReilly Media, 2011.ISBN-13: 978-9350232873
3. Wesley J Chun, Core Python Applications Programming, 3rd Edition, Pearson Education India, 2015. ISBN-13: 978-9332555365.
4. Roberto Tamassia, Michael H Goldwasser, Michael T Goodrich, Data Structures and Algorithms in Python, 1stEdition, Wiley India Pvt Ltd, 2016. ISBN-13: 978- 8126562176.

MIT | Academy of Engineering

MIT ACADEMY OF ENGINEERING, ALANDI

An Autonomous Institute Affiliated to

Savitribai Phule Pune University

Curriculum

For

Second Year

Bachelor of Technology in Mechanical Engineering

2019-2023

(With Effect from Academic Year: 2020-2021)

MIT | Academy of Engineering **Autonomous Institute Affiliated to SPPU**	**COURSE STRUCTURE (2019 - 2023)**		
SCHOOL OF MECHANICAL & CIVIL ENGINEERING	**W. E. F**	**:**	**2020-2021**
SECOND YEAR BACHLEOR OF TECHNOLOGY IN MECHANICAL ENGINEERING	**RELEASE DATE**	**:**	**01/06/2020**
	REVISION NO.	**:**	**1.0**

SEMESTER: III

SUMMER INTERNSHIP

COURSE			TEACHING SCHEME			EXAMINATION SCHEME AND MARKS						CREDIT
TYPE	CODE	NAME	Hour/Week			THEORY			PRACT		TOTAL	
			L	P	T	MSE	ESE	IA	T/P	DM		
NSC5	AS203	Applied Mathematics	3	2	-	35	35	30	50	0	150	4
DC01	ME231	Strength of Materials	3	2	-	35	35	30	50	0	150	4
DC02	ME232	Thermal Engineering	3	2	-	35	35	30	50	0	150	4
DC03	ME233	Manufacturing Technology	3	2	-	35	35	30	50	0	150	4
SDP3	ET224	Digital Prototyping	0	4	-	0	0	25	0	50	75	2
SDP4	ME230	Minor Project- Design	0	2	-	0	0	0	0	50	50	1
SDP5	ME241	Industrial Measurements & Instrumentation	0	4	-	0	0	25	0	50	75	2
ESC7	CV203	Environmental Sciences	1	0	-	-	-	-	-	-	Audit	
TOTAL			**13**	**18**	**0**	**140**	**140**	**170**	**200**	**150**	**800**	**21**

SEMESTER: IV

COURSE			TEACHING SCHEME			EXAMINATION SCHEME AND MARKS						CREDIT
TYPE	CODE	NAME	Hour/Week			THEORY			PRACT		TOTAL	
			L	P	T	MSE	ESE	IA	T/P	DM		
ESC8	ME221	Materials Engineering	3	2	-	35	35	30	50	0	150	4
DC04	ME234	Machines & Mechanisms	3	2	-	35	35	30	50	0	150	4
DC05	ME235	Fluid Mechanics	3	2	-	35	35	30	50	0	150	4
DC06	ME222	Engineering Informatics	3	2	-	35	35	30	50	0	150	4
SDP6	ET235	Rapid Prototyping	0	4	-	0	0	25	0	50	75	2
SDP7	ME240	Minor Project- Implementation	0	2	-	0	0	0	0	50	50	1
HSS3	HP202	Professional Skills I	0	4	-	0	0	25	0	50	75	2
HSS4	HP203	Liberal Learning	1	0	-	-	-	-	-	-	Audit	
TOTAL			**13**	**18**	**0**	**140**	**140**	**170**	**200**	**150**	**800**	**21**

MIT Academy of Engineering (An Autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2019 – 2023)	
SCHOOL OF HUMANITIES AND ENGINEERING SCIENCES	**W.E.F**	2020 - 2021
SECOND YEAR BACHELOR OF TECHNOLOGY CHEM/CIVIL/MECH ENGINEERING	**COURSE NAME**	Applied Mathematics
	COURSE CODE	AS203
	COURSE CREDITS	4
RELEASED DATE : 01/07/2020	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA	PRACTICAL	DEMONSTRATION	
3	2	35	35	30	50	NIL	150

PRE-REQUISITE : First Year Engineering Mathematics OR Diploma Engineering Mathematics

COURSE OBJECTIVES :

AS203.CEO.1: To evaluate the Laplace and inverse transform of functions.

AS203.CEO.2: To evaluate the Fourier series of periodic functions and Fourier transform of non-periodic functions.

AS203.CEO.3: To evaluate the derivative of vector-valued functions.

AS203.CEO.4: To evaluate the area and the surface integrals of the vector functions.

AS203.CEO.5: To apply numerical methods for solving the problems of general calculus and differential equations.

AS203.CEO.6: To execute the program on problems of numerical methods using MATLAB.

COURSE OUTCOMES :

The students after completion of the course will be able to,

AS203.CO.1: Evaluate the Laplace and Inverse Laplace transform and will solve the differential equations.

AS203.CO.2: Rewrite the periodic and non-periodic functions as a series of sines and cosines.

AS203.CO.3: Differentiate a vector valued function in plane or space.

AS203.CO.4: Solve and compute the area and volume of the objects.

AS203.CO.5: Apply the numerical methods to problems of calculus and differential equations.

AS203.CO.6: Execute the program codes using MATLAB.

THEORY

UNIT 1	Laplace Transform and its Applications to LDE	9 HOURS

Introduction of Laplace Transform, Properties: First shifting, Change of scale, Linearity, Multiplication by t, Division by t. Laplace Transform of derivatives, Unit Step function, Impulse Function and Periodic Functions. Introduction of Inverse Laplace Transform, Properties: First shifting, Change of scale, Linearity, Multiplication by s, Division by s. Derivatives, Integration. Use of partial fractions to find Inverse Laplace Transform. Applications of Laplace Transfrom to find Solution of linear differential equations.

UNIT 2	Vector Differentiation	6 HOURS

Vectors in 2-D and 3-D, Scalar Product, Vector Product, Vector/scalar functions and fields, Derivative of vectors, Velocity and Acceleration, Gradient of a Scalar Field, Directional Derivative, Divergence of a Vector Field, Curl of a Vector Field.

UNIT 3	Vector Integration	6 HOURS

Line Integration, Line Integrals Independent of Path, Double Integrals Green's Theorem in the Plane, Surfaces for Surface Integrals. Surface Integrals, Volume Integrals, Divergence Theorem, Stoke's Theorem.

UNIT 4	Fourier Series and Fourier Transform	9 HOURS

Periodic functions, Fourier series, Dirichlets conditions, determination of Fourier constants, Half ranges series, arbitrary period functions series. Introduction of Fourier Transform, Fourier Integral Theorem (without proof), Fourier transform and its properties, Fourier Sine Transform, Fourier Cosine Transform, and Inverse Fourier transforms.

UNIT 5	Numerical Methods I	6 HOURS

Numerical Differentiation and Integration, Interpolation: Finite Differences, Newtons and Lagranges Interpolation. Numerical solution of System of linear equations by Gauss elimination method, LU-Decomposition method.

UNIT 6	Numerical Methods II	6 HOURS

Solution of Ordinary differential equations by Eulers, Modified Eulers, Runge-Kutta 4th order methods, Adams-Bashforth Predictor and Corrector Method, Solution of Partial Differential equations by Numerical method: Crank Nicholson method .

PRACTICAL: Any 10 practicals are performed as per the requirement of a branch.		
PRACTICAL NO.01		**2 HOURS**
Introduction to MATLAB: Syntax, keywords, matrices, polynomials, loops.		
PRACTICAL NO.02		**2 HOURS**
Introduction to MATLAB: In-built functions, 2D/3D plots, creating simple programs.		
PRACTICAL NO.03		**2 HOURS**
Finding Laplace transforms of functions, solution of differential equations using Laplace transforms.		
PRACTICAL NO.04		**2 HOURS**
Finding Fourier transforms of functions, Plotting of transforms.		
PRACTICAL NO.05		**2 HOURS**
Numerical Integration: Trapezoidal, Simpsons 1/3rd and Simpsons 3/8th rule.		
PRACTICAL NO.06		**2 HOURS**
Interpolation techniques: Lagranges Interpolation.		
PRACTICAL NO.07		**2 HOURS**
Interpolation techniques: Newtons Interpolation.		
PRACTICAL NO.08		**2 HOURS**
Solution of differential equation by modified Eulers method.		
PRACTICAL NO.09		**2 HOURS**
Solution of differential equation by Runge-Kutta method.		
PRACTICAL NO.10		**2 HOURS**
Curve Fitting: Linear, Quadratic.		
PRACTICAL NO.11		**2 HOURS**
Solution of algebraic equations: Newton- Raphson method.		
PRACTICAL NO.12		**2 HOURS**
Solution of algebraic equations: Bisection method.		
PRACTICAL NO.13		**2 HOURS**
Curve Fitting: Cubic, Exponential.		

TEXT BOOK

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10 th edition, Wiley Eastern Ltd., 2015, ISBN: 13: 9788126554232.
2. Dr. B.V. Ramana, Higher Engineering Mathematics, 5 th edition, Tata McGraw Hill, 2017, ISBN: 978-0-07-063419-0.
3. Amos Gilat, MATLAB: An Introduction with Applications, 4th edition, Wiley Publication, 2010, ISBN-13: 978-0-470-76785-6.

REFERENCE BOOK

1. B.S. Grewal, Higher Engineering Mathematics, 44 th edition, Khanna Publications, 2018, ISBN: 978-81-933284-9-1.
2. Ram N. Patel and Ankush Mittal, Programming in MATLAB- A Problem solving approach, Pearson Education, 2014, ISBN-978-93-325-2481-1.

MIT Academy of Engineering (An autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2019 – 2023)	
SCHOOL OF MECHANICAL AND CIVIL ENGINEERING	**W.E.F**	**AY:** 2020 - 2021
SECOND YEAR BACHELOR OF TECHNOLOGY MECHANICAL ENGINEERING	**COURSE NAME**	Strength of Materials
	COURSE CODE	ME231
	COURSE CREDITS	4
RELEASED DATE : 01/07/2020	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA	PRACTICAL	DEMONSTRATION	
3	2	35	35	30	NIL	50	150

PRE-REQUISITE : NIL

COURSE OBJECTIVES :

ME231.CEO.1: To remember the fundamental concepts including static equilibrium, geometry of deformation, and material constitutive behavior.

ME231.CEO.2: To understand the concept of resistance, deformation, thermal stresses and Principal Stresses.

ME231.CEO.3: To construct shear forces and bending moment diagrams for different beams under various loads.

ME231.CEO.4: To analyze concept of Slope and Deflections, Bending and Shear stresses in beams for solving numerical.

ME231.CEO.5: To Judge suitable dimensions for Column, solid and hollow circular shafts for mechanical systems.

COURSE OUTCOMES :

The students after completion of the course will be able to,

ME231.CO.1: Memorize the fundamental concepts including static equilibrium, geometry of deformation, and material constitutive behavior.

ME231.CO.2: Understand the concept of resistance, deformation and thermal stresses and Principal Stresses.

ME231.CO.3: Construct shear forces and bending moment diagrams for different beams under various loads.

ME231.CO.4: Analyze concept of Slope and Deflections, Bending and Shear stresses in beams for solving numerical.

ME231.CO.5: Judge suitable dimensions for Column, solid and hollow circular shafts for mechanical systems.

THEORY COURSE CONTENT

UNIT 1	**Simple Stresses and Strains**	**8 HOURS**

Concept of Resistance and deformation , stress tensor, Determinate and Indeterminate problems in Tension and Compression - Thermal Stresses - pure shear – Young's modulus of elasticity, Poisson's ratio, Modulus of rigidity and Bulk modulus - Relation between elastic constants - Stress-strain diagrams for brittle and ductile materials - working stress - Strain energy in tension and compression - Impact loading

UNIT 2	**Principal Stresses and Strains**	**8 HOURS**

Normal & shear stresses on any oblique plane. Concept of principal planes, derivation of expression for principal stresses & maximum shear stress, position of principal planes & planes of maximum shear. Graphical solution using Mohr's circle of stresses. Principal stresses in shaft subjected to torsion, bending moment & axial thrust (solid as well as hollow), Concept of equivalent torsional and bending moments.

Theories of elastic failure: Maximum principal stress theory, maximum shear stress theory, maximum distortion energy theory, maximum principal strain theory, maximum strain energy theory – their applications & limitations.

UNIT 3	**Shear Forces and Bending Moments**	**8 HOURS**

Shear forces & bending moment for statically determinate beams due to concentrated loads, uniformly distributed loads, uniformly varying loads & couples, Relationship between rate of loading, shear force and bending moment. Positions of point of contra shear & positions of points of contra flexure.

UNIT 4	**Bending Stresses and Shear Stresses in Machine Elements**	**8 HOURS**

Bending stresses: Theory of simple bending, assumptions, derivation of flexural formula, Modulus of rupture, section modulus, second moment of area of different cross sections with respective centroidal & parallel axes, bending stress distribution diagrams, moment of resistance & section modulus

Shear stresses: Concept, derivation of shear stress distribution formula, shear stress distribution diagrams for varying sections, maximum and average shears stresses, shear stress diagram for different cross section, Shear connectors.

UNIT 5	Slope & Deflection	8 HOURS
Relation between BM & slope, slope & deflection of determinate beams, standard loading cases using Macaulay's method and Moment Area method, deflection due to shear.		
UNIT 6	**Torsion and columns**	**8 HOURS**
Stresses, strain & deformations in determinate shafts of solid & hollow, homogeneous & composite circular cross section subjected to twisting moment, derivation of torsion equation, stresses due to combined torsion, bending & axial force on shafts. Strain energy due to bending and torsion **Buckling of columns:** Concept of buckling of columns, Euler's formula for buckling load for column with hinged ends, concept of equivalent length for various end conditions, Limitations of Euler's formula, Rankine's formula (Only theoretical treatment)		

PRACTICAL		
Part A: Experimental Approach		
PRACTICAL NO.01	**Tensile Test**	**2 HOURS**
Tension test for ductile and brittle material on Universal Testing Machine using extensometer		
PRACTICAL NO.02	**Compression Test**	**2 HOURS**
Compression test for ductile and brittle material on Universal Testing Machine using extensometer		
PRACTICAL NO.03	**Shear Test**	**2 HOURS**
Shear test of ductile material on Universal Testing Machine.		
PRACTICAL NO.04	**Verification of Flexural Formula**	**2 HOURS**
Experimental verification of flexural formula in bending for simply supported beam or cantilever beam.		
PRACTICAL NO.05	**Torsion Test**	**2 HOURS**
Verification of torsional formula on circular bar for different materials.		
PRACTICAL NO.06	**Strain Gauge**	**2 HOURS**
Verification of the bending stresses in beam using strain gauge.		

Part B: Analytical Approach		
PRACTICAL NO.01	**Principal Stresses**	**4 HOURS**
Principal stresses through graphical and analytical method.		
PRACTICAL NO.02	**Shear Force and Bending Moment Diagram**	**4 HOURS**
Shear force and bending moment diagrams for beams with different end conditions.		
PRACTICAL NO.03	**Slope and Deflection**	**4 HOURS**
Slope and deflection for beams with different end conditions.		
PRACTICAL NO.04	**Verification of Flexural Formula**	**2 HOURS**
Experimental verification of flexural formula in bending for simply supported beam or cantilever beam.		

Part C: Computational Approach using MD solid		
PRACTICAL NO.01	**Principal Stresses**	**4 HOURS**
Principal stresses using MD Solid		
PRACTICAL NO.02	**SFD and BMD**	**4 HOURS**
Calculation of SFD and BMD using MD Solid		
PRACTICAL NO.03	**Slope and Deflection**	**4 HOURS**
Calculation of Slope and deflection using MD solid		

TEXT BOOK

1. G. H. Ryder, "Strength of Materials", 3rd Edition, Macmillan Pub", India.(ISBN-13: 978-0333109281)
2. S.S. Rattan, "Strength of Material", Tata McGraw Hill Publication Co. Ltd.(ISBN-13: 978-0071072564)
3. S. Ramamurtham,"Strength of material", Dhanpat Rai Publication.(ISBN-13: 978-8187433545)
4. Timoshenko and Young," Strength of Materials", CBS Publication, (ISBN-13: 978-0442085476)

REFERENCE BOOK

1. Beer and Johnston," Strength of materials", CBS Publication, ISBN-13: 978-0070042841
2. E.P. Popov, "Introduction to Mechanics of Solids", Prentice Hall Publication, (ISBN-13: 978-0134877693)
3. Singer and Pytel," Strength of materials", Harper and row Publication, (ISBN-13: 978-0495667759)

MIT Academy of Engineering (An autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2019 – 2023)	
SCHOOL OF MECHANICAL AND CIVIL ENGINEERING	**W.E.F**	**AY:** 2020 - 2021
SECOND YEAR BACHELOR OF TECHNOLOGY MECHANICAL ENGINEERING	**COURSE NAME**	Thermal Engineering
	COURSE CODE	ME232
	COURSE CREDITS	4
RELEASED DATE : 01/07/2020	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA	PRACTICAL	DEMONSTRATION	
3	2	35	35	30	50	NIL	150

PRE-REQUISITE : NIL

COURSE OBJECTIVES :

ME232.CEO.1: To Identify and use units as well as notations in thermodynamics.

ME232.CEO.2: To apply the first and second laws of thermodynamics to various gas processes and cycles.

ME232.CEO.3: To apply fundamentals of IC engines to enhance its performance, combustion and emission characteristics.

ME232.CEO.4: To correlate the properties of steam, dryness fraction measurement and performance estimation of steam generators.

COURSE OUTCOMES :

The students after completion of the course will be able to,

ME232.CO.1: Apply the basic concepts and laws of thermodynamics to various thermal processes and real systems.

ME232.CO.2: Formulate performance of various thermodynamic gas power cycles.

ME232.CO.3: Evaluate performance characteristics of IC engine and recent IC engine technologies.

ME232.CO.4: Examine the quality of steam and performance of steam generators.

THEORY COURSE CONTENT		
UNIT 1	**Laws of Thermodynamics**	**8 HOURS**
Review of thermodynamics and mathematical representation of thermodynamic properties, Macroscopic and microscopic analysis in thermodynamics ,Laws of thermodynamics, Steady flow energy equation and its application to different devices, Role of thermodynamics in engineering applications like heat engine, heat pump and refrigerator, Introduction of cryogenics and its applications.		
UNIT 2	**Entropy & Ideal gas**	**8 HOURS**
Entropy as a property, Clausius inequality, Principle of increase of entropy, Concept of Availability, Irreversibility, Exergy analysis and Thermoeconomics, Ideal Gas Definition and Gas Laws, Dalton's law of partial pressure & properties of gas mixture, Equation of State, Ideal gas processes on P-V and T-S Diagrams: Constant Pressure, Constant Volume, Isothermal, Adiabatic, Polytropic, Throttling Processes, Calculations of heat transfer, work done, internal energy, change in entropy and enthalpy.		
UNIT 3	**Properties of Pure Substances**	**8 HOURS**
Pure substance, Phases of pure substances and their transitions, Critical and triple point of a pure substance, Formation of steam, Properties of steam, Use of Steam tables, P-V-T and Mollier diagram for steam, Dryness fraction and its determination, Study of steam calorimeters (Barrel, Separating, Throttling and combined).		
UNIT 4	**Gas Power Cycles**	**8 HOURS**
Air Standard Cycle, Efficiency and Mean Effective Pressure, Otto Cycle, Diesel cycle, Dual cycle, Brayton cycle, Carnot cycle, Rankine cycle, Comparison of cycles, Deviation of Actual Cycle from Ideal Cycles, Energy Analysis of Power Cycles, Introduction of Regeneration, Reheating, and Co-generation.		
UNIT 5	**I.C. Engine**	**8 HOURS**
Review of basic terms of SI & CI engine, Stages of combustion in SI & CI engine, Thermo-chemistry of fuel and Combustion stoichiometry, Abnormal combustion, I.C. Engine Emissions and Controlling methods, Testing of IC Engines: Methods to determine various performance parameters, characteristic curves and heat balance sheet, Recent trends in IC engine technologies like HCCI, EGR, Turbocharging, Potential alternative liquid and gaseous fuels, etc		
UNIT 6	**Steam Generators**	**8 HOURS**
Classification and Constructional details of boilers, Mountings and accessories of boiler, Boiler design requirement, Introduction to IBR Act, Boiler draught (natural and artificial draught), Boiler performance calculations-Equivalent evaporation, Boiler efficiency, Energy balance and factors affecting boiler performance, Energy conservation options in Boiler.		

PRACTICAL: Perform any seven experiments.		
PRACTICAL NO.01	**Joule's experiment**	**2 HOURS**
Joule's experiment to validate first law of thermodynamics.		
PRACTICAL NO.02	**Case Study**	**2 HOURS**
Application of steady flow energy equation to study the performance of engineering devices.		
PRACTICAL NO.03	**Air standard cycle using MATLAB**	**4 HOURS**
Performance estimation of Air standard cycle using standard simulation software's		
PRACTICAL NO.04	**Engine Test**	**4 HOURS**
Test on Multi cylinder Petrol engine for determination of Friction power and Mechanical efficiency.		
PRACTICAL NO.05	**Engine Test**	**4 HOURS**
Test on diesel engine using different operating condition to determine various efficiencies, performance parameters and Heat balance sheet.		
PRACTICAL NO.06	**Steam Quality using Calorimetry**	**2 HOURS**
Measurement of dryness fraction of steam by Calorimeter		
PRACTICAL NO.07	**Boiler trial**	**4 HOURS**
Trial on boiler to determine boiler efficiency, equivalent evaporation and Energy Balance.		
PRACTICAL NO.08	**Self-Learning Based Project**	**4 HOURS**
A group of 4 students will be given following set of experiments which needs to be performed to prepare a report based on the practical observations, literature review, discussions among peers and faculty members: 1. Evaluation of thermodynamic properties of working substance 2. Determination of Flash Point and Fire Point of various fuels 3. Analyze the engine thermodynamic characteristics using fuel air cycles and combustion charts 4. Joule-Thompson Porous Plug Experiment for throttling process 5. Transesterification process for biodiesel production etc.		

ACTIVITIES: Perform any two activities.		
ACTIVITY NO.01	**Industrial Visit**	**4 HOURS**
Industrial visit to any process industry which uses boiler, boiler mountings & accessories and submission of detailed report.		
ACTIVITY NO.02	**Thermodynamics Software Based Learning**	**4 HOURS**
A group of 4 students will be given following set of experiments which needs to be performed based on the interactive thermodynamics software, literature review, discussions among peers and faculty members: 1. Phase Behavior on a Pressure-Volume Diagram 2. Combustion Reactions in a Furnace 3. Effects of variables on Otto Cycle		
ACTIVITY NO.03	**Group task (Technical Poster Presentation)**	**4 HOURS**
A group of 4 students will be given any topic on recent trends in IC engine technologies to collect technical information regarding importance and applications through various sources, prepare technical poster on the same in precise as well as summarized format and finally do presentation in front of judges.		

TEXT BOOK

1. P. K. Nag, Engineering Thermodynamics, Tata McGraw Hill Publications, 2008, ISBN 0-07-026062-1
2. Rayner Joel, Basic Engineering Thermodynamics, Pearson Education ltd., 1996, (ISBN 978-81-317-1888-9)
3. Yunus A. Cengel, Thermodynamics – An Engineering Approach, Tata McGraw Hill, 2008, ISBN 0073305375
4. V. Ganesan, Internal Combustion Engines, Tata McGraw-Hill, ISBN 978-1259006197

REFERENCE BOOK

1. Hawkins G. A, Engineering Thermodynamics, John Wiley and Sons, 1986, ISBN 0471812021
2. Van Wylen, Sonntag R. E, Fundamentals of Classical Thermodynamics, John Wiley and Sons, 1978, ISBN 0471047945
3. T.D. Eastop and A. McConkey, Applied Thermodynamics, Addison Wesley Longman, 2009, ISBN 978-81-7758-238-3
4. Lynn D. Russell, Engineering Thermodynamics, Oxford University Press, 2007, ISBN 0195689054
5. Heywood, Internal Combustion Engine Fundamentals, Tata McGraw-Hill, ISBN 978-1259002076

MIT Academy of Engineering (An autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2019 – 2023)	
SCHOOL OF MECHANICAL AND CIVIL ENGINEERING	**W.E.F**	**AY:** 2020 - 2021
SECOND YEAR BACHELOR OF TECHNOLOGY MECHANICAL ENGINEERING	**COURSE NAME**	Manufacturing Technology
	COURSE CODE	ME233
	COURSE CREDITS	4
RELEASED DATE : 01/07/2020	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA	PRACTICAL	DEMONSTRATION	
3	2	35	35	30	50	NIL	150

PRE-REQUISITE : NIL

COURSE OBJECTIVES :

ME233.CEO.1: To select appropriate manufacturing processes for manufacturing a product.
ME233.CEO.2: To interpret possible remedies related to manufacturing defects in product.
ME233.CEO.3: To develop jigs and fixtures for various products.
ME233.CEO.4: To outline the importance of Digital and intelligent manufacturing.

COURSE OUTCOMES :

The students after completion of the course will be able to,

ME233.CO.1: Illustrate the working of various conventional manufacturing machines.
ME233.CO.2: Choose proper tools and various machining parameters for manufacturing.
ME233.CO.3: Demonstrate the working of various Machines like CNC, VMC, HMC.
ME233.CO.4: Outline the concept of digital manufacturing.

THEORY COURSE CONTENT		
UNIT 1	**Conventional Machines and Processes**	**8 HOURS**
Introduction to Lathe, milling and drilling. Introduction to joining processes - Arc, TIG, MIG and Spot welding, Brazing and soldering, laser and electron-beam welding, welding defects and inspection. Introduction to Grinding.		
UNIT 2	**Advanced Cutting Tools**	**8 HOURS**
Classification of cutting tools: single and multipoint, Tool coatings processes; PVD and CVD, Introduction to advanced cutting Tools, carbide, brazed and index able inserts used in industries. Introduction to Orthogonal and oblique cutting, Concept of speed, feed, depth of cut, cutting action, cutting forces, Tool dynamometry- Requirements, types and applications.		
UNIT 3	**Material Shaping Processes**	**8 HOURS**
Introduction to cold and hot working, Recrystallization temperature of metals. Introduction to casting, Rolling, Extrusion, Forging, Sheet metal bending, Press machines, blow molding and injection molding, Introduction to Cold forming processes. Introduction to – Laser Forming Processes, Superplastic Forming and Electroforming processes.		
UNIT 4	**Advanced Machines**	**10 HOURS**
Introduction to NC, CNC, HMC, VMC and VTL, CNC Plasma cutter, CNC Tools, CNC controllers, CNC axes and drives. Automatic Tool and pallet Changer, CNC Part Programming and CNC support systems.		
UNIT 5	**Jigs and Fixtures**	**6 HOURS**
Design principles of Jig/Fixture and their parts, fastening elements, construction elements, and process planning for Jig/Fixture manufacturing, Jig, and Fixture design for simple component.		
UNIT 6	**Digital and Intelligent Manufacturing**	**8 HOURS**
Introduction to Digital Manufacturing & Design technology, Digital Manufacturing and Design, Advantages of Digital manufacturing and design, Introduction to Intelligent Machining, Sensors and Sensing Techniques, Process Control Strategies, Future Directions in Advanced Machining.		

PRACTICALS		
List A – Workshop Dependent		
Along with following experiments, students have to go through Virtual labs also.		
PRACTICAL NO.01	**Machining Operations**	**4 HOURS**
To manufacture a product involving – operations on Lathe, Milling and Drilling Machines like facing, step turning, taper turning drilling, slotting & keyway making.		
PRACTICAL NO.02	**Welding Operations**	**4 HOURS**
To manufacture a usable product by welding joint using TIG or MIG or Arc welding, with its process sheet like Edge preparation, drilling, tapping, taper filling.		
PRACTICAL NO.03	**Sheet Metal Operations**	**4 HOURS**
To manufacture a usable product from sheet metal by using riveting joint		
PRACTICAL NO.04	**Face/cylindrical Grinding operation**	**4 HOURS**
To perform face/cylindrical grinding of metal component on CNC Grinding machine.		
PRACTICAL NO.05	**Super finishing – Burnishing**	**4 HOURS**
To perform burnishing process on work piece and finding the surface roughness value using surface roughness tester.		

List B – Software Dependent		
PRACTICAL NO.06	**Casting simulation (project based)**	**8 HOURS**
To determine Casting temperatures at the end of solidification and eliminating casting defect like shrinkage, porosity, etc. (using Pro-cast software or virtual labs.)		
PRACTICAL NO.07	**Sheet metal Forming simulation. (Project based)**	**8 HOURS**
To determine the optimal processing parameters for forming an aluminum alloy into a complex shaped component (using PAM-STAMP software or virtual labs.)		

TEXT BOOK

1. Complete casting, John Campbell, Elsevier Ltd., Butterworth-Heinemann, UK, British Library ISBN – 13: 9781856178099.
2. Digital Twin Driven Smart manufacturing, Fei Tao, Meng Zhang, A.Y.C. Nee, Academic press, London, UK, ISBN No – 9780128176306.
3. Digital Manufacturing and Assembly systems in Industry 4.0, Kaushik kumar, Divya Zindani, J. Paulo Davim, CRC press, Taylor & Francis Group, ISBN No – 9780429464768.
4. Mechanics of Sheet metal forming, Z. Marciniak, J.L. Duncan, S.J. Hu, Butterworth-Heinemann, UK, 2002, ISBN 0750653000.
5. Introduction to welding and brazing, D. R. Milner, R.L. Apps, Pergamon Press, Oxford, London, UK, ISBN No – 080133428.
6. Grinding Technology, Stephen Malkin, Industrial Press, New York, ISBN No. – 9780831132477.
7. CNC Machining handbook, Alan Overby, Mc Graw Hill, New York, London, ISBN No – 9780071623025.

REFERENCE BOOK

1. Manufacturing Science, Amitabha Ghosh and Ashok Kumar Mallik-2nd Edition, East-West Press Pvt Ltd, 2010, ISBN No. - 8176710636, 9788176710633.
2. Manufacturing Technology- Foundry, Forming and Welding, Rao P. N., Tata McGraw Hill, 1987, ISBN No. – 13:9789353160500, 10:9353160502.
3. Elements of Manufacturing Technology Vol II, Hajra Choudhary S.K and Hajra Choudhary A.K, Media Publishers, 2007, ISBN No. - 8185099146, 9788185099149 & 8185099154, 9788185099156.
4. Fundamentals of Modern Manufacturing, M. P. Groover, John Wiley and Sons, Fundamentals of Modern Manufacturing, ISBN No. – 9780470467008.
5. Principles of Metal Casting by R.W. Heine, C.R. Loper and Rosenthal, Tata McGraw Hill, New Delhi, ISBN No. – 9780871707246, 0871707241

MIT Academy of Engineering (An autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2019 – 2023)	
SCHOOL OF ELECTRICAL ENGINEERING	**W.E.F**	**AY:** 2020 - 2021
SECOND YEAR BACHELOR OF TECHNOLOGY	**COURSE NAME**	Digital Prototyping
	COURSE CODE	ET224
	COURSE CREDITS	2
RELEASED DATE : 01/07/2020	**REVISION NO**	0.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA	PRACTICAL	DEMONSTRATION	
NIL	4	NIL	NIL	25	NIL	50	75

PRE-REQUISITE : ME104 - Engineering Graphics, EX102 - Electrical and Electronics Engineering, CV102 - Applied Mechanics

COURSE OBJECTIVES :

ET224.CEO.1: To learn about materiality and techniques.
ET224.CEO.2: To justify the product development cycle through prototype project.
ET224.CEO.3: To inculcate implementation of skills by proper budget planning with effective troubleshooting and practices in aesthetics & ergonomics.
ET224.CEO.4: To develop abilities to transmit technical information clearly and test the same by delivery of presentation based on the prototype Project.

COURSE OUTCOMES :

The students after completion of the course will be able to,

ET224.CO.1: Consolidate the techniques, skills and modern engineering tools.
ET224.CO.2: Apply acquired skills to the construction of a prototype project.
ET224.CO.3: Develop a prototype project by performing tasks in team.
ET224.CO.4: Demonstrate the work carried out in a team.

PRACTICAL

Course Introduction:

This course is aiming at a Project Based Learning methodology. Through a series of projects, students will learn to design, build, and debug engineering prototype systems. They will cover multiple aspects of the prototyping process.

Students will complete four modules in rotational manner,

1. Hardware Prototyping (HP)
2. Software Prototyping(SP)

In the module hardware prototyping students will develop a prototype of electronic product. Student will be acquiring different skills in electronics like Soldering, Wiring and PCB Design using Electronic Design Automated tools, Assembly of electronic product, Testing and troubleshooting, requirement Analysis , Product concept development in electronic product design.

On the other hand in software prototyping students will learn Software development life cycle (SDLC) concepts, AEIOU framework, UML diagrams, Requirement analysis, data flow diagrams, creating high fidelity prototypes, Testing and Analysis etc.

Each module will have on an average six laboratory sessions. The students will complete them in rotational manner. Every module will award for 75 marks.

Marks of two modules at a time will be averaged in one semester and if student secures passing marks (passing grade) after averaging; then the required credits of the course will be earned.

For Digital Prototyping, Semester - III

Module	**Programs**
a) Hardware Prototyping (HP)	SY BTECH Electronics Engineering, Electronics & Telecommunication Engineering, Computer Engineering, Information technology
b) Software Prototyping (SP)	

For Digital Prototyping, Semester - IV

Module	**Programs**
a) Hardware Prototyping (HP)	SY BTECH Civil Engineering, Mechanical Engineering, Chemical Engineering
b) Software Prototyping (SP)	

MODULE: 1/2	Hardware Prototyping (HP)	28 HOURS

PRACTICAL:

PRACTICAL NO. 01	Introduction to design and construction of electronic prototyping	02 HOURS

1. Gain familiarity with basic product design stages; Conceptualization, Detailed Design and Implementation. Form a group of students. (04 max)
2. Acquire concepts of basic processes in electronic prototyping. Develop Concept Description Sheet (CDS) for product to be designed.
3. Perform Brainstorming and develop a simple electronic product idea based on given pre-declared theme in given time span. Hence draw Physical and Mechanical Drawing.
4. Perform Customer Survey and Competitor Analysis
5. Develop Specifications and Make requirement analysis. Hence develop Bill of Material.
6. Develop a plan for construction of electronic proto from a concept.

PRACTICAL NO. 02	Basic electronic prototyping skills	02 HOURS

1. Soldering
   - Demonstrate structure of solder wire, soldering temperature, soldering station and gun.
   - Highlight Industrial safety norms, use of lead free solder, extractor fan etc.
   - Use of flux, desoldering gun, desoldering techniques, removing components/wires.
   - Fix Solder defects and inspect quality of solder joints.
2. Wiring
   - Cleaning, stripping and tinning the wires.
   - Connections and protections for wires.

PRACTICAL NO. 03	PCB design using basic Electronic Design Automation (EDA)tools	06 HOURS

1. Gain familiarity with PCB Design software.
2. Draw schematics for PCB design.
3. Make PCB layout as per circuit diagram. Learn PCB design standards.
4. Export PCB files like gerber (.gbr), .pdf etc.

PRACTICAL NO. 04	PCB fabrication	06 HOURS

1. Develop negative imprints of top and bottom sides and expose to PCB.
2. Perform etching process for PCB.
3. Perform cleaning and shearing for required size.
4. Check continuity of tracks.
5. Use drilling machine to make drills.

PRACTICAL NO. 05	Assembly and testing of electronic proto	08 HOURS

1. Make assembly of electronic prototype
2. Insert components, perform lead cutting with standard clearance.
3. Review mechanical fitment of PCB with component insertion.
4. Solder components and make wiring.
5. Test prototype for electrical functionality, to perform rework if required.
6. Assemble PCB with mechanical fitments and assemblies.
7. Analyze performance and compare with specifications.
8. Develop Customer feedback sheet and Take feedback from Customers.
9. Make Customer feedback Analysis based on ratings.

PRACTICAL NO. 06	Final project presentation	04 HOURS

1. Demonstrate an electronic prototype in a team.
2. Write a report on implementation of prototype. (10-15 pages max)
3. Present prototype implementation in a team by Power Point presentation.
4. Enumerate proposed specifications of electronic prototype.
5. Highlight financial aspects including proposed cost and bill of material.
6. Present Customer feedback analysis.

REFERENCE BOOK

1. Printed Circuit Boards: Design and Technology, Walter C. Bosshart, Tata McGraw-Hill Education, 1983, ISBN: 978-0074515495.
2. Electronic Assembly Fabrication, Charles A. Harper, 1st ed.,McGraw-Hill Education, 2002 ISBN: 978-0071378826.
3. Soldering in Electronics Assembly, Frank Riley, 1st ed., Springer, 2013, ISBN: 978-3-662-13163-3.
4. Electronic Techniques: Shop Practices and Construction, R. S. Villanucci, A. W. Avtgis, W.F. Megow, 6th ed., Practice-Hall, 1999. ISBN: 978-0130195661.
5. Printed Circuit Boards: Design, Fabrication, and Assembly, R. S. Khandpur, 1st ed. McGraw-Hill Education, 2005, ISBN: 978-0071464208.
6. Practical Electronics for Inventors, Paul Scherz , Simon Monk ,3rd Edition, McGraw-Hill Education, 2013, ISBN 978-0071771337 (Available on TAB edition, Kindle)
7. IPC-J-STD-001E-2010, Requirements for Soldered Electrical and Electronic Assemblies, IPC. , ISBN: 9781580986922.
8. IPC-A-610 D-2014, Acceptability of Electronic Assemblies, IPC. ISBN: 9781611931549.

MODULE: 2/2	**Software Prototyping (SP)**	**28 HOURS**
PRACTICAL		
PRACTICAL NO. 01	**Introduction to software engineering**	**04 HOURS**
Concepts, Software development life cycle (SDLC). Student need to use AEIOU Framework (Design Thinking) to decide the problem statement. Students will work in group of three on AEIOU framework		
PRACTICAL NO. 02	**Requirement analysis**	**04 HOURS**
Find the requirement specification of given problem statement and formulate the feasible solution.		
PRACTICAL NO. 03	**Design UML Diagrams for given problem statement**	**06 HOURS**
Students have to work in group on Project Development canvas and then design following, 1. Creation of data flow diagram 2. Creation of block diagram 3. Design a activity diagram		

PRACTICAL NO. 04	Design analysis	02 HOURS
Create High Fidelity Prototype		
PRACTICAL NO. 05	**Prototype Implementation**	**06 HOURS**
Use of prototype development tools such as Proto.io, Invision		
PRACTICAL NO. 06	**Presentation**	**04 HOURS**
Each group will be given 10 min to present their work.		

REFERENCE BOOK

1. Software Engineering A practitioners Approach, Roger S, Pressman, 7th Edition, ISBN: 9780073375977
2. Effective prototyping for software Makers, Jonathan Arnowitz, MIchaleArent by, ACM Digital Library,ISBN-13:978-0120885688
3. Rapid prototyping: Principles and applications in manufacturing, Chua, C. K., Leong, K. F. (1997). New York: Wiley, ISBN: 978-9812778987.
4. Fab - The coming revolution on your desktop - from personal computer to personal fabrication, Gershenfeld, N. (2005). New York: Basic Books. ISBN:978-0465027453
5. Rapid prototyping: Principles and applications, Noorani, R. (2006). Hoboken, NJ: Wiley.ISBN: 978-0-471-73001-9.
6. Rapid manufacturing: The technologies and applications of rapid prototyping and rapid tooling, Pham D. T.,Dimov S. S. (2001). New York: Springer. .ISBN: 978-1447111825
7. Digital design and manufacturing: CAD/CAM applications in architecture and design, Schodek D., Bechthold M., Griggs K., Kao K. M., Steinberg M. (2005). Hoboken, NJ: Wiley , ISBN: 978-0471456360

MIT Academy of Engineering (An autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2019 – 2023)	
SCHOOL OF MECHANICAL AND CIVIL ENGINEERING	**W.E.F**	**AY:** 2020 - 2021
SECOND YEAR BACHELOR OF TECHNOLOGY MECHANICAL ENGINEERING	**COURSE NAME**	Industrial Measurements & Instrumentation
	COURSE CODE	ME241
	COURSE CREDITS	2
RELEASED DATE : 01/07/2020	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA	PRACTICAL	DEMONSTRATION	
NIL	4	NIL	NIL	25	50	NIL	75

PRE-REQUISITE : NIL

COURSE OBJECTIVES :

ME241.CEO.1: To compare the tolerances for different machining applications.

ME241.CEO.2: To validate the measurements of various forms by using different measuring instruments.

ME241.CEO.3: To select and apply appropriate measuring instrument.

ME241.CEO.4: To verify to different properties of measuring instruments.

COURSE OUTCOMES :

The students after completion of the course will be able to,

ME241.CO.1: Identify the correct measuring instruments for different measurements.

ME241.CO.2: Summarize different types of Limits, Fits and tolerances.

ME241.CO.3: Demonstrate industrial measurements using suitable instruments.

ME241.CO.4: Estimate dimensions of complex geometries like groove, pitch diameter using electronic height gauge.

ME241.CO.5: Verify the accuracy of measuring instruments.

PRACTICAL

Part A: Problem based learning

Group of 4-5 students will work on instrumentation and measurement problem. Periodical four reviews will be conducted for every group by jury. Group has to solve the problem by using following steps.

- Understanding the problem and defining the steps.
- Develop possible solutions.
- Select a Solution.
- Implement the Solution.
- Presenting the solution in the form of report.

Part B: Basic Measurements (Any Nine)		
PRACTICAL NO.01	**Distance Measurement**	**2 HOURS**
Using line and end standards, LVDT and validating results on Electronic height gauge.		
PRACTICAL NO.02	**Angle Measurement**	**2 HOURS**
Measurement of Angle using Sine Center / Sine bar / bevel protractor and validating the accuracy with Electronic height gauge.		
PRACTICAL NO.03	**Spatial Variables Measurement**	**2 HOURS**
Measurement of spatial variables like distance, thickness, displacement, level, area, volume using different types of sensors.		
PRACTICAL NO.04	**Velocity, Acceleration, Vibrations Measurement**	**2 HOURS**
Velocity, acceleration, vibration, shock measurement using suitable sensors.		
PRACTICAL NO.05	**Solid Mechanical Variables Measurement**	**2 HOURS**
Mass, weight, density, strain, force, torque measurement using suitable sensors and gauges.		
PRACTICAL NO.06	**Fluid Mechanical Variables Measurement**	**2 HOURS**
Pressure, flow, viscosity, density measurement using suitable sensors/ gauges.		

PRACTICAL NO.07	**Temperature Variable Measurement**	**2 HOURS**
Temperature measurement using sensors, thermocouple, RTDs etc. Introduction to thermal imaging.		
PRACTICAL NO.08	**Profile Projector and Tool Maker's Microscope**	**2 HOURS**
Measurements thread geometry using profile projector and Tool Maker's microscope		
PRACTICAL NO.09	**Surface Roughness Measurement**	**4 HOURS**
Measurements of Surface roughness using Tally Surf Comparator. Validating flatness using 2D electronic height gauge.		
PRACTICAL NO.10	**Gear tooth Vernier**	**4 HOURS**
Measurement of gear tooth profile using Gear Tooth Vernier/ Gear Tooth Micrometer		

Part C: Geometric Dimensioning and Tolerances (Any Five out of Seven)		
PRACTICAL NO.01	**Design of gauges**	**4 HOURS**
Design of different types ring and plug gauges (GO-NOGO)		
PRACTICAL NO.02	**GD & T (Type of fits)**	**4 HOURS**
Type of fits- Clearance, Transition and Interference –using different hole and shaft assemblies.		
PRACTICAL NO.03	**GD & T (Form tolerances)**	**4 HOURS**
Measurement of Straightness and Flatness using 2D electronic height gauge		
PRACTICAL NO.04	**GD & T (Form tolerances)**	**4 HOURS**
Measurement of Cylindricity and Circularity of Automobile Components using 2D electronic height gauge		
PRACTICAL NO.05	**GD & T (Orientation tolerances)**	**4 HOURS**
Determination of orientation tolerances like square-ness, perpendicularity and parallelism using 2D electronic height gauge		
PRACTICAL NO.06	**Use of Comparator for inspection.**	**4 HOURS**
Use of pneumatic comparator for determination of tolerances.		
PRACTICAL NO.07	**Calibration**	**4 HOURS**
Calibration of Micrometer, Vernier caliper, Mechanical Height gauge		

Part D: Advanced Metrology - Activities	
ACTIVITY NO.01	**Industrial Visit**
Visit to Industrial Coordinate Measuring Machine / Machine Vision System and submitting the report.	

TEXT BOOK

1. Mechanical Measurements, Beckwith Marangoni and Lienhard, Pearson Education, 6th Edition, 2006. ISBN-13: 9780201847659
2. Engineering Metrology, R.K.Jain, Khanna Publishers, Delhi, 2009. ISBN: 978-81-7409-153-6
3. Metrology & Measurements, Anand Bewoor, V.A.Kulkarni, TATA McGraw Hill, 9780070140004
4. Engineering Metrology and Measurements, N Raghavendra, Oxford Publications, 9780198085492
5. Fundamental of Sensors for Engineering and Science, Patrick F Dunn, CRC Press; 1 edition, ISBN: 143986103X

REFERENCE BOOK

1. Engineering Metrology, Narayana K.L, ISBN-10: 8183711189
2. Handbook of Measurements, Adedeji B. Badiru, LeeAnn Racz, CRC Press; 1 edition, ISBN: 9781351228817.
3. Engineering Metrology, Gupta I.C., Dhanapat Rai Publications. ISBN-10: 8189928457
4. Sensors for Mechatronics, Paul P.L., Elsevier, ISBN 978-0-12-391497-2
5. ASTME, Handbook of Industrial Metrology, Prentice Hall of India Ltd. ISBN-10: 013378505X
6. Connie Dotson, Fundamentals of Dimensional Metrology, Thomson Publications, 4th Edition. ISBN-10: 0766820718

MIT Academy of Engineering (An autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2019 – 2023)	
SCHOOL OF MECHANICAL AND CIVIL ENGINEERING	**W.E.F**	**AY:** 2020 - 2021
SECOND YEAR BACHELOR OF TECHNOLOGY MECHANICAL ENGINEERING	**COURSE NAME**	Minor Project- Design
	COURSE CODE	ME230
	COURSE CREDITS	1
RELEASED DATE : 01/07/2020	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA	PRACTICAL	DEMONSTRATION	
NIL	2	NIL	NIL	NIL	NIL	50	50

PRE-REQUISITE : NIL

COURSE OBJECTIVES :

ME230.CEO.1: To categorize and define a problem to be solved.
ME230.CEO.2: To realize the ethical principles in general and its importance.
ME230.CEO.3: To make the students aware of project requirement analysis, design and planning.
ME230.CEO.4: To appreciate the importance of documenting and ethics of writing.

COURSE OUTCOMES :

The students after completion of the course will be able to,

ME230.CO.1: Delineate the problem to be solved.
ME230.CO.2: Comprehend the paramount of the health, safety and welfare of the public in the practice of engineering profession.
ME230.CO.3: Embark project planning and design.
ME230.CO.4: Inculcate problem solving skills and critically analyze the options available to solve the problem.
ME230.CO.5: Cognize the importance of documentation and report writing.

COURSE ABSTRACT

It is a need of the time to pay attention to the societal needs by an engineering graduate to solve some of the real life societal problems by providing affordable technological solutions. The concept of the minor project follows the same theme. The minor project aims to identify the problems from the society and develop the solutions for the same using science and technology for the betterment of society or human life. This will help students to understand the process of product/project development, best practices and encourage their creativity to solve real life problems. The students will learn effective team building, designing, budgeting, planning, engineering skills and processes, safety norms and standards while developing the application/ product. The students will be able to understand importance of documentation and professional ethics.

Guidelines

1. Every student shall undertake the Minor Project in semester III and IV.
2. Every student shall work on an approved project, a group of 03/04 students (maximum) shall be allotted for each minor project.
3. The group members may be from different programme to support the interdisciplinary functioning.
4. The students have to identify the problem by discussion with various stakeholders, site visits, expert-opinions and various research articles.
5. Collect the sufficient data and survey to establish the criticality of the problem to be solved.
6. Apply various tools for project planning and design.
7. Critically analyze various solutions/techniques to solve real world problems.
8. Select and justify one of the solutions identified based on the feasibility, affordability and ease of use.
9. Learn and apply standards of engineering ethics and professional behavior.
10. Adherence to the highest principles of ethics, conduct and practices.

TIMELINE

The four member jury/committee will be appointed to monitor the progress and continuous evaluation of each project. One of the member will be the project guide. Assessment shall be done jointly by the guide and jury members.

1. Formation of Project Group: 2 Weeks (1^{st} week and 2^{nd} week)
2. Finalizing title, feasibility study and approval: 3 Weeks (3^{th} week to 5^{th} week)
3. Engineering Ethics: 3^{rd} week
4. Project Review 1 Presentation: 6^{th} week
5. Analysis and Design of the Project: 3 Weeks (7^{th} week to 9^{th} week)
6. Project Review 2 Presentation: 10^{th} week
7. Report Writing, Documentation and Presentation: 2 Weeks (11^{th} week and 12^{th} week)
8. Project Review 3 Presentation: 13^{th} week (Assessment by Guide)
9. Final Evaluation/Examination Presentation: 14^{th} week

Project Demonstration (50 Marks)

1. **Review 1 (Problem Statement and Literature Survey) (10 marks)**
2. **Review 2 (Project Modeling and Designing) (10 marks)**
3. **Project Activities (10 Marks)**
    - Quiz on Ethics
    - Drafting of Literature Review and Synopsis
    - Project Planning and Design
4. **Review 3 (Project Documentation) (10 marks)**
5. **Final Demonstration & Presentation (10 marks)**

WEEK NO	INSTRUCTIONS	STUDENT'S GROUP ACTIVITIES	EXPECTED OUTCOME
Week 1	Introduction to different forefront areas available within the School. Discussion on innovative application in domain area and resources such as Books, Blog, Publication Houses	To search the domain area of interest	At least 4 subtopics in area of interest (Template I)
Week 2	To brief at least two Innovative products with complete details and their Evolution	To search the domain area/innovative products of interest	Search in area of interest (Template II)
Week 3	Ethics, Morals, Values and Integrity, Work Ethic, Civic Virtue, Senses of Engineering Ethics, Business Ethics, Media Ethics, Environmental Ethics, Bio Ethics, Computer Ethics, Research Ethics	Graded Activity Quiz on Engineering Ethics	Understand the Ethics of an Engineer (Template III)
Week 4	Introduction to Research publication, its type, science citation index, methods to search Journals. Introduction to Ethics of writing(Plagiarism)	Search domain related five papers (from Journal Paper, Conference paper, Technical report, Manual, Thesis)	Student will learn searching SCI journal and understand Ethics of writing
Week 5	Presentation on how to make Project Presentation. Title, problem statement, objective, Scope etc (Select suitable topic of domain and explain it as per the template-IV)	Graded Activity on background study (market survey, customer survey, literature Survey) of domain area of interest	Drafting literature review and Synopsis (Template IV)
Week 6	NIL	Project Review 1 Presentation	Problem Definition and Objectives

WEEK NO	INSTRUCTIONS	STUDENT'S GROUP ACTIVITIES	EXPECTED OUTCOME
Week 7	Guidelines and tools for Analysis and Design of the Project and problem solving sessions	Analysis and Design of the Project	Best practices for Analysis and Design
Week 8	Guidelines and tools for the Project Planning, Introduction to Block Diagram, System Architecture	Make use of Project Planning Tools and Design Tools	Best practices for Project Planning and Design
Week 9	Presentation, discussion and doubt clearing based on • Working on Algorithms • Working on Design/ System Architecture • Working on Analysis/ CAD modeling	Graded Activity on Project Design and Planning	Best practices of Project Planning and Design
Week 10	NIL	Project Review 2 Presentation	Project Planning, Design of a solution
Week 11	Guidelines and tools for report writing	Project Report Writing	Effective Report Writing Practices
Week 12	How to give effective presentation on project	Report Writing and Presentation	Effective Documentation of the Project
Week 13	NIL	Project Review 3 Presentation	Final Report and Presentation
Week 14	NIL	Examination: Final Demonstration and Presentation	Problem Statement, Objectives, Design and Planning

MIT Academy of Engineering (An Autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2019 – 2023)	
SCHOOL OF MECHANICAL AND CIVIL ENGINEERING	**W.E.F**	**AY:** 2020 - 2021
SECOND YEAR BACHELOR OF TECHNOLOGY	**COURSE NAME**	Environmental Science
	COURSE CODE	CV203
	COURSE CREDITS	AUDIT
RELEASED DATE : 01/07/2020	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/ PRACTICAL	PRESENTATION/ DEMONSTRATION	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA			
1	NIL	NIL	NIL	NIL	NIL	NIL	NIL

PRE-REQUISITE :

COURSE OBJECTIVES :

CV203.CEO.1: Create awareness about environmental problems among future citizens.
CV203.CEO.2: Interpret basic knowledge about the environment and its allied problems.
CV203.CEO.3: Develop an attitude of responsibility for the environment and society.
CV203.CEO.4: Perceive the importance of sustainable development

COURSE OUTCOMES :

The students after completion of the course will be able to,

CV203.CO.1: summarize the importance of ecosystem and biodiversity for maintaining ecological balance.
CV203.CO.2: identify environmental problems arising due to engineering and technological activities and the science behind those problems
CV203.CO.3: categorize the major pollutants along with sources and abatement devices for the environmental management.
CV203.CO.4: perceive the social and professional responsibility towards the environment.

Theory		
Module I	**Overview of Environment**	
Environmental Pollution: Air, Water, Soil, Solid and Hazardous Waste Management; Environment and human health, Overutilization of natural resources, Environmental Legislation, Environmental monitoring organizations in India, Environmental Protection Agency (EPA)		
Module II	**Environmental Pollution**	
Students have to visit any one non hazardous polluted site for finding the various reasons of its pollution and suggest preventive measures for it. Prepare the detailed report on it along with the photos. This could be completed in a group.		
Module III	**Global Environmental Issues**	
Introduction to: Climate change, Global warming, Acid rain, Ozone layer depletion, Plastic waste management, Municipal solid waste management, Food problem, E-waste management, Social Issues: Environmental ethics and economics.		
Module IV	**Sustainable Development**	
Concept of sustainable development, International Institute of Sustainable Development (IISD) : Introduction and Sustainable goals, Environmental Audits, Rainwater harvesting and Water management techniques.		

Activity Based Learning and Evaluation:		
Activity No. 1	**Site Visit**	
Students have to visit any one nonhazardous polluted site for finding the various reasons of its pollution and suggest preventive measures for it. Prepare the detailed report on it along with the photos. This could be completed in a group.		
Activity No. 2A	**Students has to perform any one of the following activities : 2A or 2B)**	
Students have to organize any one of the following activities in the institute and prepare a detailed report on their experience of organizing and conducting the activity, its possible benefits to the environment along with the photos. This could be completed in group of students: 1. No Car and Bike Day 2. Shutting down the fans and air conditioning systems of the campus for an hour. 3. Environmental awareness programs like organizing essay competition, poster competition, slogan making competition or any other related to it. 4. Celebrating various environmental days. 5. Any other similar activity related to the environment.		
Activity No. 2B	**Project Work**	
Students have to identify the real life environmental problems from their daily observations and try to find out the various feasible solutions for it as their project work. They are supposed to prepare the prototype, demonstration model, poster, detailed report and present it to the evaluators. The project should be related to the below mentioned heads: 1. Reuse, Recycle and Reduce 2. Environmental Pollution Monitoring and Control 3. Material Balance Concept 4. Sustainable Development 5. Environmental Innovations The evaluation is based on at least one number of project presentation reviews apart from the final project presentation.		

TEXT BOOK

1. R. J. Ranjit Daniels and Jagdish Krishnaswamy, Environmental Studies, Wiley India Publications, ISBN: 9788126519439.
2. Rao C.S. Environmental Pollution Control Engineering, Wiley Eastern Publications, ISBN: 9780470217634.
3. Cunningham W.P. and Cunningham M.A., Principles of Environmental Science, Tata McGraw-Hill Publishing Company, New Delhi, 2002.
4. Miller T. G. Jr., Environmental Science, Wadsworth Publishing Co., ISBN-10: 1111988935 ISBN: 9781111988937.

REFERENCE BOOK

1. H. S. Peavy, D. R. Rowe and G. Tchobanoglous, Environmental Engineering, McGraw Hill, ISBN: 84-282-0447-0.
2. Helen Kavitha Principles of Environmental Science, Sci tech Publications, 2nd Edition, 2008. ISBN: 9780444430243.
3. Henry J.G. and Heinke G.W., Environmental Science and Engineering, 2nd Edition, Prentice Hall of India, New Delhi, 2004, ISBN: 978-0131206502.
4. Metcalf Eddy Wastewater engineering: Treatment and reuse, McGraw Hill, ISBN: 007041878.

MIT Academy of Engineering (An Autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2019 – 2023)	
SCHOOL OF MECHANICAL AND CIVIL ENGINEERING	**W.E.F**	2020 - 2021
SECOND YEAR BACHELOR OF TECHNOLOGY	**COURSE NAME**	Materials Engineering
	COURSE CODE	ME221
	COURSE CREDITS	4
RELEASED DATE : 01/07/2019	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/ PRACTICAL	PRESENTATION/ DEMONSTRATION	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA			
3	2	35	35	30	NIL	50	150

PRE-REQUISITE :

COURSE OBJECTIVES:

ME221.CEO.1: To illustrate the fundamental properties of various engineering materials and demonstrate the need and applications of different heat treatment processes to it.

ME221.CEO.2: To explain the structure- property co relationship as a basis for performance of materials.

ME221.CEO.3: To identify the most appropriate material and the required manufacturing process for the given project in the industry/research fields.

ME221.CEO.4: To categorize the various material testing methods and characterization techniques and make use of it to apply for given component/product.

COURSE OUTCOMES:

The students after completion of the course will be able to,

ME221.CO.1: Relate the applications of various engineering materials and heat treatment processes in material processing industry.

ME221.CO.2: Interpret the specifications, composition, concepts and fundamental properties of engineering materials applied in industrial/research field.

ME221.CO.3: Select the suitable materials, manufacturing process for specified application to meet the product performance requirements within its product service life.

ME221.CO.4: Analyze the suitable material testing and characterization technique to ensure service life for specific product without any failure or deterioration in its performance.

THEORY COURSE CONTENT		
UNIT 1	**Ferrous, Nonferrous metals and alloys**	**14 HOURS**

Basics of extractive metallurgy-

Importance of metallurgy in day to day life and in industry, Overview or introduction of raw material processes of steel (Melting, Continuous casting, rolling)

Ferrous metals-

Steels-Classifications and specifications of steels and cast iron as per ASTM, SAE and Indian Standard designation system. Iron (Fe)-Iron Carbide (Fe3C) equilibrium diagram, Critical cooling rate, transformation products of Austenite-Pearlite-Martensite, Alloy steels- High Strength Low Alloy (HSLA), Boron steel, Stainless steel- Austenitic, Ferritic, Martensitic, Maraging steels- Significance, composition and applications.

Cast Irons- Classification, Manufacturing, Composition, Properties & applications of white C.I., Grey cast iron, malleable C.I., S.G. cast iron, chilled and alloy cast iron, effect of various parameters on structure and properties of cast irons. Specific applications such as machine tools, automobiles, pumps, valves etc.

Heat treatment of steels- Time- Temperature Transformation Diagram, Annealing-Conventional, Normalizing, Comparison of Annealing and Normalizing, Hardening- effects of different media- water, oil, salt bath, Vacuum Hardening (Latest oxygen free Heat treatment), Tempering- High-medium-low temperature Defects due to heat treatment- Quench cracks, oxidation, overheating. Classification of surface hardening treatments- Carburizing, Nitriding, Carbonitriding, flame hardening, induction hardening, Anodizing

Non-ferrous metals- Classification, Composition, Properties & applications of: Copper and Its Alloys-Alpha, beta and gamma brasses, Nickel and Its alloys-Inconel- Monel-Invar-Elnivar-Alnico, Aluminium and Its alloys-LM6-LM11- LM13-LM14-Hinduminium (RR350).

Bearing materials and its applications- Properties of bearing materials, Materials-Tin based babbits, Lead based babbits, Gray Cast Iron, Non-metallic bearings-Nylon, Polyamide, Self-lubricating bearings-powder metallurgical bearings

UNIT 2	**Non-metallic materials-Polymers, Ceramics and Composites**	**8 HOURS**

Classification of polymers, Polymer types-thermoplastics-thermoset-Elastomers, Polymer synthesis and processing-injection moulding-extrusion-blow moulding-calendaring, Degradation of polymers-chemical, thermal-biological- mechanical. Polymer recycling methods Introduction to Advanced Ceramics-Barium Titanate, Barium Zirconium Titanate and Barium Calcium Titanate(BZT-BCT) Ferrites, Silicon Carbide, Alumina, Ceramics, its classifications and their applications. **High Performance Polymers:** Acrylo Butadiene Styrene- Polycarbonate-Polyamide, Polymethyl Methacrylate: Characteristic, properties and evaluation

Composites: Need of composites, fabrication and testing of composite material, Particle-reinforced composites, large-particle composites, dispersion-strengthened, Fiber-reinforced composites, polymer-matrix composites, metal-matrix composites, ceramic matrix composites, carbon–carbon composites, structural composites, laminar composites. Case study for industrial applications.

UNIT 3	Strength of materials	6 HOURS

Strengthening mechanisms: Refinement of grain size, Cold working/strain hardening, Solid solution strengthening, Dispersion strengthening. Heat treatment of nonferrous metals: Precipitation, Age hardening and homogenization Creep strength, High temperature-intergranular and low temperature-trans granular fracture of materials, Fracture toughness properties of materials applied in cryogenic and high temperature- rocket and aerospace applications, Fracture toughness improvement methods-shot peening

UNIT 4	Powder metallurgical materials	8 HOURS

Basic steps of powder metallurgy process, classification & methods of powder manufacturing, characteristics of metal powders, Conditioning of metal powders (Screening, Blending & mixing, annealing), Compaction techniques (cold compaction, hot compaction, Isostatic compaction & powder rolling), mechanism & importance of sintering, Pre-sintering & sintering secondary operations.
Advantages, limitations and applications of powder metallurgy. Production of typical P/M components (with flow charts), self-lubricated bearing, cemented carbides, cermets, refractory metals, electrical contact materials, friction materials, and diamond impregnated tools, friction plate, clutch plate, commutator brushes.

UNIT 5	Corrosion and its prevention techniques	6 HOURS

Classification of corrosion- Dry corrosion & wet corrosion, Mechanism of corrosion, Types of corrosion: Pitting corrosion, stress corrosion, season cracking, Cavitation corrosion, caustic embrittlement, intergranular corrosion, crevice corrosion, erosion corrosion, uniform corrosion, galvanic corrosion,
Corrosion prevention methods- classification of different methods, e.g. inhibitors, Cathodic & anodic protection, internal & external coatings, Low & High temperature corrosion. Design against corrosion.

UNIT 6	Introduction to Advanced Materials-Nanomaterials, Magnetic, Piezoelectric materials	6 HOURS

Nanomaterials-Basic concepts of Nano science and Nanotechnology,Nanomaterials synthesis methods- Top down and bottom up approach, Sol gel technique, solution blending, laser vaporization, arc discharge method Carbon nanotubes and its classification, Graphene Principle of SEM, TEM and AFM, X ray diffraction, Fundamentals principles of SEM, SE and BSE imaging modes, Fracture mode analysis and failure analysis using SEM.AFSEM-Correlative SEM-AFM analysis
Magnetic materials- Soft & Hard Ferrites, Vibrating Sample Magnetometer for studying hysteresis curve of magnetic materials.
Dielectric material- Piezo electric and Ferro electric materials and their applications, superconductors. Modern Materials for high, low temperatures and Cryogenic applications

PRACTICAL: **Perform the following experiments.**		
PRACTICAL NO. 1	Jominy End Quench Test	**2 HOURS**
Jominy End Quench Test for hardenability.		
PRACTICAL NO. 2	Izod Impact Test	**2 HOURS**
Izod impact test		
PRACTICAL NO. 3	Charpy Impact Test	**2 HOURS**
Charpy impact test		
PRACTICAL NO. 4	Hardness Test	**2 HOURS**
Vickers hardness test		
PRACTICAL NO. 5	Hardness Test	**2 HOURS**
Rockwell hardness test		
PRACTICAL NO. 6	Hardness Test	**2 HOURS**
Poldi hardness test		
PRACTICAL NO. 7	Dye Penetrant Test	**2 HOURS**
Dye Penetrant Test for detection of surface level flaws in materials		
PRACTICAL NO. 8	Ultra-sonic Test	**2 HOURS**
Ultra-sonic test for detection of internal flaws in materials.		
PRACTICAL NO. 9	Case study-based experimentation	**4 HOURS**
Selection and performance of suitable hardness testing method for the given industrial components.		
PRACTICAL NO. 10	Microstructural analysis of steels	**2 HOURS**
Microstructural analysis of steels		
PRACTICAL NO. 11	Microstructural analysis of Cast irons	**2 HOURS**
Microstructural analysis of Cast irons		

TECHNICAL PAPER PRESENTATION/PUBLICATION ASSESSMENT PROCESS

1. Course champion should conduct meetings with faculty members, students from all disciplines for the given semester regarding following points-Importance of paper publication at SY level for placements/research work, plagiarism, research ethics, technical paper formation and publication process, demonstration of experimental and review paper formation.
2. Each faculty member should form students' groups in practical session as per students' interest domain selected from any content form the syllabus or from content beyond syllabus.
3. Each student groups will download the research papers, discuss the various technical points and doubts with peers and faculty member during the time left after conduction of practical in laboratory session as a continuous process for all weeks during semester.
4. In case of doubts are unsolved within particular practical session, then doubts are discussed within course meeting held weekly and the information is conveyed back to students to complete the loop.
5. Faculty members should display the list of Scopus/web of science indexed journals with no article processing fee or SPPU UGC CARE included journals' list and list of conferences scheduled within the semester to students and motivate students to prepare drafts.
6. The drafts are prepared by students and reviewed by faculty member, team of materials Engineering and then DRC should be done to receive suggestions on the paper draft.
7. The evaluation of the assessment can be said as complete if students' groups are able to
   (a) Publish the paper in journal or conference proceedings which are Scopus indexed or web of science indexed
   (b) Students' group has received the acceptance for the publication of their paper.
8. In case any students' group is not able to publish or receive the acceptance then minimum criteria is to communicate the paper and receive at least review 1 from reviewers of the paper with no major corrections. Communication to the journal for the paper with no major corrections and possibility of publication is mandatory for all project groups.

PROJECT BASED LEARNING- CONTENT BEYOND SYLLABUS

A group of 3 students will be given following set of experiments which needs to be performed to prepare a review report based on the practical observations, literature review discussions among peers and faculty members:

1. Identification of failure mode (cup/cone/brittle/ductile) of the given failed component obtained from any manufacturing company or workshop
2. Selection of suitable destructive and non-destructive testing method for the given component which has defects obtained from any manufacturing company or workshop

TEXT BOOK

1. Material Science & Metallurgy for Engineers, Dr. V.D. Kodgire & S. V. Kodgire, Everest Publications.31st Edition, ISBN No: 8186314008
2. Mechanical Behavior & Testing of Materials, A. K. Bhargava, C.P. Sharma P H I Learning Private Ltd. 2011 edition, ISBN No 13-9788120342507

REFERENCE BOOK

1. Engineering Metallurgy, Higgins R. A., Viva books Pvt. Ltd., 2004 ISBN No 13-9788176490276
2. Material Science & Engineering, Raghavan V., Prentice Hall of India, New Delhi. 2003 ISBN No 13-9788120324558
3. Introduction to Physical Metallurgy, Avner, S. H., Tata McGraw-Hill, 2014, ISBN 13-9780074630068
4. Materials Science & Engineering, W. Callister, Wiley Publications,2013, ISBN No 13-9788126521432
5. Physical Metallurgy for Engineers, Clarke D.S. & Varney W.R. Affiliated East-West Press, New Delhi ISBN No 13-978-8176710350

MIT Academy of Engineering (An autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2019 – 2023)	
SCHOOL OF MECHANICAL AND CIVIL ENGINEERING	**W.E.F**	**AY:** 2020 - 2021
SECOND YEAR BACHELOR OF TECHNOLOGY MECHANICAL ENGINEERING	**COURSE NAME**	Machines & Mechancisms
	COURSE CODE	ME234
	COURSE CREDITS	4
RELEASED DATE : 01/07/2020	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA	PRACTICAL	DEMONSTRATION	
3	2	35	35	30	NIL	50	150

COURSE OBJECTIVES :

ME234.CEO.1: To recall the concept of degrees of freedom, and interrelate inversions of various mechanisms with respect to their applications.
ME234.CEO.2: To learn the kinematic analysis of mechanisms with graphical solutions.
ME234.CEO.3: To illustrate the analysis of power transmission elements: Belt and rope drives using analytical methods.
ME234.CEO.4: To develop competency in Drawing cam Profile.
ME234.CEO.5: To formulate the equations of transmission ratios in simple and Epicyclic Gear trains.
ME234.CEO.6: To explain the characteristics of gyroscopic couple and flywheels.

COURSE OUTCOMES :

The students after completion of the course will be able to,

ME234.CO.1: State the concept of degrees of freedom and select suitable mechanisms for the engineering applications.
ME234.CO.2: Determine kinematic analysis (Velocity, acceleration, Inertia forces) for a given mechanism using graphical methods.
ME234.CO.3: Calculate the velocity ratio's of belt and rope drives with analytical methods and suggest suitable applications.
ME234.CO.4: Sketch different types of cam profiles for a given follower motions using drawing tools.
ME234.CO.5: Solve the numericals based on simple and epicyclic gear trains using formula methods.
ME234.CO.6: Analyze the effect of gyroscopic couple and turning moment diagrams for flywheel.

THEORY COURSE CONTENT		
UNIT 1	**Introduction to Mechanism**	**6 HOURS**
Kinematic link, Types of links, Kinematic pair, Types of constrained motions, Types of Kinematic pairs, Kinematic chain, Types of joints, Mechanism, Machine, Degree of freedom (Mobility), Kutzbach criterion, Grubler's criterion, Inversion, Four bar chain and its inversions, Slider crank chain and its inversions, Double slider crank chain and its inversions **Self Learning:** Robot Architecture and related mechanisms		
UNIT 2	**Kinematic analysis of plane mechanism**	**6 HOURS**
Displacement analysis. Instantaneous center of Rotation, Body centrode and Space centrode. Kennedy theorem. Velocity analysis by graphical method. Acceleration analysis by graphical method. Coriolis component of acceleration. Klein's construction. D'Alembert's principle. Dynamic Force analysis		
UNIT 3	**Belt, Rope and Chain Drives**	**6 HOURS**
Belt Drives: Type of belts, Tension ratio in belts, Initial tension, Open & cross belt drive, Slipping of Belts, creep. Length of belt, Power transmitted by belt, chain drives. Advantages & Disadvantages of chain drive. **Self Learning:** Timer Belt applications		
UNIT 4	**Cams and followers**	**6 HOURS**
Classification of cams. Classification of followers. Terminology. Motions of followers. Construction of Cam profiles. Cam jump phenomenon.		
UNIT 5	**Simple and Epicyclic Gear Trains**	**8 HOURS**
Classification of gears. Terminology of gears. Fundamental law of gearing. Interference and undercutting. Helical gears. Virtual number of teeth. Center distance of helical gears. Efficiency of Spiral gears. Worm and worm wheel. Epicyclic Gear trains.		
UNIT 6	**Gyroscope, Governors and Flywheel**	**8 HOURS**
Gyroscopic torque. Gyroscopic effect in Aero planes, Naval ships. Introduction to governor and types, Introduction to flywheel. Turning moment diagram. Flywheel analysis.		

PRACTICAL: Perform the following experiments.		
PRACTICAL NO.01	**Project based learning to create a prototype of a mechanism**	**6 HOURS**
To model the mechanism using software (Mechanalyser or other suitable software) and Create Prototype of any inversion of a specific Mechanism		
PRACTICAL NO.02	**Velocity and Acceleration Analysis of a specific Mechanism**	**4 HOURS**
Prepare a drawing sheet for Velocity and Acceleration Analysis of a specific Mechanism, simulate it using software (Mechanalyser or other suitable software).		
PRACTICAL NO.03	**Dynamic Force Analysis of a slider crank mechanism using Klein's Construction**	**2 HOURS**
Prepare a drawing sheet for Dynamic force Analysis of a single slider Mechanism, simulate it using software (Mechanalyser or other suitable software).		
PRACTICAL NO.04	**Modeling and Analysis of Belt Drive**	**4 HOURS**
Mathematical Modeling and Analysis of Belt drive using MATLAB or other suitable software.		
PRACTICAL NO.05	**Cam Follower Mechanism**	**2 HOURS**
To Draw the profile of the cam using Mechanalyser or other suitable software and simulate the same for a given Motion of Cam		
PRACTICAL NO.06	**Epicyclic gear trains**	**2 HOURS**
Analysis of Epicyclic gear trains to calculate transmission ratio's and simulation.		
PRACTICAL NO.07	**Gyroscopic couple of Uniform disc**	**2 HOURS**
Experimentally Determine the Gyroscopic couple of Uniform disc		
PRACTICAL NO.08	**Determine the M.I. of Flywheel**	**2 HOURS**
Experimentally determine the moment of inertia of a flywheel		

TEXT BOOK

1. John Uicker, Joseph Shigley, 'Theory of Machines and Mechanisms', Oxford University Press. ISBN: 9780190264482
2. N. K. Mehta, Machine Tool Design and Numerical Control, Tata McGraw Hill Publication. ISBN: 13: 978-125900457
3. J.S.Rao, "Mechanisms and Machine Theory", Wiley, ISBN-13 : 978-0470211311
4. S. S. Rattan, 'Theory of Machines', McGraw Hill Publications. ISBN:13: 978- 9351343479
5. A. G. Ambekar, Mechanism and Machine Theory, PHI. ISBN: 9788120331341
6. Ballaney, P., "Theory if Machines and Mechanisms", 2005, ISBN 9788174091222 / 817409122X Khanna Publications

REFERENCE BOOK

1. Thomas Bevan, 'The Theory of Machines', Pearson Publications. ISBN: 9788131729656
2. R L Norton, Kinematics and Dynamics of Machinery, McGraw-Hill. ISBN-13: 978-9351340201
3. Kenneth J Waldron, Gary L Kinzel, Kinematics, Dynamics and Design of Machinery, Wiley. ISBN: 978-1-118-93328-2
4. Meriam, J L and Kraige, L G, Engineering Mechanics: Dynamics, Wiley. ISBN: 9780471429173
5. D.K. Pal, S.K. Basu, Design of Machine Tools, Oxford & Ibh Publishing Co Pvt. Ltd. ISBN-13: 9788120417779
6. Bansal, R. K., "Theory of machines", Laxmi Publications Pvt. Ltd, New Delhi
7. C. S. Sharma & Kamlesh Purohit, "Theory of Machine and Mechanism", PHI.

MIT Academy of Engineering (An autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2019 – 2023)	
SCHOOL OF MECHANICAL AND CIVIL ENGINEERING	**W.E.F**	**AY:** 2020 - 2021
SECOND YEAR BACHELOR OF TECHNOLOGY MECHANICAL ENGINEERING	**COURSE NAME**	Fluid Mechanics
	COURSE CODE	ME235
	COURSE CREDITS	4
RELEASED DATE : 01/07/2020	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA	PRACTICAL	DEMONSTRATION	
3	2	35	35	30	50	NIL	150

COURSE OBJECTIVES :

ME235.CEO.1: To recall properties and basic concepts of fluid mechanics.
ME235.CEO.2: To observe flow patterns and able to classify the flow.
ME235.CEO.3: To apply various fluid dynamic equations to flow field.
ME235.CEO.4: To analyze and minimize various losses in flow field.
ME235.CEO.5: To predict the behavior of flow field in real life.

COURSE OUTCOMES :

The students after completion of the course will be able to,

ME235.CO.1: Interpret the properties and behavior of the fluid at rest and in motion.
ME235.CO.2: Explain different parameters related to fluid kinematics to visualize the fluid flow.
ME235.CO.3: Utilize different equations of fluid flow to compute the velocity and discharge.
ME235.CO.4: Analyze the laminar and turbulent internal flows considering the losses.
ME235.CO.5: Evaluate various parameters related to the flow around immersed bodies and present the governing equation in non dimensional form.

THEORY COURSE CONTENT		
UNIT 1	**Fundamental Concepts and Fluid Statics**	**8 HOURS**
Fundamental Concepts: Continuum, fluid properties – Viscosity along with Non Newtonian Fluids, Vapor Pressure, Cavitation, Bulk Modulus and compressibility. Classification of fluid. **Fluid Statics:** Pressure, Pascal's law, Static pressure variation for incompressible and compressible fluids, Hydrostatic equation, Application to manometer, Forces on submerged surfaces, Buoyancy, stability and Archimedes' Principle.		
UNIT 2	**Fluid Kinematics**	**6 HOURS**
Description of flow field - Langragian and Eulerian approach, Acceleration, Classification of flow field, Continuity Equation, Fluid element's translation, rotation and deformation, Flow patterns streamlines, path lines and streak lines, Circulation, Vorticity, stream function and velocity potential function. Free and Forced Vortex Flow		
UNIT 3	**Fluid Dynamics**	**7 HOURS**
Forces acting on fluid, Forces in Navier–Stokes and Reynolds equation, Euler's equation, Bernoulli's equation and its application- Venturimeter, Orificemeter and Pitot Tube. Flow through the orifice and notches. Kinetic energy and Momentum correction factor. Flowmeters: Ultrasonic, Electromagnetic, Laser Doppler Velocimetry, Particle Image Velocimetry		
UNIT 4	**Flow Through Pipes and Head Losses**	**9 HOURS**
Reynolds Number and its significance in flow, Laminar flow through pipes and ducts, Deriving velocity profile using NS equation and developing expression to compute other quantities-flow rate, pressure drop, shear stress, friction factor etc. Introduction to Turbulent flow **Head losses-** Major and Minor losses, Moody's Chart, Pipes in series, Equivalent pipe, HGL, TEL.		
UNIT 5	**External Flows**	**7 HOURS**
Boundary layer theory, Boundary layer thickness:-displacement, momentum and energy. Separation of Boundary Layer and Methods of Control, Drag force on flat plate due to boundary layer formation, Forces on immersed bodies: -Lift and Drag, Bluff and streamline body. Terminal velocity, Drag and lift on stationary and rotating cylinder, Magnus effect, Drag on sphere, Aerofoil terminology.		
UNIT 6	**Dimensional Analysis**	**5 HOURS**
Fundamental and derived units and dimensions, Dimensional Homogeneity, Methods of Dimensional Analysis- Rayleigh's Method & Buckingham's pi theorem, Dimensionless Numbers and model laws, similitude		

Important Instructions:

1. Practical/Project has to be performed in a group of maximum 4 students..
2. Students have to submit the detailed report on each practical/project.

PRACTICAL:

PRACTICAL NO.01	**Design a pipe system**	**8 HOURS**

Design a pipe system for a pump of specified power, specified pump efficiency, which should deliver specific discharge of fluid up to a specific height. In order to complete the above practical, students has to do following activities

1. To determine viscosity of the fluid
2. Identify the type of flow by using Reynold's experiment
3. Calculate all the losses in flow field (except losses in the pump)
4. Plot the velocity profile and visualize the flow by using CFD tools

PRACTICAL NO.02	**Discharge Measurement**	**4 HOURS**

1. Pipe Flows: Using magnetic flow meter, Venturimeter and Orificemeter.
2. Open Channel Flow: Using Notches

PRACTICAL NO.03	**Analyzing the Internal & External Flows**	**6 HOURS**

In order to complete the above practical, students has to do following activities

1. Verify the Bernoulli's Theorem for Internal Flow
2. Plot the pressure distribution around a aerofoil shape by using wind tunnel

PRACTICAL NO.04	**Mini Project**	**6 HOURS**

Students have to identify real-world situation/problem related to applications of basic fluid mechanics concepts and prepare the working model or prototype for the selected project along with the detailed report.

TEXT BOOK

1. Dr. R.K. Bansal, "Fluid Mechanics", Laxmi Publication, 2017, ISBN No. 9788131808153
2. Dr. P.N. Modi, Dr. S. M. Seth, "Fluid Mechanics and Hydraulic Machines", Standard book house,2009, ISBN No. 78-8189401269
3. Frank M. White, "Fluid Mechanics", McGraw Hill Publications, 2010, ISBN-13: 978-0077422417
4. Streeter and Wylie, "Fluid Mechanics", McGraw Hill, ISBN-13: 978-0070622425
5. Munson, "Fundamentals of Fluid Mechanics", Wiley, 2001, ISBN-13: 978-0471442509

REFERENCE BOOK

1. Kundu, Cohen, Dowling,"Fluid Mechanics", Elsevier India, 2015, ISBN-13: 978-0124059351
2. YunusCengel, John Cimbala, "Fluid Mechanics Fundamentals and Applications", McGraw Hill, ISBN-13:978-0-07-070034-5
3. Som, Biswas and Chakraborty, "Introduction to fluid mechanics and fluid machines", McGraw Hill,2017, ISBN-13: 978-0071329194
4. FOX, McDONALD, PRITCHARD, "Fluid Mechanics", Wiley publication,2015, ISBN No. 978-81-265-4128-7
5. R. C. Hibbeler, "Fluid Mechanics", Person Publication, 2018, ISBN No. 978-93-325-4701-8
6. John Anderson Jr. "Computational Fluid Dynamics the basics with application" McGraw Hill, 2012, ISBN: 9781259025969

MIT Academy of Engineering (An Autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2019 – 2023)	
SCHOOL OF MECHANICAL AND CIVIL ENGINEERING	**W.E.F**	2020 - 2021
SECOND YEAR BACHELOR OF TECHNOLOGY	**COURSE NAME**	Engineering Informatics
	COURSE CODE	ME222
	COURSE CREDITS	4
RELEASED DATE : 01/07/2019	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA	PRACTICAL	DEMONSTRATION	
3	2	35	35	30	NIL	50	150

COURSE OBJECTIVES:

ME222.CEO.1: To introduce facts, concept and theory of an information system for understanding the evolution of an information.

ME222.CEO.2: To explain the Information Life Cycle (ILC).

ME222.CEO.3: To develop IoT based information system.

COURSE OUTCOMES:

The students after completion of the course will be able to,

ME222.CO.1: Understand data and its types, information and knowledge of information life cycle (ILC).

ME222.CO.2: Make use of sensors, data acquisition systems (DAS) and design of experiment (DoE).

ME222.CO.3: Identify various data storage, data transmission, data analysis, data prediction and optimization techniques.

ME222.CO.4: Learn in depth knowledge of data/information visualisation and hands on experience on various data management and visualisation techniques.

ME222.CO.5: Understand the human computer interaction (HCI) system and computation techniques .

ME222.CO.6: Design of IoT based information system.

THEORY COURSE CONTENT		
UNIT 1	**Fundamentals of Informatics**	**8 HOURS**
Engineering Systems , Data, Types of Data: Primary data, Secondary data, Operational data, Derived data, Structured, Semi-Structured, Unstructured. Meta data : Administrative and Descriptive. Data forms: Analogy and Digital (Telephone and Stenography) ADC and DAC, Quantitative and Qualitative. Information, Knowledge of Information Life Cycle.		
UNIT 2	**Data Acquisition**	**8 HOURS**
Data Acquisition Systems (DAS): Analog and digital data acquisition system. Introduction to Design of Experiments (DoE): Data measurement and computing. Data Collection Methods: Human-machine Interface, Interview, Survey, questionnaire, observation, documents and records Hardware and Software Interface: Introduction to sensing, monitoring, control, data cards, signal conditioning, and various compatible software.		
UNIT 3	**Data Transmission & Analysis**	**6 HOURS**
Data Transmission: Introduction to data transmission, transmission terminology, transmission modes i.e. Online or Offline. Data Storage: Need of data storage, types of storage methods i.e. PC or Cloud Based etc. Data Evaluation: Quantitative and qualitative evaluation methods Data Analysis: Data analysis tools, types of data analysis i.e. statistical, predictive, diagnostic etc.		
UNIT 4	**Information Visualization**	**8 HOURS**
Introduction to data visualisation and its importance, advantages of data good data visualisation. Types of data visualisations i.e. Histograms, Box plots, Charts, Tables, Graphs, Contour plots, Maps, Infographics, Dashboards etc. Data visualisation tools and techniques: Google Charts, Tableau, Microsoft excel, Python, Minitab etc.		
UNIT 5	**Human Computer Interface**	**6 HOURS**
Basics of Human Computer Interface (HCI): Definition, its various applications Demonstrate an understanding of guidelines, principles, and theories influencing human Computer interaction Steps and types of experimental design, usability and Goals of usability, experimental testing, and evaluation of human-computer interaction systems. GUI Design Rules: Normans principles, Shneidermans rules GUI Evaluation : Neilsons ten heuristics principles		
UNIT 6	**Internet of Things**	**6 HOURS**
IoT Overview, Characteristics and Architecture Enabling technologies for IoT: smart sensors/devices, network communication, actuators, controllers, processors, softwares. IoT Ecosystem: Basic elements / building blocks of IoT application, Systematic method to design, IOT application Signal Processing: Introduction to various signal processing techniques and suitable softwares.		

PRACTICAL:		
PRACTICAL NO. 1		**2 HOURS**
Identify suitable variables from a real time system to: collect data using quantitative or qualitative techniques; store data in suitable data base represent data using visualization techniques i.e. Excel, Tableau etc.		
PRACTICAL NO. 2		**2 HOURS**
Hands on experience on various DoE techniques like Factorial, Taguchi, and Response Surface Methodology in real applications using various software like Design expert and Minitab.		
PRACTICAL NO. 3		**2 HOURS**
Practical use of sensors and data acquisition system in measuring/recording the data.		
PRACTICAL NO. 4		**2 HOURS**
Real time application of data transmission methods and techniques.		
PRACTICAL NO. 5		**2 HOURS**
Hands on practice on various data analysis softwares like Microsoft Excel, SPSS, Minitab, LabVIEW etc.		
PRACTICAL NO. 6		**2 HOURS**
Real time application of various data prediction and optimization methods.		
PRACTICAL NO. 7		**2 HOURS**
Design/development of Human-Computer interface by means of any website or mobile application.		
PRACTICAL NO. 8		**2 HOURS**
Deploy an IoT based automation system for a real time application		

TEXT BOOK

1. Ralph M Stair, George W Reynolds, "Fundamentals of Information Systems", Course Technology Inc; 5th edition, 2008, ISBN 978-1423925811.
2. Benny Raphael, Ian F. C. Smith, "Engineering Informatics: Fundamentals of Computer-Aided Engineering", Wiley-Blackwell; 2nd Revised edition, 2013, ISBN-13: 978-1119953418.
3. Paul Mcfedries, Excel Data Analysis: Your Visual Blueprint for Analyzing Data, Charts and Pivot Tables", Wiley; Fourth edition 2013, ISBN-13 978-8126544004

REFERENCE BOOK

1. Gerard Jounghyun Kim, Human Computer Interaction: Fundamentals and Practice", CRC Press, Auerbach Publications, 1 edition, 2015 ISBN 9781482233896
2. Adrian McEwen, Hakim Cassimally, "Designing the Internet of Things", Wiley, 2013 ISBN-13: 978-1118430620

MIT Academy of Engineering (An autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2019 – 2023)	
SCHOOL OF ELECTRICAL ENGINEERING	**W.E.F**	**AY:** 2020 - 2021
SECOND YEAR BACHELOR OF TECHNOLOGY	**COURSE NAME**	Rapid Prototyping
	COURSE CODE	ET235
	COURSE CREDITS	2
RELEASED DATE : 01/07/2020	**REVISION NO**	0.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA	PRACTICAL	DEMONSTRATION	
NIL	4	NIL	NIL	25	NIL	50	75

PRE-REQUISITE : ME104 - Engineering Graphics, EX102 - Electrical and Electronics Engineering, CV102 - Applied Mechanics

COURSE OBJECTIVES :

ET235.CEO.1: To learn about materiality and techniques.
ET235.CEO.2: To justify the product development cycle through prototype project.
ET235.CEO.3: To inculcate implementation of skills by proper budget planning with effective troubleshooting and practices in aesthetics & ergonomics.
ET235.CEO.4: To develop abilities to transmit technical information clearly and test the same by delivery of presentation based on the prototype Project.

COURSE OUTCOMES :

The students after completion of the course will be able to,

ET235.CO.1: Consolidate the techniques, skills and modern engineering tools.
ET235.CO.2: Apply acquired skills to the construction of a prototype project.
ET235.CO.3: Develop a prototype project by performing tasks in team.
ET235.CO.4: Demonstrate the work carried out in a team.

PRACTICAL

Course Introduction:

This course is aiming at a Project Based Learning methodology. Through a series of projects, students will learn to design, build, and debug engineering prototype systems. They will cover multiple aspects of the prototyping process.

Students will complete four modules in rotational manner,

1. Mechanical Prototyping (MP)
2. Civil Prototyping (CP)

In Mechanical prototyping, students will learn rapid prototyping skills. Students will focus on basics of CAD modeling, hands on practice on CAD software, 3D Modeling , 3D Printing, Fabrication of prototype and testing etc.

On the contrary in civil prototyping students will learn developing bamboo structures by testing and analyzing bamboo, designing bamboo joinery, and testing of bamboo structures.

Each module will have on an average six laboratory sessions. The students will complete them in rotational manner. Every module will award for 75 marks.

Marks of two modules at a time will be averaged in one semester and if student secures passing marks (passing grade) after averaging; then the required credits of the course will be earned.

For Rapid Prototyping, Semester - III

Module	**Programs**
a) Mechanical Prototyping (MP)	SY BTECH Civil Engineering, Mechanical Engineering, Chemical Engineering
b) Civil Prototyping (CP)	

For Digital Prototyping, Semester - IV

Module	**Programs**
a) Mechanical Prototyping (MP)	SY BTECH Electronics Engineering, Electronics & Telecommunication Engineering, Computer Engineering, Information technology
b) Civil Prototyping (CP)	

MODULE: 1/2	Mechanical Prototyping (MP)	28 HOURS

PRACTICAL:

PRACTICAL NO. 01	Introduction to prototyping	04 HOURS

1. Introduction to different prototyping, traditional prototyping vs. advance rapid prototyping, different types of prototyping techniques (clay modeling, casting, carpentry, metal art etc.) and their working principle.
2. Different types of materials used in prototyping model.
3. Introduction of multi axis (4D and 5D) machines used in prototyping and machining.
4. Making of paper prototyping (virtual or physical).
5. Applications and need of prototype in emerging field like Bio - medicals, defense, manufacturing, aerospace etc.

PRACTICAL NO. 2a	Basics of CAD modeling	04 HOURS

1. Introduction of CAD software.
2. Introduction of 2D, 3D Modeling using CAD software package.
3. Hands on practice of CATIA or any other CAD software.
4. Formation of students group per project team.

PRACTICAL NO. 2b	3D Modeling for prototyping	04 HOURS

1. Introduction of 3D modelling and its interaction with prototype machine
2. Identify physical constraints of prototyping.
3. Sketcher-workbench and its applications
4. Part design workbench.
5. Preparation of 3D prototyping model by CAD software for final project

PRACTICAL NO. 03	Preprocessing of 3D printing slicing	03 HOURS

1. Generating STL files of 3D models from CAD software & working on STL files.
2. Pre-Processing the 3D Model in Cuba software / kisslicer - repeater for slicing.
3. Selection of orientation of model, support generation, skin and wall thickness- depth setting.
4. Setting of printing speed, flow rate, volume, mass and time require for printing or manufacturing.
5. Practice of slicing on 3D Cad model and decide optimize parameters.

PRACTICAL NO. 04	Orientation and support generation, manufacturing planning	03 HOURS

1. Suitable filament material for 3D printing and selection and its properties.
2. Selection of material and process for making physical models by other tradition methods (machining, wood, clay, paper, polymer, etc).
3. Slicing pattern, tool path generation, G Code and gives input to prototype machine for actual part/object manufacturing.

PRACTICAL NO. 05	Manufacturing and fabrication of model	06 HOURS

1. Introduction 3D printer machines, and other machines used for prototyping.
2. Demonstration of 3D printing machine pre-setting and filament material loading.
3. Hands on experience of rapid prototype machine for part/object/model, manufacturing of conventional prototype model if any, assembly if required.
4. Calculation of cost of product, financial aspect, Bill of material (BOM), testing for prototyping, Plan to promote product/model in market, etc.

PRACTICAL NO. 06	Project presentation	02 HOURS

1. Final Presentation and demonstration of models.
2. Report submission (assessment).

REFERENCE BOOK

1. Rapid Prototyping: Principles and Applications in Manufacturing, Chua C K, Leong K F, Chu S L, World Scientific, ISBN-13: 978-9812778987.
2. Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, Gibson D W Rosen, Brent Stucker, Springer, ISBN: 978-1-4419-1119-3.
3. Rapid Prototyping: Principles and Applications in Manufacturing, Noorani R, John Wiley & Sons, ISBN: 978-0-471-73001-9.
4. Rapid Tooling: Technologies and Industrial Applications, Hilton P, Jacobs P F, CRC press. ISBN:978-0824787882
5. Rapid Prototyping and Engineering applications: A tool box for prototype development, Liou W L, Liou F W, CRC Press, ISBN: 978-0849334092.
6. Rapid Prototyping: Theory & practice, Kamrani A K, Nasr E A, Springer, ISBN: 978-0-387-23291-1.
7. Kenneth Cooper, Rapid Prototyping Technology: Selection and Application, Marcel Dekker, Inc. New York, ISBN: 082470261.

MODULE: 2/2	Civil Prototyping (CP))	28 HOURS
PRACTICAL:		
PRACTICAL NO. 01	**Introduction to civil prototyping**	**02 HOURS**
Introduction of bamboo, its physical, mechanical properties, selection, seasoning and treatment, case studies of bamboo structures.		
PRACTICAL NO. 02	**Testing & Analysis of Bamboo**	**04 HOURS**
Study of different test on Bamboo & Analysis of structures made by bamboo.		
PRACTICAL NO. 03	**Design of bamboo Joinery**	**04 HOURS**
Study of different bamboo structures, Hands on different types of joinery, axial and angular joints by different methods		
PRACTICAL NO. 04	**Making bamboo structures**	**08 HOURS**
Making of bamboo structures		
PRACTICAL NO. 05	**Testing on bamboo structure (Post Testing)**	**04 HOURS**
Testing of different bamboo structures		
PRACTICAL NO. 06	**Final project presentation**	**04 HOURS**
Comparative study of analytical and test results of the bamboo Structure, final project presentation.		

REFERENCE BOOK

1. Vector mechanics for Engineers: statics and dynamics by Beer & Johnston 10th edition, McGraw Hill Education , ISBN: 978-0073398242
2. Bamboo Architecture & Design (Architecture & Materials), by Chris van Uffelen, , ISBN: 978-3037681824
3. Designing and Building with Bamboo ,Jules J.A. Janssen Technical University of Eindhoven Eindhoven, The Netherlands, ISBN 978-8186247464
4. Codes and standards:
    - IS 1902:1993.Code of Practice for preservation of bamboo and cane for non-structural purposes.
    - IS 6874:1973 Methods of test for round bamboos
    - IS 7344:1974 Specification for bamboo tent bamboos.
    - IS 8242:1976 Methods of tests for split bamboos
    - IS 8295 (Part 1): 1976 Specification for bamboo chicks
    - ISO 22157 Standard guidelines for tensile, compressive, shear and bending Strength Parallel to grain and Perpendicular to grain.

MIT Academy of Engineering (An autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2019 – 2023)	
SCHOOL OF MECHANICAL AND CIVIL ENGINEERING	**W.E.F**	**AY:** 2020 - 2021
SECOND YEAR BACHELOR OF TECHNOLOGY MECHANICAL ENGINEERING	**COURSE NAME**	Minor Project-Implementaion
	COURSE CODE	ME240
	COURSE CREDITS	1
RELEASED DATE : 01/07/2020	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA	PRACTICAL	DEMONSTRATION	
NIL	2	NIL	NIL	NIL	NIL	50	50

COURSE OBJECTIVES :

ME240.CEO.1: To disseminate different methodical approaches to make solution.
ME240.CEO.2: To explain different conventional and modern engineering tools/techniques.
ME240.CEO.3: To engage them in creative thinking to improve the project performance using recent trends.
ME240.CEO.4: To educate about different types of prototyping.
ME240.CEO.5: To be more self efficient to solve problem in real time design environment.
ME240.CEO.6: To create awareness about Intellectual Property Rights(IPR).

COURSE OUTCOMES :

The students after completion of the course will be able to,

ME240.CO.1: Select appropriate method for making of solution.
ME240.CO.2: Compare various engineering tools/technique to develop solution.
ME240.CO.3: Justify the selected method/tools opted for making of solution.
ME240.CO.4: Develop tangible solution to defined problem.
ME240.CO.5: Test the developed solution.
ME240.CO.6: Document solution in the form of Project report / IPR drafts.

COURSE ABSTRACT

Project is an avenue to cater Societal and Industrial needs. Minor project is one of the platform which students will use to solve real time problems. This course focuses on Selection of Methods/Engineering tools/Analytical techniques for making of solution.Further it emphasizes on importance of testing of solution by various stake holders.Through this course student learns to comprehensively understand engineering fundamentals and concepts, gets practical experience, chance to showcase skills, learns about team work, communication skills and responsibilities. It also imparts knowledge of Intellectual Property Rights.

Guidelines

1. Group members should deliberate upon different methodical approaches and finalize the appropriate method.
2. Students group should explore different Engineering tools/techniques for making of solution.
3. Justify the selected method/Engineering tools/analytical techniques identified based on the feasibility, affordability and ease of use.
4. While making the solution ,its imperative to take inputs/suggestions from various stake holders.
5. Solution must be critically analyzed from aspects.
6. Completed solution must be tested by target user/stake holders.
7. Students must protect their innovation,proof of concept through IPR .
8. While working in team, individual student should contribute and communicate effectively to maintain team balance.

TIMELINE

1. IPR Activity on Earlier allocated Group : 2 Weeks (1^{st} ,2^{nd} week)
2. Presentation of Project Review -1- Finalizing title with feasibility study and approval: 2 Weeks (4^{th}, 5^{th} week)
3. Presentation of Project Review -2 Analysis and Design of Project: 2 weeks (9^{th}, 10^{th} week)
4. Preparation of Project Progress Report – I (week 11^{th} and 12^{th}) Project Phase-II
5. Project Review III (10 marks) (11^{th} week)
6. Evaluation by external examiner (End Semester by 12^{th}, 13^{th} week)

Demonstration and Presentation (50 Marks)

1. **Review 1 (Project Implementation) (10 marks)**
2. **Review 2 (Project Demostration) (10 marks)**
3. **Project Activities (10 Marks)**
   - Quiz on IPR (5 marks)
   - Patent Drafting (5 marks)
4. **Review 3 (Project Documentation) (10 marks)**
5. **Final Demonstration and Presentation (10 marks)**

WEEK NO	TASK TO BE DONE BY MENTOR	ACTIVITY TO BE PERFORMED BY STUDENTS GROUP	EXPECTED OUTCOME
Week 1	Introduction to IPR (Patent & Right) (30 min) Videos on Patent: (30 min)	Student will attempt Quiz-I IPR after the lecture (10 Questions) Graded Activity 5marks Template I	Student will learn the patents and how to search patent
Week 2	How to check patent through CDAC online portal.	Student will do prior art search for their project, and try to generate patent Abstract as per the (Template- II)	Submission of Patent Abstract as per the prescribed Template.
Week-3	Design, Architectural overview /feasibility analysis of the project, Recent trends available to improve the performance.	Discussion on system architecture/ design method/ feasibility of project idea.	Student will implement the best feasible method to generate prototype
Week-4	NIL	Review I (10 Marks) - Presentation	Student will present progress done in project prototype building.
Week-5	Searching of Patents, Drafting of Patents , Filing of Patents , types of patent Application, Patent Documents. Expert lecture on above topic.	Final Drafting of complete patent document (5 marks) Graded Activity	Student will understand the basics of drafting patents, important of filling patent Submission in LMS
Week-6	Presentation, discussion and doubt clearing based on • Working on Algorithms / Design • Working on Analysis • Developing Prototype / Programming/ Circuits etc	As per department / school	Student will learn to prevent design flaws.

WEEK NO	TASK TO BE DONE BY MENTOR	ACTIVITY TO BE PERFORMED BY STUDENTS GROUP	EXPECTED OUTCOME
Week-7	Presentation, discussion and doubt clearing based on • Working on Algorithms/Design • Working on Analysis • Testing of Prototype/ Code/ Circuits of project	As per department / school	Student will analyze for project outcome
Week-8	NIL	Review-II (10 Marks) - Presentation	Student will work for performance improvement if project not working satisfactorily.
Week-9	Regarding Final PPT For Project Faculty himself gives a presentation based on how to make effective presentation on research topics.	Student will submit the Draft PPT through LMS at the end of Week-10	Student will learn to generate PPT covering all final outcomes of the project.
Week-10	Regarding Final report Generation For Project Faculty himself gives a presentation based on how to make effective project report should explain all guidelines to be followed while preparing report	Student will submit the Draft Project report through LMS at the end of Week-10	Student report are expected to have design Analysis, and the project should be expected to one year with the same guide
Week-11	NIL	Review-III (10 Marks)-Presentation	Students are expected to prepare a detailed project report and Project PPT , they should also check for plagiarism.
Week-12	Final Project presentation and project report submission to the project coordinator. Faculty will review the student projects with external examiner	Presentation and demonstration of project.	Prototypes/Software and Final Project report

MIT Academy of Engineering (An Autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2019 – 2023)	
SCHOOL OF HUMANITIES AND ENGINEERING SCIENCES	**W.E.F**	2020 - 2021
SECOND YEAR BACHELOR OF TECHNOLOGY	**COURSE NAME**	Professional Skills
	COURSE CODE	HP 202
	COURSE CREDITS	2
RELEASED DATE : 01/07/2020	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA	PRACTICAL	DEMONSTRATION	
NIL	4	NIL	NIL	NIL	50	25	75

PRE-REQUISITE : NIL

COURSE OBJECTIVES :

HP202.CEO.1: To increase students confidence during everyday communication.

HP202.CEO.2: To increase impact of students communication during presentations and public speaking.

HP202.CEO.3: To develop Leadership qualities among students.

COURSE OUTCOMES :

The students after completion of the course will be able to,

HP202.CO.1: Express themselves effectively in routine and real-world interactions through verbal and written communication.

HP202.CO.2: Show Confident Public Speaking skills.

HP202.CO.3: To showcase leadership qualities during tough tasks, make decisions and actions effectively within time.

TUTORIALS: (SECTION A)		
TUTORIAL NO.01	**Role Plays and Picture Description**	**4 HOURS**
It helps students to sharpen their extempore skills with effective articulation and logical sequencing of content.		
TUTORIAL NO.02	**Creative Writing Skills and Presentation Skills**	**8 HOURS**
It aims at evolving effective writing skills and presentation skills.		
TUTORIAL NO.03	**Voice Modulation and Audio - Video Listening and Debate**	**8 HOURS**
To enhance listening skills and to teach the students the basic components of voice modulations and helping them practice it. It helps overcome stage fear and learn audience engagement		
TUTORIAL NO.04	**Leadership**	**6 HOURS**
Leadership qualities helps person to lead a team in achieving the set vision. It helps in planning to execute it, utilizing resources and motivating people involved in it.		
TUTORIAL NO.05	**Decision Making**	**4 HOURS**
It helps to make necessary courageous and difficult decisions and carry them into action.		
TUTORIAL NO.06	**Time Management**	**6 HOURS**
It helps organizing and planning how to divide valuable time between specific activities and prioritizing activities.		
SECTION B:	**Verbal, Reasoning and Aptitude Training through BtechGuru**	**12 HOURS**

TEXT BOOK

1. J.K.Gangal, A Practical Course in Effective English Speaking Skills, Prentice Hall India Learning Private Limited (2012), ISBN-10: 8120345843.
2. Jean Yates, Practice Makes Perfect: English Conversation, Premium Second Edition, McGraw-Hill Education; 2 edition, ISBN-10: 1259643271.
3. Brian Stacy, Speak to Win. How to Present with Power in Any Situation, AMACOM; Special ed. edition (16 February 2008). ISBN-10: 0814401570.
4. Simon Wootton and Terry Horney, Strategic Thinking A Nine Step Approach to Strategy and Leadership for Managers and Marketer, ISBN13: 9780749460778.
5. Lorin Woolfe, The Bible on Leadership: From Moses to Matthew – Management Lessons for Contemporary Leaders, ISBN-10 : 0814439438; ISBN-13 : 978-0814439432.

REFERENCE BOOK

1. J.K.Gangal, A Practical Course in Effective English Speaking Skills, Prentice Hall India Learning Private Limited (2012), ISBN-10: 8120345843.
2. Jean Yates, Practice Makes Perfect: English Conversation, Premium Second Edition, McGraw-Hill Education; 2 edition, ISBN-10: 1259643271.
3. Brian Stacy, Speak to Win. How to Present with Power in Any Situation, AMACOM; Special ed. edition (16 February 2008). ISBN-10: 0814401570.
4. Garr Reynolds, Presentation Zen: Simple Ideas on Presentation Design and Delivery (Voices That Matter) , New Riders; 2 edition (8 December 2011), ISBN-10: 0321811984.

MIT Academy of Engineering (An Autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2019 – 2023)	
SCHOOL OF HUMANITIES AND ENGINEERING SCIENCES	**W.E.F**	2020 - 2021
SECOND YEAR BACHELOR OF TECHNOLOGY	**COURSE NAME**	Liberal Learning
	COURSE CODE	HP203
	COURSE CREDITS	AUDIT
RELEASED DATE : 01/07/2020	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA	PRACTICAL	DEMONSTRATION	
1	NIL	NIL	NIL	NIL	NIL	DEMONSTRATION	NIL

PRE-REQUISITE : NIL

COURSE OBJECTIVES :

HP203.CEO.1: To create awareness about joy of learning among students
HP203.CEO.2: To teach the skills necessary to be a lifelong learner
HP203.CEO.3: To provide students with broad knowledge of the wider worlds.
HP203.CEO.4: To develop a sense of social responsibility as well as strong and transferable intellectual and practical skills.
HP203.CEO.5: To inculcate intellectual, civic, and practical capacities in students.

COURSE OUTCOMES :

The students after completion of the course will be able to,

HP203.CO.1: Develop a skill in the domain of their interest.
HP203.CO.2: Demonstrate the skills learnt in the course.
HP203.CO.3: Apply the concepts learnt in real-life situations.

NOTE : Students may select any one of the following tracks

COURSE CONTENTS

Track 1	**Introduction to photography**	**12 HOURS**

Types of camera, Basic camera controls. Light & Lenses, Understanding the Exposure Triangle. Aperture, Shutter Speed, and ISO. Auto and manual focus, Depth of field Landscape & nature photography, Creative aspects.

Track 2	**Dance**	**12 HOURS**

Study and demonstration of various dance forms such as classical, Bollywood, street dance, ballroom dance and Contemporary.

Track 3	**Creative Writing**	**12 HOURS**

Introduction to Creative Writing-How, literary aspects, different genres, forms of writing and script writing, Short Story Writing. Blog Writing.

Track 4	**Guitar**	**12 HOURS**

Parts of guitar, Names of strings, Proper right hand techniques, Proper left hand techniques, Tuning Guitar, Tuning by Ear, Tuning to a keyboard

Introduction to guitar fret board & The Chromatic Scale- The Chromatic Scale, Fret board, How to read Guitar Tablature, Finger exercises, how to read Chord Blocks.

Track 5	**Art and Craft**	**12 HOURS**

Sketching & Drawing, Elements of Art, types of art forms, types of Painting, Craft, Wrap in scrap, Best out of waste, Paper craft, Cloth craft & Rangoli.

Track 6	**Robotics**	**12 HOURS**

Introduction to Robotics, Robotics Links and joints, Selection & types of sensors, Actuators.

Track 7	**Drama**	**12 HOURS**

Learning & practicing narrations, craft and art conceptualization as an effective presentation, Survey for identification of social and global issues as a concept in script writing, Sound and illumination measures.

Understanding the audition for various sections like drama & film.

Illustrating the dialog delivery, expressions, volume, pitch in the dialog, Expression through photography and editing skill with an expertise in handling cameras, microphone, effective management skill enabling the justification through foundation till representation.

Track 8	**Yoga and Meditation**	**12 HOURS**

Concept of mind, Consciousness. Concentration techniques, Breathing exercises, Visualizations, Walking meditations. Simple yoga, Meditation and prayer, Asana and its types , Pranayama, its types and principles.

Track 9	**Automotive Skills**	**12 HOURS**

Introduction to Automotive system, Brake system, Power train of automotive, Suspension system, Computer Aided Engineering, Manufacturing and safety, Assembly and finishing.

Track 10	**Empathy & Compassion**	**12 HOURS**

Importance of Empathy, Role of empathy and compassion for engineers, Empathy activities, Skepticism About the Self, Free Will and the Situation, Recognizing emotions reading body language, improving listening skills, mindful self compassion, Compassionate Leadership,Origins of Morality, joy of giving, social responsibility, exercising social services.

Track 11	**Singing**	**12 HOURS**

Vocal cords, Voice types, Female: Soprano or alto, Male: Tenor, baritone or bass, Breathing Techniques, Role of breathing in singing, types of scales and pitches, Musical notes foundation of any song, warm-up exercises: Humming exercise, tongue twisters, vowels, Tempo of song, Tempo Markings, Practicing all octaves, analysis of songs, practicing songs.

Track 12	**Chess**	**12 HOURS**

Introduction to game of Chess. Rules, movement of pieces, strengths and weaknesses of all pieces. Stalemate, touch move, etiquette, pawn promotion and zugzwang, square of the pawn. Fundamental checkmate patterns, basic rules, special moves and rules such as castling, promotion, EnPassant, good moves for the opening.

Track 13	**RC Plane**	**12 HOURS**

Introduction to RC planes, study with categorization of planes and study of control forces on RC plane. Study of control surfaces. Study of airfoil, Studying the concepts of take-off, cruising, landing and motions during flight. Study of graphs. Study on factors affecting the flight of plane. Control and propulsion system of RC aircraft. Introduction and making of Electrical glider.

Track 14	Drone Making	12 HOURS

Three thumb rules, Basic of FAA, Combination of electronics, Frame design , Motor stator reading and dimension, Basic of electronics, Introduction to Drones, Fundamental of Flight, Airframes and Electric Motors, ESC and flight controller, Receivers And Transmitter, Battery and chargers, Basic building Tutorial with working on software(Betaflight), FPV and LOS Simulations, Working on development of Betaflight.

NOTE : More tracks will be added as per demand of the students

MIT | Academy of Engineering

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Curriculum

For

Third Year

Bachelor of Technology in Mechanical Engineering

2019-2023

(With Effect from Academic Year: 2021-2022)

MIT | Academy of Engineering **Autonomous Institute Affiliated to SPPU**	**COURSE STRUCTURE (2019 - 2023)**		
SCHOOL OF MECHANICAL & CIVIL ENGINEERING	**W. E. F**	**:**	**2021-2022**
THIRD YEAR BACHLEOR OF TECHNOLOGY IN MECHANICAL ENGINEERING	**RELEASE DATE**	**:**	**01/06/2020**
	REVISION NO.	**:**	**1.0**

SEMESTER: V

SUMMER INTERNSHIP (Audit: ME300**)**

COURSE			**TEACHING SCHEME**			**EXAMINATION SCHEME AND MARKS**						**CREDIT**
TYPE	**CODE**	**NAME**	**Hour/Week**			**THEORY**			**PRACT**		**TOTAL**	
			L	P	T	MSE	ESE	IA	T/P	DM		
DC07	ME341	Machine Design	3	2	-	35	35	30	50	0	150	4
DC08	ME342	Turbomachines	3	2	-	35	35	30	50	0	150	4
DC09	ME343	Hydraulics & Pneumatics	3	0	-	35	35	30	0	0	100	3
OE01	ME35#	Open Elective	3	2	-	35	35	30	50	0	150	4
HSS5	CS361	Project Management	2	0	-	0	50	25	0	0	75	2
SDP8	ME37#	Skill Development Course (Computer Aided Product Design)	0	4	-	0	0	25	50	0	75	2
SDP9	ME350	Project Design	0	4	-	0	0	25	0	50	75	2
TO0TAL			**15**	**12**	**0**	**140**	**190**	**195**	**200**	**50**	**775**	**21**

SEMESTER: VI

COURSE			**TEACHING SCHEME**			**EXAMINATION SCHEME AND MARKS**						**CREDIT**
TYPE	**CODE**	**NAME**	**Hour/Week**			**THEORY**			**PRACT**		**TOTAL**	
			L	P	T	MSE	ESE	IA	T/P	DM		
DC10	ME344	Design of Transmission Systems	3	2	-	35	35	30	50	0	150	4
DC11	ME346	Heat Transfer	3	2	-	35	35	30	50	0	150	4
DC12	ME347	Quality Assurance	3	0	-	35	35	30	0	0	100	3
OE02	ME36#	Open Elective	3	2	-	35	35	30	50	0	150	4
SDP10	ME38#	Skill Development Course (Mechanical Simulations)	0	4	-	0	0	25	50	0	75	2
SDP11	ME365	Project Implementation	0	4	-	0	0	25	0	50	75	2
HSS6	HP305	Employability Skills	0	4	-	0	0	25	0	50	75	2
TOTAL			**12**	**18**	**0**	**140**	**140**	**195**	**200**	**100**	**775**	**21**

Open Elective (OE): 3 Courses			
	Sl. No.	**Course Code**	**Name of Course**
Computer Aided Engineering	1.	ME351	Finite Element Analysis
	2.	ME361	Computational Fluid Dynamics-1
	3.	ME491	Computational Fluid Dynamics-2
Robotics and Automation	1.	ME352	Robot Fundamental & Kinematics
	2.	EX371	Robot Dynamics and Control
	3.	EX471	AI in Robotics /Cognitive Robotics
Automobile Engineering	1.	ME354	Automobile System Design
	2.	ME364	Vehicle Dynamics
	3.	ME494	Autotronics and e-Vehicles

MIT Academy of Engineering (An autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2019 – 2023)	
SCHOOL OF MECHANICAL AND CIVIL ENGINEERING	**W.E.F**	**AY:** 2021 - 2022
THIRD YEAR BACHELOR OF TECHNOLOGY MECHANICAL ENGINEERING	**COURSE NAME**	Machine Design
	COURSE CODE	ME341
	COURSE CREDITS	4
RELEASED DATE : 01/06/2021	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA	PRACTICAL	DEMONSTRATION	
3	2	35	35	30	50	NIL	150

COURSE OBJECTIVES :

ME341.CEO.1: To Select design procedure and Design parameters for machine Elements
ME341.CEO.2: To make use of different design standards.
ME341.CEO.3: To interpret different types of failure modes and criteria.
ME341.CEO.4: To illustrate design of different types of machine elements.
ME341.CEO.5: To develop teamwork, critical thinking and planning through design project.

COURSE OUTCOMES :

The students after completion of the course will be able to,

ME341.CO.1: Recall fundamental Design procedure and Design parameters for machine Elements. [L1]
ME341.CO.2: Illustrate Design Procedure of the Machine Elements considering failure criterias. [L2]
ME341.CO.3: Identify the various stresses induced in a machine elements for safer dimensions. [L3]
ME341.CO.4: Examine the stresses induced in machine elements for various failure modes. [L4]
ME341.CO.5: Determine the optimum and reliable solutions for the Mechanical Engineering problems based on required criteria's. [L5]

THEORY COURSE CONTENT		
UNIT 1	**Fundamentals of Machine Design**	**8 HOURS**
Introduction to Machine Design, Design Process Cycle, Design Considerations. Standards and Codes, Preferred Series, Ethics in design. Design for Manufacturing, Assembly & safety and reliability- Factor of safety, Service Factor. Design of Simple Machine Elements– Cotter joints, Knuckle joint.		
UNIT 2	**Shafts, Keys & Couplings**	**8 HOURS**
Design of Shafts on the basis of Strength, Torsional Rigidity And Lateral Rigidity. ASME Codes for shaft design. Design of Keys, Design of Couplings.		
UNIT 3	**Design Against Fluctuating Load**	**8 HOURS**
Stress Concentration – Causes and remedies, fluctuating stresses, fatigue failure, S-N curve, Endurance, Notch Sensitivity, Endurance Strength Modifying Factors, Design For Finite And Infinite life, Cumulative Damage In Fatigue Failure, Soderberg, Gerber, Goodman, Modified Goodman diagrams, Fatigue Design under combined stresses.		
UNIT 4	**Bearings**	**6 HOURS**
Classification, Static And Dynamic Load Carrying Capacities, Stribeck Equation, Load-Life Relationship, Selection of Bearing life, Selection of Rolling Contact Bearing From Manufacture's Catalogue, Bearing with probability of survival other than 90 %. Mounting of Bearings, Preloading of bearings, Failures in Bearings- causes and remedies.		
UNIT 5	**Brakes And Clutches**	**6 HOURS**
Brakes, Block Brake with Short Shoe, Block Brake with Long Shoe, Pivoted Block Brake with Long Shoe, Internal Expanding Brake, Band Brakes, Disk Brakes, Clutches, Torque Transmitting Capacity, Multi-disk Clutches, Friction Materials, Cone Clutches, Centrifugal Clutches.		
UNIT 6	**Springs**	**6 HOURS**
Types, applications and materials for springs, Stress and deflection equations for helical compression Springs, Style of ends, Design of helical compression and tension springs, Springs in series and parallel, Concentric helical springs, Surge in springs, Design of Multi-leaf springs. Helical torsion Spring. Introduction to Concepts of Design Automation, Generative Design and Topology Optimization in Design.		

PRACTICAL		
PRACTICAL NO.01	**Introduction to Conventional Drawing, Manufacturing Tolerances, Geometric Dimensioning and Tolerances.**	**06 HOURS**

1. Introduction to Conventional Machine Drawing Fundamentals
2. Application of Limits, Fits & Tolerance, and Surface finish symbols to the Simple machine elements.

   Practical 1 is to be performed by Using CAD Software. The submission of the practical work must be done by a group of 4-5 Students in terms of CAD Drawings. Each Group Should be assigned with different set of machine drawings. Use of SP 46: 2003.

PRACTICAL NO.02	**Design Project**	**20 HOURS**

Design of Assembly of Simple Machine Elements comprising of minimum three-five machine elements. It should consist of design of combination of the Simple machine element learned in Machine Design. Open ended problem statement related to current mechanical engineering applications is given to students or identified by students. The project Team will include 4-5 Members.

Each project shall consist Of Two Full Imperical Size Sheets-one involving assembly drawing with part list and overall dimensions and other involving the detailed drawing of individual components. Manufacturing tolerances, Surface finish symbols and geometric tolerances should be specified so as to make it a working drawing.

A design report giving all necessary calculations of design of components and assembly should be separately submitted in the form of a file. Design data book should be used wherever necessary.

The drawings shall be completed by drawing and drafting software's.

TEXT BOOK

1. Bhandari V. B., "Design of Machine Elements", Tata McGraw Hill, 2017. ISBN 13: 9780070681798.
2. Karwa Rajendra, "A Text Book of Machine Design", Laxmi Publication, 2006.
3. P.S. G. Design Data book (PSG College of Engg. & Tech.), DPV Printers, Coimbatore, 2012.
4. Shigley, J.E and Mischke, C. R. Mechanical Engineering Design, 6/e, Tata McGraw Hill, 2005. ISBN-13: 978-0071002929.
5. Paul H Black and O. E. Adams, P., Machine Design, 3/e, McGraw Hill Book Company, Inc., New York, USA., 2007. ISBN-13: 978-0070055247.
6. Kannaiah, P., Machine Design, 2/e, Scitech Publication Pvt. Ltd., 2009. ISBN 13: 9788183711517.
7. Norton, R. L., Machine Design: An Integrated Approach, 3/e, Pearson, 2004.
8. C.S.Sharma , Kamlesh Purohit :Design of Machine Elements PHI Learning Pvt. Ltd, 2012..

REFERENCE BOOK

1. Machine elements in Mechanical Design by R.L. Mott, Prentice Hall. ISBN: 0130618853, 9780130618856
2. Mechanical Design by P. Childs, Elsevier. ISBN: 9780080886862
3. Fundamentals of Machine Component Design by R. C. Juvinall & K. M. Marshek, Wiley. ISBN-13: 978-1118012895
4. Machine Design by R.L. Norton. ISBN: 0-13-148190-8
5. B.J. Hamrock, and S.R. Schmid, Fundamentals of Machine Elements, Tata McGraw Hill, New Delhi, 2005. ISBN-13: 978-1482247480
6. SP 46 (2003) : Engineering Drawing Practice for Schools and Colleges ,Bureau of Indian Standards

MIT Academy of Engineering (An autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2019 – 2023)	
SCHOOL OF MECHANICAL AND CIVIL ENGINEERING	**W.E.F**	**AY:** 2021 - 2022
THIRD YEAR BACHELOR OF TECHNOLOGY MECHANICAL ENGINEERING	**COURSE NAME**	Turbomachines
	COURSE CODE	ME342
	COURSE CREDITS	4
RELEASED DATE : 01/06/2021	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA	PRACTICAL	DEMONSTRATION	
3	2	35	35	30	50	NIL	150

COURSE OBJECTIVES :

ME342.CEO.1: To recall the basics of Fluid Machines
ME342.CEO.2: To summarize basic thermo-fluid dynamics flow equations
ME342.CEO.3: To construct the velocity triangle for different turbo machines
ME342.CEO.4: To examine the different performance parameters of turbo machines
ME342.CEO.5: To select the Turbo machines for required application

COURSE OUTCOMES :

The students after completion of the course will be able to,

ME342.CO.1: Classify the different turbo machines. [L1]
ME342.CO.2: Illustrate energy transfer in turbo machines using thermo-fluid dynamics equation. [L2]
ME342.CO.3: Model rotating element of turbo machines using velocity triangles. [L3]
ME342.CO.4: Analyse the overall performance of turbo machines using characteristic parameters. [L4]
ME342.CO.5: Recommend the suitable turbo machines for required application. [L5]

THEORY COURSE CONTENT		
UNIT 1	**Fundamental Concepts and Impulse Turbine**	**8 HOURS**
Fundamental Concepts: Classification of Turbomachines, Application of Turbomachines, Impulse momentum principle, Impact of jet for Stationary and Moving Plates **Series of Radial Vanes:** Types, Velocity Triangles, Analysis for work done equations and vane efficiency. **Impulse Turbine (Pelton Turbine):** Construction and Working ,Velocity Triangle Analysis, Design of Pelton Runner, Governing of Impulse Turbine		
UNIT 2	**Reaction Turbines**	**8 HOURS**
Introduction : Radial flow reaction turbine ,Head on Reaction Turbine ,Degree of Reaction **Francis Turbine :** Construction and Working ,Velocity Triangle Analysis, Design of Francis Turbine Runner, Governing of Francis Turbine **Kaplan Turbine :** Construction and Working ,Velocity Triangle Analysis, Design of Kaplan Turbine Runner, Governing of Kaplan Turbine		
UNIT 3	**Draft Tube and Performance Parameters for Turbines**	**6 HOURS**
Draft Tube : Construction and Working , Efficiency of Draft Tube **Performance Parameters:** Specific Speed, Unit Quantities, Characteristic curve of Turbines Cavitation in Reaction Turbine, Methods to avoid Cavitation		
UNIT 4	**Pumps**	**8 HOURS**
Centrifugal Pumps: Construction and Working , Velocity Triangle analysis, Heads and Efficiencies, Priming Methods, Multistage Pump ,Minimum speed for starting of Centrifugal Pump, Cavitation in Pump, Net Positive Suction Head (NPSH) **Performance Parameter :** Specific Speed, Characteristic curve of Pumps, Matching of Pump characteristic		
UNIT 5	**Compressor**	**6 HOURS**
Classification of Air Compressor : Fan, Blowers, Centrifugal Compressor, Axial Flow Compressor, Performance parameters for Fans, Blowers Application of Air Compressors **Centrifugal Compressors:** Construction and Working , Velocity Triangle analysis, Thermodynamic Analysis **Performance Parameters:** Slip factor, Power input factor, various losses in centrifugal compressor, Surging and Choking in Compressor		

UNIT 6	Jet Propulsion and Advancement in Turbomachines	6 HOURS
Gas Turbine: Gas Turbine Cycle, Types, Classification, Gas turbines engine and its components - constructional details of components - working principles of different components **Jet Propulsion:** Jet Propulsion Cycles - Turbojet, Turboprop, Turbofan. Rocket Propulsion, Ramjet Engines. Performance Characteristics **Self Study Topics:** Micro steam turbine/ expanders, Wind Turbine, Self-Priming Pump, smart submersible pump, Digital twins for Turbomachines, Turbocharged Car, Advanced Materials for Turbo vanes		

PRACTICAL		
PRACTICAL NO.01	**Impact of Jet**	**4 HOURS**
Verification of impulse momentum principle		
PRACTICAL NO.02	**Pelton Wheel**	**4 HOURS**
Trial on impulse water turbine (Pelton wheel) and plotting of main and operating characteristics		
PRACTICAL NO.03	**Francis Turbine**	**4 HOURS**
Trial on hydraulic reaction turbine (Francis Turbine) and plotting of main and operating characteristics		
PRACTICAL NO.04	**Centrifugal Pump**	**4 HOURS**
Trial on centrifugal pump and plotting operating characteristics		
PRACTICAL NO.05	**Centrifugal Air Compressor**	**4 HOURS**
Trial on centrifugal air compressor and plotting its characteristics		

ACTIVITIES : (Perform Any Two)		
ACTIVITY NO. 01	**Industrial Visit**	**4 HOURS**
Visit to Hydraulic/Steam Power Plant/ Pumping Station		
ACTIVITY NO. 02	**Design of Pumping System**	**4 HOURS**
Design of pumping system installation using manufacturers' catalogue, specific to domestic or industrial application.		
ACTIVITY NO. 03	**Design and Analysis of Vanes /Blades in Turbomachines**	**4 HOURS**
Design and Analysis of Vanes/Blades of Turbomachines using suitable software		

TEXT BOOK

1. Turbines, Compressors & Fans, S.M. Yahya, Tata-McGraw Hill. ISBN: 9781259000720
2. Turbomachines, B. U. Pai, Wiley India. ISBN: 9788126539550
3. Fluid mechanics and hydraulic machines, Dr. R.K. Bansal. ISBN-13: 978-8131808153
4. Hydraulic Machines, Dr. J. Lal, Metropolitan Book Co. Pvt. Ltd., Delhi. ISBN-13: 978-8120000261
5. Hydraulics, Fluid Mechanics and Machinery, Modi P N & Seth S N, Standard Book House, New Delhi. ISBN: 9788189401269
6. R. Yadav, Steam and Gas Turbines and Power Plant Engineering, VII edition, Central Publ. house. ISBN-13: 978-8185444352

REFERENCE BOOK

1. William W. Perg, Fundamentals of Turbomachinery, John Wiley & Sons.
2. Thermal Turbomachines, Dr.Onkar Singh, Wiley India. ISBN: 9788126546855
3. V. P. Vasandani, Theory of Hydraulic Machinery, Khanna Publishers, Delhi. ISBN-13: 978-8174092502
4. Karassik, Hand Book of Pumps, Tata McGraw Hills Ltd., New Delhi. ISBN: 9780071460446
5. S.L. Dixon, Fluid Mechanics, Thermodynamics of Turbomachinery, IV edition, Butterworth-Heinemann Publ., 1966. ISBN-13: 978-0124159549

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SCHOOL OF MECHANICAL AND CIVIL ENGINEERING	**W.E.F**	**AY:** 2021 - 2022
THIRD YEAR BACHELOR OF TECHNOLOGY MECHANICAL ENGINEERING	**COURSE NAME**	Hydraulics & Pneumatics
	COURSE CODE	ME343
	COURSE CREDITS	3
RELEASED DATE : 01/06/2021	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA	PRACTICAL	DEMONSTRATION	
3	NIL	35	35	30	NIL	NIL	100

COURSE OBJECTIVES :

ME343.CEO.1: To understand the Fluid power basic theory

ME343.CEO.2: To study of working principle of various components used in hydraulic and pneumatic systems

ME343.CEO.3: To understand the operation of hydraulics & pneumatics circuits and components typically used in industry

ME343.CEO.4: To design & Selection of different components used in hydraulic and pneumatic systems

ME343.CEO.5: To construct a range of functional hydraulic circuits. Read hydraulics & pneumatics circuit drawings

COURSE OUTCOMES :

The students after completion of the course will be able to,

ME343.CO.1: Recognize principle of various components used for hydraulic & pneumatic systems.[L1]

ME343.CO.2: Draw control circuits for hydraulic and pneumatic systems.[L3]

ME343.CO.3: Evaluate different industrial applications of hydraulic and pneumatic system.[L5]

ME343.CO.4: Design hydraulic circuits for industrial applications.[L4]

ME343.CO.5: Troubleshooting of hydraulic & pneumatic circuits through Automation studio software.[L5]

THEORY COURSE CONTENT		
UNIT 1	**Fluid Power Principles & Hydraulic Pumps**	**5 HOURS**
Introduction to Fluid power, Advantages and Applications, Fluid power systems, Types of fluids, Properties of fluids and selection, Basics of Hydraulics, Pascal's Law, Numericals on hydraulic pressure, flow and work Hydraulic fluids: types, properties and applications, Reservoirs, Strainers & filters, Fluid conductors, sealing devices, fluid couplings, Pumping Theory, Pump Classification, Construction & Working of pumps, Selection criteria of Linear and Rotary, Fixed and Variable displacement pumps		
UNIT 2	**Direction, Pressure & Flow Control in Hydraulic Systems**	**6 HOURS**
Directional Control Valves- Symbolic representation, constructional features of 2- and 3-ways valves, cheque Q meter, check valves, Pressure control valves: Unloading, sequencing, relief, pressure reducing, counterbalance. Flow Control Valves -compensated and non-compensated FCV, pressure and temperature compensated FCV, flow metering circuits, symbolic representation through Hydraulic charts,		
UNIT 3	**Control of Hydraulic Systems**	**8 HOURS**
Accumulators : Piston, bladder, diaphragm types; Actuators-single acting , double acting , tandem, telescopic ,rotary actuators, Introduction to hydraulic motors-gear type, piston type , vane type, Case study Control of slide for fast and slow movements in machines, cylinder locking control in press, control of hydraulic press circuits for accident prevention, sequencing control for multi-cylinder operation, speed control for hydraulic motor, Electro-hydraulic control for multi-cylinders connected in series and parallel, control circuits of various mechanical machines like milling, shaping, grinding machines etc., multiple pump control circuits, high pressure circuit controls using accumulators, pressure intensification circuits using intensifiers		
UNIT 4	**Pneumatics & Electro Pneumatic Control Systems**	**6 HOURS**
Pneumatic- working, Compressed air systems, Color Coding For safety in Industries, Pneumatic control valves-flow, pressure and direction, pneumatic circuits, electropneumatic circuits using positioning sensors and solenoid valves, logic gates in pneumatics and applications		
UNIT 5	**Trouble Shooting & Maintenance of Hydraulics Circuits**	**6 HOURS**
Contaminations in hydraulic circuits, Filters- Full, Proportional, Micronics, magnetic, filter ratings, filter positions and troubleshooting, Trouble shooting in pumps- pumps installation, pumps operation and maintenance, and pressure drops, troubleshooting in actuators- cylinder and motor maintenance. Preventive maintenance of hydraulic circuits and TPM schedules.		
UNIT 6	**Design of Hydraulic Circuits**	**6 HOURS**
Design of Hydraulic Circuits – Use of data tables for circuit design, design principles and hydraulic thumb rules, introduction to product catalogue of hydraulic circuits. Introduction of Automation Studio software for Circuit design		

TEXT BOOK

1. Dudley A. Pease, John J. Pippenger , Basic Fluid Power, Prentice-Hall, 1987, ISBN, 0130615080.
2. Anthony Esposito," Fluid Power with Applications", PHI / Pearson Education, 2005. ISBN:9789332518544
3. Douglas M. Considine," Process Instruments and Control Handbook" McGraw-Hill, New York. 1985 ISBN 10: 0070124280
4. Majumdar, S.R., "Pneumatic Systems – Principles and Maintenance", Tata McGraw Hill, 2007. ISBN 10: 8120800435
5. Vicker/ Eaton Hydraulic Chart / Manual.

REFERENCE BOOK

1. Shanmuga Sundaram.K, "Hydraulic and Pneumatic controls", SChand & Co, 2006. ISBN 9788121926355
2. Majumdar, S.R., "Oil Hydraulics Systems- Principles and Maintenance", Tata McGraw Hill, 2001 ISBN 0071406697
3. Micheal J, Pinches and Ashby, J.G., "Power Hydraulics", Prentice Hall, 1989. ISBN 0136874436
4. 99 Example of pneumatic application, Author G Prede & D. Schloz Publisher FESTO –AG Germany

SELF LEARNING:

ACTIVITY.1: Simulation of Hydraulic Circuit using Virtual Simulation link e4training.com
ACTIVITY.2: Design of Basic Hydraulic circuit using Hydraulic circuit training APP (Google app)
ACTIVITY.3: Simulating actuators using Hydraulic circuit training APP (Google app)
ACTIVITY.4: Simulation of fixed displacement pump) (Google app)

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SCHOOL OF MECHANICAL AND CIVIL ENGINEERING	**W.E.F**	**AY:** 2021 - 2022
THIRD YEAR BACHELOR OF TECHNOLOGY MECHANICAL ENGINEERING	**COURSE NAME**	Finite Element Analysis
	COURSE CODE	ME351
	COURSE CREDITS	4
RELEASED DATE : 01/06/2021	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA	PRACTICAL	DEMONSTRATION	
3	2	35	35	30	50	NIL	150

COURSE OBJECTIVES :

ME351.CEO.1: To understand the fundamentals of Finite Element Analysis
ME351.CEO.2: To formulate the design problems into FEA
ME351.CEO.3: To perform engineering simulations using Finite Element Analysis software
ME351.CEO.4: To understand the ethical issues related to the utilization of FEA in the industry.

COURSE OUTCOMES :

The students after completion of the course will be able to,

ME351.CO.1: Explain the fundamentals of finite element method. [L2]
ME351.CO.2: Formulate simple problems into finite elements. [L3]
ME351.CO.3: Solve for modeling and meshing of structural problems. [L3]
ME351.CO.4: Derive element matrix equation by different methods by applying basic laws in mechanics and integration by parts. [L4]
ME351.CO.5: Use professional-level finite element software to solve engineering problems in Solid mechanics. [L5]

THEORY COURSE CONTENT		
UNIT 1	**Get into FEA**	**8 HOURS**
Basics of Solid Mechanics, Basic equations of elasticity, Equilibrium equation in elasticity, plane stress, plane strains, Solution methodologies to solve engineering problem, Failure Analysis of product, Review of Theories of Failures, CAE driven design process, Past, Present & Future of FEA, FEA Terminology, General Procedure of FEA, Introduction to Types of Analysis.		
UNIT 2	**Discretization and Basic Procedure**	**6 HOURS**
Introduction to meshing/ discretization, Introduction to different element types, 1D, 2D & 3D Meshing, Mesh Quality Check, Boundary Conditions. Introduction to different approaches used in FEA such as direct approach, Variational approach, weighted residual, energy approach, Galerkin and Raleigh Ritz approach.		
UNIT 3	**1 D Elements: Springs & Bars**	**8 HOURS**
Types of 1D elements, displacement function, global and local coordinate systems, polynomial form of interpolation functions- linear, quadratic and cubic, properties of shape function, primary and secondary variables. Formulation of elemental stiffness matrix and load vector for Spring, bar using any approach, Assembly of global stiffness matrix and load vector, properties of stiffness matrix, treatment of boundary conditions- elimination approach, stress and reaction forces calculations.		
UNIT 4	**1d Elements: Beams & Truss**	**6 HOURS**
Shape functions, Formulation of elemental stiffness matrix and load vector for truss and beam using any approach, Assembly of global stiffness matrix and load vector, treatment of boundary conditions-elimination approach, stress and reaction forces calculations.		
UNIT 5	**2d Elements**	**6 HOURS**
Family of 2-D elements: plane stress, plane strain, plate, membrane, thin shell etc., effect of mesh density, effect of biasing in critical region, Two-Dimensional Stress Analysis: Plane Stress/Strain problems in 2D elasticity, constitutive relations Constant Strain Triangle(CST), Linear Strain Rectangle (LSR), displacement function, Pascal's triangle, compatibility and completeness requirement, convergence requirements, strain field, stress field, Formulation of element stiffness matrix and load vector for Plane Stress/Strain problems .Assembly of global stiffness matrix and load vector, Boundary conditions, solving for primary variables (displacement), stress calculations		
UNIT 6	**Isoparametric Elements**	**6 HOURS**
Concept of isoparametric elements, Terms isoparametric, super parametric and subparametric. Coordinate mapping : Natural coordinates, Area coordinates (for triangular elements), higher order triangular and quadrilateral elements (Lagrangean and serendipity elements), Numerical integration **Self Learning:**Linear Static Analysis, Nonlinear Static Analysis, Explicit & Implicit Methods, 2D Equation of Equilibrium, Plate, Membrane, Thin Shell, Axisymmetric Solid, Effect of mesh density & Biasing, Galerkin Weighted residual method		

PRACTICAL		
PRACTICAL NO.01		**2 HOURS**
1D Spring elements finite element MATLAB code		
PRACTICAL NO.02		**4 HOURS**
2D Truss elements finite element MATLAB code		
PRACTICAL NO.03		**2 HOURS**
Analysis of a rectangular plate with a circular hole		
PRACTICAL NO.04		**4 HOURS**
Analysis of Beam with different cross sections with different loads and validate with analytical results.		
PRACTICAL NO.05		**4 HOURS**
Analysis Bar with different cross sections with different loads and validate with analytical results.(Also take composite bars)		
PRACTICAL NO.06		**2 HOURS**
Analysis of any machine component consisting of 3-D elements using FEA Software.		
PRACTICAL NO.07		**2 HOURS**
Modeling and meshing of plate with 2 D tria and quad Element using preprocessor with quality check		
PRACTICAL NO.08		**2 HOURS**
Modeling and meshing of any 3 D machine component using Preprocessor with quality check		
PRACTICAL NO.09		**2 HOURS**
Analysis of Truss with different loading conditions and validate with analytical results.		
PRACTICAL NO.10		**2 HOURS**
Fatigue Analysis of component subjected to completely reversed, fluctuating loads		
PRACTICAL NO.11		**2 HOURS**
Analysis of spur gear		

TEXT BOOK

1. J. N. Reddy, "An Introduction to the Finite Element Method", Tata McGraw-Hill.ISBN-13-9780070513556
2. C.S. Krishnamurthy, "Finite Element Analysis: Theory & Programming, TMH Publishing Co".
3. K.J. Bathe, Finite Element Procedures, Klaus-Jurgen Bathe.ISBN-13- 978-0133173055

REFERENCE BOOK

1. Tirupathi R Chandrupatla and Ashook D. Belegundu, Introduction of Finite Element in Engineering, Prentice Hall of India, 1997.ISBN-13- 978-0132162746
2. O.C. Zienkiewicz , The Finite Element Method.ISBN-13- 978-1856176330
3. Rao S. S., The Finite Element Methods of Engineering, Pergamon Press, 1989.ISBN-13- 978-1856176613
4. Segerland L. J., "Applied Finite Element Analysis", Wiley Publication, 1984-ISBn-13- 978-0471806622
5. Gokhale N. S., Deshpande S. S., Bedekar S. V. and Thite A. N., —Practical Finite Element Analysis, Finite to Infinite, Pune

MIT Academy of Engineering (An autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2019 – 2023)	
SCHOOL OF MECHANICAL AND CIVIL ENGINEERING	**W.E.F**	**AY:** 2021 - 2022
THIRD YEAR BACHELOR OF TECHNOLOGY MECHANICAL ENGINEERING	**COURSE NAME**	Robot Fundamentals and Kinematics
	COURSE CODE	ME352
	COURSE CREDITS	4
RELEASED DATE : 01/06/2021	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA	PRACTICAL	DEMONSTRATION	
3	2	35	35	30	50	NIL	150

COURSE OBJECTIVES :

ME352.CEO.1: To understand the basics of robotics and various robot structures.
ME352.CEO.2: To describe different types of sensors and actuators
ME352.CEO.3: To discuss forward kinematics and Inverse kinematics of robots
ME352.CEO.4: To analyze different transmission system used in robot
ME352.CEO.5: To evaluate the Trajectory planning techniques used for robots
ME352.CEO.6: To apply the concepts of balancing to robots

COURSE OUTCOMES :

The students after completion of the course will be able to,

ME352.CO.1: List the key components of Industrial robot. [L1]
ME352.CO.2: Classify, sensors and actuators of industrial robots. [L2]
ME352.CO.3: Select transmission system for robots. [L4]
ME352.CO.4: Apply the kinematics and Inverse kinematics principles to robot. [L3]
ME352.CO.5: Determine the Trajectory of the given robot. [L5]
ME352.CO.6: Build the task based robot by applying knowledge of sensors, actuators.[L6]

THEORY COURSE CONTENT		
UNIT 1	**Introduction**	**6 HOURS**
Introduction and History, Specifications of Robots, Law of robots, Links and Joints, robot mechanisms ,Classifications of robot, Different configuration of robot, Work envelope ,Degree of freedom of robot , Performance of Robot ,Flexible automation versus Robotic technology Applications of robots ,Recent advancement in Robotics. **Self Learning Topics: -** Recent advancement in Robotics.		
UNIT 2	**Sensor and Actuators**	**6 HOURS**
Sensors: Sensor classification, Internal Sensors, External Sensors, Sensor Selection Criteria, Interfacing and programming with microcontrollers. Remote Center Compliance Device(RCC) Actuators: Pneumatic, hydraulic, electric (DC, servomotor, stepper motor), Selection of motors, Interfacing and programming with microcontrollers. **Self Learning Topics: -** Remote Center Compliance Device(RCC)		
UNIT 3	**Power Transmission System & Robot End Effectors**	**8 HOURS**
Power transmitting elements, Transmission system for Industrial Robots and non Industrial Robots, Harmonic Drive, Classification of End effectors, Introduction to robotics grippers, Active and passive grippers. Drive system for grippers. Gripper force analysis and gripper design. **Self Learning Topics: -** Harmonic Drive and its construction		
UNIT 4	**Robot Kinematics**	**8 HOURS**
Relationship between joint positions, end-effector position and orientation , Representation of a Vector , Translational Matrix , Rotation Matrix ,Homogenous transformation, Euler's Angle , Denavit Heartenberg parameters, Direct kinematics of a manipulator, Inverse kinematics, Geometric approach and Algebraic approach for inverse kinematics. **Self Learning Topics: -** Kinematics model of Industrial Robot		
UNIT 5	**Trajectory Planning and Manipulator Control**	**8 HOURS**
Introduction to trajectory planning, Trajectory generation, Steps in Trajectory planning, Cartesian space & Joint Space Technique, Manipulator control –Linear, 2nd order, force control, modeling and control of a single joint. **Self Learning Topics: -** Potential field method for motion planning		
UNIT 6	**Balancing of Robots**	**6 HOURS**
Centre of Gravity, Static balancing, Dynamic balancing, Balancing of revolving masses and Balancing of reciprocating masses, Critical speed, Balancing machines. **Self Learning Topics: -** Balancing machines. Vibration Isolators		

PRACTICAL		
PRACTICAL NO.01		**4 HOURS**
Topic Selection and component requirement analysis of particular robot.		
PRACTICAL NO.02		**4 HOURS**
Interfacing and programming of different types of sensors with Microcontroller using Electronics Trainer Kit.		
PRACTICAL NO.03		**4 HOURS**
Interfacing and programming DC, Servo motors using Microcontroller with and without Joystick.		
PRACTICAL NO.04		**2 HOURS**
Performance on Pneumatic Actuators using trainer kit.		
PRACTICAL NO.05		**2 HOURS**
Build and simulate the kinematic model of a given robot using a suitable software		
PRACTICAL NO.06		**4 HOURS**
To determine trajectory for a given robot using trajectory planning technique		
PRACTICAL NO.07		**2 HOURS**
Study of Robot operating System.(ROS)		
PRACTICAL NO.08		**6 HOURS**
Capstone Project – Build a task based Robot with sensors and Actuators		

TEXT BOOK

1. Mikell P. Groover , Industrial Robots – Technology , Programming and applications, McGraw Hill , New York , 2014 , ISBN :978-0070249899
2. Deb S. R. and Deb S., Robotics Technology and Flexible Automation, Tata McGraw Hill Education Pvt. Ltd, 2010. ISBN :978-0070077911
3. John J.Craig , Introduction to Robotics, Pearson, 2009 ,2nd edition , ISBN : 978-0201543612,
4. Reza Jazar, Theory of Applied Robotics,2010, Springer US, ISBN :978-0-387-68964

REFERENCE BOOK

1. Richard Klafter, "Robotic Engineering: An Integrated Approach", Prentice – Hall, ISBN: 978-8121926164.
2. R K Mittal & I J Nagrath, Robotics and Control, McGraw Hill Publication, 2015, ISBN:9780070482937
3. Fu K S, Gonzalez R C, Lee C.S.G, "Robotics : Control, Sensing, Vision and Intelligence", McGraw Hill, 1987, ISBN : 9780070226258
4. S.K.Saha, "Introduction to Robotics", Tata-McGraw-Hill Publication, ISBN: 978-0070140011

MIT Academy of Engineering (An autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2019 – 2023)	
SCHOOL OF MECHANICAL AND CIVIL ENGINEERING	**W.E.F**	**AY:** 2021 - 2022
THIRD YEAR BACHELOR OF TECHNOLOGY MECHANICAL ENGINEERING	**COURSE NAME**	Automobile System Design
	COURSE CODE	ME353
	COURSE CREDITS	4
RELEASED DATE : 01/06/2021	**REVISION NO**	0.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/ PRACTICAL	PRESENTATION/ DEMONSTRATION	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA			
3	2	35	35	30	50	NIL	150

COURSE OBJECTIVES :

ME353.CEO.1: To impart knowledge about Automobile components
ME353.CEO.2: To design and develop Automobile systems
ME353.CEO.3: To standardize automotive parts
ME353.CEO.4: To optimize automotive parts

COURSE OUTCOMES :

The students after completion of the course will be able to,

ME353.CO.1: Identify and visualize automotive parts. [L1]
ME353.CO.2: Select and design the different automobile system for given situation. [L2]
ME353.CO.3: Standardize the different parts. [L3]
ME353.CO.4: Optimize the parts for given situation. [L4]

THEORY COURSE CONTENT		
UNIT 1	**Clutch System**	**6 HOURS**
Design of various clutch system components (Single plate, multiple plates, centrifugal clutch, lining material) and Pressure Plate Assembly components. Hydraulic Clutch system components (Master Cylinder, Slave cylinder, reservoir) clutch fluid – its properties, hydraulic pipes. Clutch Pedal & Clutch hand lever design. Clutch cable Design / selection considerations		
UNIT 2	**Design of Propeller Shaft**	**5 HOURS**
Design of propeller shaft for bending, torsion, rigidity and critical speed criteria. Design of universal joint and slip joint.		
UNIT 3	**Design of Axle**	**8 HOURS**
Front Axle beam, Steering Knuckle, King pin. Rear Axle (drive Axle) tube, Design of fully floating, half floating axle and dead axle. Design of Final drive and differential: Design of spiral bevel and hypoid type of final drive/differential.		
UNIT 4	**Steering System**	**6 HOURS**
Condition for true rolling, Turning circle radius, Principle of Ackermann steering, Ackermann-linkage geometry, Steering gear ratio, Steering box torque, Design of various steering gear box.		
UNIT 5	**Braking System**	**8 HOURS**
Brake balance, Stopping distance, Brake fade, Work done in braking, Braking efficiency, Braking of vehicle, Braking of vehicle moving in a curved path, Design of drum brake, Design of disc brake, Design of hydraulic brake system, Design of hand brake or parking brake.		
UNIT 6	**Suspension System**	**8 HOURS**
Function of suspension, Forces act on suspension, Suspension springs (laminated or leaf, coil, torsion bar, rubber spring, pneumatic spring), Design of laminated or leaf spring, Design of helical or coil spring, Design		

PRACTICAL		
PRACTICAL NO.01		**2 HOURS**
To Standardize the any automobile system part for size , torque and power.		
PRACTICAL NO.02		**2 HOURS**
To demonstrate the clutch for given situation of automobile vehicle.		
PRACTICAL NO.03		**4 HOURS**
To design the propeller shaft for given situation of automobile vehicle.		
PRACTICAL NO.04		**2 HOURS**
To design the Axle for given situation of automobile vehicle		
PRACTICAL NO.05		**2 HOURS**
To demonstrate the steering system for given situation of automobile vehicle.		
PRACTICAL NO.06		**4 HOURS**
To demonstrate the braking system for given situation of automobile vehicle		
PRACTICAL NO.07		**4 HOURS**
To demonstrate the suspension system for given situation of automobile vehicle.		
PRACTICAL NO.08		**2 HOURS**
Study of Comfort & Safety: Seats, mirrors, cruise control airbag and belt tensioners.		
PRACTICAL NO.09		**2 HOURS**
To optimize the part from above design given situation of automobile vehicle.		

TEXT BOOK

1. Harald Naunheimer, Bernd Bertsche, Joachim Ryborz, Wolfgang Novak "Automotive Transmission: Fundamentals, Selection, Design & Application" 2nd Edition, SpringerVerlag Berlin Heidelberg 1994, 2011. ISBN 978-3-642-16214-5
2. Donald E. Malen "Fundamentals of Automobile Body Structure Design" SAE International Publication.ISBN-10 0768021693 ISBN-13 978-0768021691
3. Newton, W.Steeds and T.K.Garret, "The Motor Vehicle", 13th Edition, Butterworth Heinemann, India, 2004. ISBN 10-1560918985 ISBN 13-9781560918981
4. P.M.Heldt, "Automotive Chassis", Chilton Co., New York, 1982. ISBN 13: 8888000141792
5. W.Steed, "Mechanics of Road Vehicles", Illiffe Books Ltd., London. 1992. ISBN: 9789351921912, 9351921913
6. Heinz Heisler, "Advanced Vehicle Technology", second edition, Butterworth – Heinemann, New York, 2002. ISBN: 9780750651318, 9780750651318

REFERENCE BOOK

1. William Crouse, "Automobile Engineering" ISBN 10: 0070634351
2. Harban Singh Rayat, "The Automobile", S. Chand & Co. Ltd, New Delhi, 2000.ISBN-10 : 8121902142; ISBN-13 : 978-8121902144
3. G.J.Giles, "Steering Suspension and Tyres", Illiffe Books Ltd., London, 1975.ISBN-10: 0592006204 ISBN-13: 978-0592006208
4. Kirpal Singh, "Automobile Engineering", Standard publishers, Distributors, Delhi, 1999.ISBN-10: 8180141772 ISBN-13: 978-8180141775
5. G.B.S.Narang, "Automobile Engineering", Khanna Publishers, Twelfth reprint New Delhi, 2005.ISBN-10: 9387394255 ISBN-13: 978-9387394254
6. R.P.Sharma, "Automobile Engineering", Dhanpat Rai & Sons, New Delhi, 2000. ISBN-s10: 9383182059 ISBN-13: 978-9383182053.

MIT Academy of Engineering (An autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2019 – 2023)	
SCHOOL OF COMPUTER ENGINEERING AND TECHNOLOGY	**W.E.F**	**AY:** 2021 - 2022
THIRD YEAR BACHELOR OF TECHNOLOGY	**COURSE NAME**	Project Management
	COURSE CODE	CS361
	COURSE CREDITS	2
RELEASED DATE : 01/07/2021	**REVISION NO**	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY				PRESENTATION/	TOTAL
LECTURE	PRACTICAL	ICE	ECE	IA	PRACTICAL	DEMONSTRATION	
2	NA	NA	50	25	NA	NA	75

PRE-REQUISITE :

COURSE OBJECTIVES :

CS361.CEO.1: To create awareness of organizational strategy for project implementation.
CS361.CEO.2: To understand the rules for creating a Work Breakdown Structure for a Project. .
CS361.CEO.3: To illustrate approaches for risk identification, analysis, and assessment.
CS361.CEO.4: To identify key characteristics of a high-performance project team.
CS361.CEO.5: understand the critical success factors in project management.

COURSE OUTCOMES :

The students after completion of the course will be able to,

CS361.CO.1: Identify the Project Management Knowledge Areas and Processes.
CS361.CO.2: Classify the responsibilities while designing the Project Master Plan.
CS361.CO.3: Outline the Cost Estimating and Cost Escalation Process.
CS361.CO.4: Demonstrate and highlight The Processes of Project Quality Management.
CS361.CO.5: Analyze Management of a Project and Maturity Models.

THEORY :		
UNIT 1	**Basics of Project Management**	**6 HOURS**
Contents: Introduction, Need for Project Management, SMART Project, Knowledge Areas and Processes, The Project Manager and Project Management Office, Phases of Project Management Life Cycle, Project environments, Impact of Delays in Project Completions **Case Study:**		
UNIT 2	**Systems and Procedures for Planning and Control**	**5 HOURS**
Contents: Type of Projects, The Project Master Plan, The Project Charter, Project Organization and Responsibilities, Work Breakdown Structure (WBS), Networks Diagrams, The Critical Path, Gantt Charts and Calendar Schedules, CPM, PERT (Project Management Tools: GanttProject, OpenProj) **Case Study:**		
UNIT 3	**Cost Estimating, Budgeting and Risk Management**	**5 HOURS**
Contents: Cost Estimating and Cost Escalation, Cost Estimating Process, Elements of Budgets and Estimates, Risk Management process, Project Risk by Phases, Risk Assessment, Risk Response Planning, Risk Tracking and Response **Case Study:**		
UNIT 4	**Project Quality Management and Organization Behavior**	**5 HOURS**
Contents: The Concept of Quality, The Processes of Project Quality Management, Techniques for Quality Assurance during System Development, Stakeholders, Managing Participation, Teamwork and Conflict. **Case Study:**		
UNIT 5	**The Corporate Context**	**5 HOURS**
Contents: Project Management Maturity and Maturity Models, Knowledge and Time Management, International Projects and associated problems, Entrepreneurs and Startup. **Case Study:**		

TEXT BOOK

1. Project Management for Business, Engineering, and Technology, 3rd Edition, John M. Nicholas and Herman Steyn ELSEVIER ISBN: 978-0-7506-8399-9.
2. Project Management Planning and Control, Managing Engineering, Construction and Manufacturing Projects to PMI, APM and BSI Standards, Seventh Edition, Eur Ing Albert Lester, B H Copyright © 2017 Elsevier Ltd, ISBN: 978-0-08-102020-3.
3. Project Management in Product Development, George Ellis, Copyright © 2016 Elsevier Inc, ISBN: 978-0-12-802322-8.
4. Project Management best Practices, 4th Edition, HAROLD KERZNER, Wiley Copyright © 2018, ISBN 978-111-9-46885-1.

REFERENCES

1. Project Management Toolbox, Second Edition, Russ J. Martinelli, Dragan Z. Milosevic, Wiley Copyright © 2018, ISBN 978-1-118-97312-7.
2. Project Management Essentials You Always Wanted To Know, Kalpesh Ashar, VIBRANT PUBLISHERS
3. The Practical guide to Project Management, 1st Edition, Christine Petersen, ISBN 978-87-403-0524-1
4. Beginning Project Management (e book), John M. Preston
5. Project Management from Simple to Complex, Russell W. Darnall, John M. Preston, The Open University of Hong Kong

MIT Academy of Engineering (An autonomous Institute Affiliated to SPPU)	COURSE SYLLABI (2019 – 2023)	
SCHOOL OF MECHANICAL AND CIVIL ENGINEERING	**W.E.F**	**AY:** 2021 - 2022
THIRD YEAR BACHELOR OF TECHNOLOGY MECHANICAL ENGINEERING	**COURSE NAME**	Computer Aided Product Design
	COURSE CODE	ME371
	COURSE CREDITS	2
RELEASED DATE : 01/06/2021	**REVISION NO**	0.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA	PRACTICAL	DEMONSTRATION	
NIL	4	NIL	NIL	25	50	NIL	75

COURSE OBJECTIVES :

ME372.CEO.1: To design product in digital environment and design procedure implementation using CAD/CAM applications for better, efficient and fast product development

COURSE OUTCOMES :

The students after completion of the course will be able to,

ME372.CO.1: Design solid parts. [L2]
ME372.CO.2: Build assemblies. [L3]
ME372.CO.3: Design intent applied to solid parts and assemblies. [L4]
ME372.CO.4: Create sheet metal components. [L5]
ME372.CO.5: Generate the NC program using software package. [L4]

GEOMETRY TRANSFORMATION		
PRACTICAL NO.01	**Transformation of Geometry**	**12 HOURS**
Write the codes for transformation i.e. Traslation, Rotation, Reflection & Dilation of geometry using coding software package and validate with analytical results.		
SOLID MODELING		
PRACTICAL NO.02	**Sketching & Constraining**	**04 HOURS**
Editing Sketches, Exiting the Sketch Environment, Changing the View of the Sketch, Creating Solid Revolved Bodies, Copying, Moving, and Rotating Objects		
PRACTICAL NO.03	**Solid Modeling**	**12 HOURS**
Types of Datum Planes, Creating Fixed and Relative Datum Axes, Projecting External Elements, Creating Holes by Using the Hole Tool, Creating Grooves, Creating Slots, Creating Chamfers, Pattern Feature Tool, Mirror Feature Tool, Creating Swept Features, Creating Tubes or Cables, Creating Shell Features,		
PRACTICAL NO.04	**Assembly Modeling**	**04 HOURS**
Top-down Approach, Bottom-up Approach, Placement Constraints, Package, Creating the Exploded State, References Tab, Options Tab, Explode Line Tab, The Bill of Materials, Generating Drawing Views, Generating the General View, Generating the Projection View, Generating the Detailed View, Generating the Auxiliary View		
PRACTICAL NO.05	**Surface Modeling**	**08 HOURS**
Creating an Extruded Surface, Revolved Surface, Ruled Surface, Creating Curves from Bodies, Advanced Surface Modeling Tools		
PRACTICAL NO.06	**Working with Sheetmetal Components**	**04 HOURS**
Creating the Unattached Revolve Wall, Creating the Unattached Blend Wall, Creating the Unattached Rotational, Blend Wall, Creating the Unattached Offset Wall		
COMPUTER AIDED MANUFACTURING		
PRACTICAL NO.07	**Toolpath & NC Code Generation**	**12 HOURS**
Tool Path generation for Turning, Millining operations, NC Code generation using any CAM Software Package.		

TEXT BOOK

1. Creo Parametric 7.0 for Designers, 7th Edition, Prof. Sham Tickoo, Purdue University Northwest, USA, CADCIM Technologies, USA
2. SOLIDWORKS 2021 for Designers, 19th Edition, CADCIM Technologies, USA, Prof. Sham Tickoo, Purdue University Northwest, USA, 978-1-64057-103-7 978-1-64057-099-3
3. Creo Parametric 7.0 for Designers, 7th Edition, Prof. Sham Tickoo, Purdue University Northwest, USA, CADCIM Technologies, USA 978-1-64057-099-3
4. Creo Parametric 7.0 for Designers, 7th Edition, Prof. Sham Tickoo, Purdue University Northwest, USA, CADCIM Technologies, USA 978-1-64057-099-3

REFERENCE BOOK

1. Documentation of any software package used.