



MIT ACADEMY OF ENGINEERING, ALANDI

An Autonomous Institute Affiliated to

Savitribai Phule Pune University

Curriculum

For

Bachelor of Technology

In

Chemical Engineering

(Choice Based Credit System)

2019-2023

**BoS Chairman
Dean,
School of Chemical Engineering**

**Member Secretary
Academic Council
Dean, Academics**

**Chairman
Academic Council
Director, MITAoE**

MIT Academy of Engineering, Alandi, Pune
An Autonomous Institute affiliated to Savitribai Phule Pune University

CURRICULUM FRAMEWORK (2019 PATTERN)
CHEMICAL 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)			4	3	3	3	2		15
4.	Discipline Elective (DE)								2	2
5.	Open Elective (OE)					1	1	1		3
6.	Humanities and Social Science (HSS)	1	1		2	1	1	1	1	8
7.	Skill Development and Project (SDP)	1	1	2	2	2	2	3	1	14
TOTAL		7	6	8	7	7	7	7	4	53

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)			14	12	12	11	7		56	35
4.	Discipline Elective (DE)								6	6	3.75
5.	Open Elective (OE)					4	4	4		12	7.5
6.	Humanities and Social Science (HSS)		2		2	2	2	2	2	12	7.5
7.	Skill Development and Project (SDP)	2	2	3	3	4	4	8	6	32	20
TOTAL		21	19	21	21	22	21	21	14	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	22	21	43
4.	Final Year	21	14	35
TOTAL				160

CONTACT HOURS				
SL. NO.	YEAR	SEMESTER		TOTAL
		1	2	
1.	First Year	29 / 27	28 / 30	57
2.	Second Year	28	31	59
3.	Third Year	29	28	57
4.	Final Year	25	20	45
TOTAL				218

ABBREVIATIONS		
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


 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	
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	30	30	40	50	-	150	4
NSC2	AS106	Engineering Physics	3	2	-	30	30	40	50	-	150	4
ESC1	EX102	Electrical & Electronic Engineering	3	2	-	30	30	40	50	-	150	4
ESC2	ME104	Engineering Graphics	2	4	-	-	60	40	100	-	200	4
ESC3	CS101	Logic Development - C	1	4	-	-	40	-	100	-	140	3
SDP1	ME105	Experimental Tools and Techniques	-	4	-	-	-	-	40	60	100	2
TOTAL			12	16	1	90	190	160	390	60	890	21
SEMESTER: II (Version I)												
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		
NSC3	AS107	Statistics and Integral Calculus	3	-	1	30	30	40	50	-	150	4
NSC4	CH101	Science of Nature	3	2	-	30	30	40	50	-	150	4
ESC4	CV102	Applied Mechanics	3	2	-	30	30	40	50	-	150	4
ESC5	CS102	Application Programming - Python	1	4	-	-	40	-	100	-	140	3
HSS1	HP103/4/5	English for Engineers //(German/Japanese)	0	4	-	-	-	-	100	-	100	2
SDP2	ME106	Design Thinking	-	4	-	-	-	-	40	60	100	2
HSS2	HP106	Indian Constitution	1	-	-	-	-	-	-	-	Audit	
TOTAL			11	16	1	90	130	120	390	60	790	19

 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	30	30	40	50	-	150	4
NSC2	CH101	Science of Nature	3	2	-	30	30	40	50	-	150	4
ESC1	CV102	Applied Mechanics	3	2	-	30	30	40	50	-	150	4
ESC2	CS101	Logic Development - C	1	4	-	-	40	-	100	-	140	3
HSS1	HP103/4/5	English for Engineers /(German/Japanese)	0	4	-	-	-	-	100	-	100	2
SDP2	ME106	Design Thinking	-	4	-	-	-	-	40	60	100	2
TOTAL			10	16	1	90	130	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	30	30	40	50	-	150	4
NSC4	AS106	Engineering Physics	3	2	-	30	30	40	50	-	150	4
ESC3	EX102	Electrical & Electronic Engineering	3	2	-	30	30	40	50	-	150	4
ESC4	ME104	Engineering Graphics	2	4	-	-	60	40	100	-	200	4
ESC5	CS102	Application 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	90	190	160	390	60	890	21

 MIT Academy of Engineering Autonomous Institute Affiliated to SPPU		COURSE STRUCTURE (2019 - 2023)			
SCHOOL OF CHEMICAL ENGINEERING		W.E.F	:	2020-2021	
SECOND YEAR BACHLEOR OF TECHNOLOGY IN CHEMICAL ENGINEERING		RELEASE DATE		:	01/07/2020
		REVISION NO.		:	1.0


SEMESTER: III													
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			
ESC6	ME221	Material Engineering	3	2	-	35	35	30	0	50	150	4	
DC01	CH221	Material and Energy Balance	3	0	-	35	35	30	0	0	100	3	
DC02	CH222	Inorganic and Analytical Chemistry	3	2	-	35	35	30	50	0	150	4	
DC03	CH223	Momentum transfer	3	2	-	35	35	30	50	0	150	4	
DC04	CH224	Chemical Engineering Thermodynamics	3	0	-	35	35	30	0	0	100	3	
SDP3	ET235	Rapid Prototyping	0	4	-	0	0	0	0	75	75	2	
SDP4	CH230	Minor Project I	0	2	-	0	0	0	0	50	50	1	
ESC7	CV203	Environmental Sciences	1	0	-	-	-	-	-	-	Audit		
TOTAL			16	12	0	175	175	150	100	175	775	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			
NSC5	AS203	Applied Mathematics	3	2	-	35	35	30	50	0	150	4	
DC05	CH231	Heat Transfer	3	2	-	35	35	30	50	0	150	4	
DC06	CH232	Advanced Chemistry	3	2	-	35	35	30	50	0	150	4	
DC07	CH233	Mass Transfer	3	2	-	35	35	30	50	0	150	4	
HSS3	HP202	Professional Skills	0	4	-	0	0	25	0	50	75	2	
SDP5	ET224	Digital Prototyping	0	4	-	0	0	0	0	75	75	2	
SDP6	CH240	Minor Project II	0	2	-	0	0	0	0	50	50	1	
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 CHEMICAL ENGINEERING	W.E.F	:	2021-2022
THIRD YEAR BACHLEOR OF TECHNOLOGY IN CHEMICAL ENGINEERING	RELEASE DATE	:	01/07/2021
	REVISION NO.	:	1.0

SEMESTER: V												
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		
DC08	CH341	Chemical Engineering Operations	3	2	-	35	35	30	50	0	150	4
DC09	CH342	Separation Process	3	2	-	35	35	30	50	0	150	4
DC10	CH 343	Chemical Reaction Engineering	3	2	-	35	35	30	50	0	150	4
OE01	CH 351	Process Engineering	3	2	-	35	35	30	50	0	150	4
HSS5	HP304	Project Management	2	0	-	0	50	25	0	0	75	2
SDP7	CH344	Skill Development Lab (CFD)	0	4	-	0	0	25	50	0	75	2
SDP8	CH345	Project Design	0	4	-	0	0	25	0	50	75	2
TOTAL			14	16	0	140	190	195	250	50	825	22

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		
DC11	CH361	Process Dynamics and Control	3	2	-	35	35	30	50	0	150	4
DC12	CH362	Chemical Equipment Design I	3	2	-	35	35	30	50	0	150	4
DC13	CH363	Chemical Process Technology	3	0	-	35	35	30	0	0	100	3
OE02	CH371	Process Modelling and Simulation	3	2	-	35	35	30	50	0	150	4
HSS6	HP305	Professional Skills	0	4	-	0	0	25	0	50	75	2
SDP9	CH364	Skill Development Lab (ASPEN ONE)	0	4	-	0	0	25	50	0	75	2
SDP10	CH365	Mini Project II	0	4	-	0	0	25	0	50	75	2
TOTAL			12	16	0	140	140	195	200	100	775	21

 MIT Academy of Engineering Autonomous Institute Affiliated to SPPU		COURSE STRUCTURE (2019 - 2023)		
SCHOOL OF CHEMICAL ENGINEERING		W.E.F	:	2022-2023
FINAL YEAR BACHLEOR OF TECHNOLOGY IN CHEMICAL ENGINEERING		RELEASE DATE	:	01/07/2022
		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		
DC14	CH461	Plant Design with Piping	1	4	-	0	30	20	50	25	125	3
DC15	CH462	Chemical Equipment Design II	3	2	-	35	35	30	50	0	150	4
OE03	CH471	Process Intensification and Integration	3	2	-	35	35	30	50	0	150	4
HSS7	HP405 / HP406	Engineering Economics/ Psychology	2	0	-	0	50	25	0	0	75	2
SDP11	CH463	Skill Development Lab (Aspen EDR)	0	4	-	0	0	25	50	0	75	2
SDP12	CH464	Major Project I	0	4	-	0	0	25	0	50	75	2
SDP13	CH465	Summer Internship	-	-	-	-	-	-	-	150	150	4
TOTAL			9	16	0	70	150	155	200	225	800	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		
DE01	CH48#	Refer Annexure	3	0	-	35	35	30	0	0	100	3
DE02	CH49#	Refer Annexure	3	0	-	35	35	30	0	0	100	3
HSS8	HP406 / HP405	Psychology / Engineering Economics	2	0	-	0	50	25	0	0	75	2
SDP14	CH466	Major Project II	-	12	-	0	0	100	0	100	200	6
TOTAL			8	12	0	70	120	185	0	100	475	14

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		
DE01	CH48#	Refer Annexure	3	0	-	35	35	30	0	0	100	3
DE02	CH49#	Refer Annexure	3	0	-	35	35	30	0	0	100	3
SDP16	CH467	Semester Long Internship Design	-	-	-	-	-	-	-	150	150	4
SDP17	CH468	Semester Long Internship Implementation	-	-	-	-	-	-	-	150	150	4
TOTAL			6	0	0	70	70	60	0	300	500	14

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

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
5.	CS102	Application Programming
6.	ME221	Material Engineering
7.	IT221	Engineering Informatics
8.	CV203	Environmental Science

Discipline Core (DC): 15 Courses		
Sl. No.	Course Code	Course Name
1.	CH221	Material and Energy Balance
2.	CH222	Analytical Chemistry
3.	CH223	Momentum transfer
4.	CH224	Chemical Engineering Thermodynamics
5.	CH231	Heat Transfer
6.	CH232	Advanced Chemistry
7.	CH233	Mass Transfer
8.	CH341	Chemical Engineering Operations
9.	CH342	Separation Process
10.	CH343	Chemical Reaction Engineering
11.	CH361	Process Dynamics and Control
12.	CH362	Chemical Equipment Design I
13.	CH363	Chemical Process Technology
14.	CH461	Plant Design with Piping
15.	CH462	Chemical Equipment Design II

Discipline Elective (DE): 2 Courses		
Sl. No.	Course Code	Course
1	CH481	Introduction to Paint Technology
	CH482	Energy Engineering
	CH483	Petroleum Refining Technology
	CH484	Biochemical Engineering
	CH485	Environment Engineering
2	CH491	Paint Manufacturing Process
	CH492	Energy Management and Audit
	CH493	Petrochemical Engineering
	CH494	Bioprocess Technology
	CH495	Chemical Process Safety

Open / Minor Elective School Wise: CHEMICAL ENGINEERING				
Sl. No.	Minor Track	Semester	Course Code	Course Name
1	Process Engineering	V	CH351	Process Engineering
2		VI	CH371	Process Modeling and Simulation.
3		VII	CH471	Process intensification and Integration
1	Piping Design Engineering	V	CH352	Piping Engineering
2		VI	CH372	Piping Layout
3		VII	CH472	Piping Design & Engineering
1	Entrepreneurship	V	HP311	Foundation Course in Entrepreneurship
2		VI	HP312	Advance course in Entrepreneurship
3		VII	HP411	Startup and Incubation

Humanities and Social Science (HSS): 8 Courses		
Sl. No.	Course Code	Course Name
1.	HP103	English for Engineers
2.	HP104	German
3.	HP105	Japanese
4.	HP106	Indian Constitution
5.	HP202	Professional Communication
6.	HP203	Liberal Learning
7.	HP304	Project Management
8.	HP305	Professional Skills
9.	HP405	Engineering Economics
10.	HP406	Psychology

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	Prototyping I
4.	CH224	Minor Project I
5.	ET235	Prototyping II
6.	CH234	Minor Project II
7.	CH344	Skill Development Lab (CFD)
8.	CH345	Mini Project I
9.	CH364	Skill Development Lab (ASPEN ONE)
10.	CH365	Mini Project II
11.	CH463	Skill Development Lab (ASPEN EDR)
12.	CH464	Major Project I
13.	CH465	Summer Internship
14.	CH466	Major Project II
15.	CH467	Semester Long Internship Design
16.	CH468	Semester Long Internship Implementation

Honors Elective Tracks: 4 Courses					
Sl. No.	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	4
1	Product Design	V	PD301	Fundamental of Design Elements	4
2		VI	PD302	Packaging Design	4
3		VII	PD401	Ergonomics & Human - Product Interface	4
4		VIII	PD402	Product / Systems Design Project	4

Open//Minor Electives (OE)							
Programme Name	Minor 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 Design
Computer Engineering	Data science	CS351	Descriptive Analytics	CS353	Predictive Analysis	CS461	Big Data Analytics
	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//Minor Electives (OE)							
Programme Name	Minor 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	ME491	Advanced Analysis
	Robotics and Automation	ME352	Fundamentals of Robotics	ME362	Kinematics & Dynamics of Robots	ME492	Electrical and Electronics Systems of Robots
	Industrial Engineering & Management	ME353	Industrial Engineering	ME363	Operations Management	ME493	Supply Chain Management
	Automobile Engineering	ME354	Automobile System Design	ME364	Vehicle Dynamics	ME494	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



MIT ACADEMY OF ENGINEERING, ALANDI

An Autonomous Institute Affiliated to

Savitribai Phule Pune University

Curriculum


For

First Year


Bachelor of Technology

2019-2023

(With Effect from Academic Year: 2019-2020)


 An Autonomous Institute Affiliated to SPPU SCHOOL OF ENGINEERING SCIENCES AND HUMANITIES	COURSE STRUCTURE (2019 - 2023)		
	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	
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
NSC2	AS106	Engineering Physics	3	2	-	20	40	40	50	-	150	4
ESC1	EX102	Electrical & Electronic Engineering	3	2	-	20	40	40	50	-	150	4
ESC2	ME104	Engineering Graphics	2	4	-	-	60	40	100	-	200	4
ESC3	CS101	Logic Development	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	
TYPE	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
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	Application Programming	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

 An Autonomous Institute Affiliated to SPPU	COURSE STRUCTURE (2019 - 2023)			
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	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	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 & Electronic Engineering	3	2	-	20	40	40	50	-	150	4
ESC2	ME104	Engineering Graphics	2	4	-	-	60	40	100	-	200	4
ESC5	CS102	Application Programming	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 (An Autonomous Institute Affiliated to SPPU)	Academy of Engineering			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/ PRACTICAL	PRESENTATION/ DEMONSTRATION	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA			
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 & 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 & 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 & 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. O'Neil, Advanced Engineering Mathematics, 7 th edition, Cengage Learning, 2012, ISBN: 13: 9788131503102.

 MIT (An Autonomous Institute Affiliated to SPPU)	Academy of Engineering		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/ PRACTICAL	PRESENTATION/ DEMONSTRATION	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA			
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
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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
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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
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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
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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
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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
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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 (m_e) 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-heinemann,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 (An Autonomous Institute Affiliated to SPPU)	Academy of Engineering		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/ PRACTICAL	PRESENTATION/ DEMONSTRATION	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA			
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
<p>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.</p>		
UNIT 2	Applications of Biology	6 HOURS
<p>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.</p>		
UNIT 3	The role of chemistry for engineers	7 HOURS
<p>(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.</p> <p>(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.</p>		
UNIT 4	Chemical Bonding - The Formation of Materials	8 HOURS
<p>(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.</p> <p>(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.</p>		
UNIT 5	Chemical Analysis and Instrumentation	6 HOURS
<p>Schrodinger's 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 Bohr's atomic model.</p>		

UNIT 6	Water treatment and effluent management	5 HOURS
<p>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</p>		

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 (An Autonomous Institute Affiliated to SPPU)	Academy of Engineering			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/ PRACTICAL	PRESENTATION/ DEMONSTRATION	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA			
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	DC 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
<ol style="list-style-type: none"> 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 (An Autonomous Institute Affiliated to SPPU)	Academy of Engineering		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/ PRACTICAL	PRESENTATION/ DEMONSTRATION	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA			
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
<p>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.</p> <p>Further Reading: *Self study-Application to jib crane.</p>		
UNIT 2	Friction	6 HOURS
<p>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.</p> <p>Further Reading: *Self study-Screw friction.</p>		
UNIT 3	Properties of surfaces	6 HOURS
<p>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.</p> <p>Further Reading: *Self study- Mass moment of Inertia.</p>		
UNIT 4	Kinematics of planar motions	7 HOURS
<p>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.</p> <p>Further Reading: *Self study- Curvilinear motion in polar coordinates.</p>		
UNIT 5	Kinetics- Force and acceleration	6 HOURS
<p>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.</p> <p>Further Reading: *Self study- Free Vibrations.</p>		
UNIT 6	Kinetics Energy and momentum	6 HOURS
<p>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.</p> <p>Further Reading: *Self study- Space mechanics.</p>		

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
<ol style="list-style-type: none"> 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
<ol style="list-style-type: none"> 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

 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/ PRACTICAL	PRESENTATION/ DEMONSTRATION	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA			
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 & Solid Geometry	12 HOURS
Essentials of engineering graphics including technical sketching, Projection of Line, Plane, Solid.		
UNIT 2	Orthographic Projections & 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 & 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)

 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						TOTAL
		THEORY			PRACTICAL			
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

 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/ PRACTICAL	PRESENTATION/ DEMONSTRATION	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA			
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 (An Autonomous Institute Affiliated to SPPU)	Academy of Engineering			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/ PRACTICAL	PRESENTATION/ DEMONSTRATION	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA			
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 through group 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

 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						TOTAL
		THEORY			PRACTICAL			
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
<ul style="list-style-type: none"> • 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
<ul style="list-style-type: none"> • 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
<ul style="list-style-type: none"> • 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
<ul style="list-style-type: none"> • 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
<ul style="list-style-type: none"> • 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
<ul style="list-style-type: none"> • 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
<ul style="list-style-type: none"> • 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
<ul style="list-style-type: none"> • 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
<ul style="list-style-type: none"> • 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
<ul style="list-style-type: none"> • 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
<ul style="list-style-type: none"> • 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
<ul style="list-style-type: none"> • 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

 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/ PRACTICAL	PRESENTATION/ DEMONSTRATION	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA			
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
<ol style="list-style-type: none"> 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
<ol style="list-style-type: none"> 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). 		


<p>15 Study of Virtual Instrumentation.</p> <p>16 Open IT : Optical Mouse, Cathode Ray Oscilloscope, Study of Power Supply PA System, CD Player, TV, Microwave oven (Any Two)</p>		
PRACTICAL NO.03	Mechanical Engineering (Any 6 practicals from the following list)	12 HOURS
<ol style="list-style-type: none"> 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
<ol style="list-style-type: none"> 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
<ol style="list-style-type: none"> 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
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TEXT BOOK
<ol style="list-style-type: none"> 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
<ol style="list-style-type: none"> 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 (An Autonomous Institute Affiliated to SPPU)	Academy of Engineering		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/ PRACTICAL	PRESENTATION/ DEMONSTRATION	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA			
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 (An Autonomous Institute Affiliated to SPPU)	Academy of Engineering			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/ PRACTICAL	PRESENTATION/ DEMONSTRATION	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA			
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 (An Autonomous Institute Affiliated to SPPU)	Academy of Engineering		COURSE SYLLABI (2019 – 2023)	
	SCHOOL OF HUMANITIES AND ENGINEERING SCIENCES		W.E.F	2019- 2020
FIRST YEAR BACHELOR OF TECHNOLOGY		COURSE NAME		Python Programming Applications
		COURSE CODE		CS102
		COURSE CREDITS		3
RELEASED DATE : 01/07/2019		REVISION NO		1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME & MARKS						TOTAL
		THEORY			PRACTICAL			
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 $e=mc^2$ 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. <ul style="list-style-type: none"> • 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 $60 \geq$ and <75 then the grade is first division. If aggregate is $50 \geq$ and <60 , then the grade is second division. If aggregate is $40 \geq$ 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
<ol style="list-style-type: none"> 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:		
<ol style="list-style-type: none"> 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, ALANDI

An Autonomous Institute Affiliated to

Savitribai Phule Pune University

Curriculum


For

Second Year

**Bachelor of Technology in
Chemical Engineering**


2019-2023

(With Effect from Academic Year: 2020-2021)

 Autonomous Institute Affiliated to SPPU		COURSE STRUCTURE (2019 - 2023)		
SCHOOL OF CHEMICAL ENGINEERING		W.E.F	:	2020-2021
SECOND YEAR BACHLEOR OF TECHNOLOGY IN CHEMICAL ENGINEERING		RELEASE DATE	:	01/07/2020
		REVISION NO.	:	1.0

SEMESTER: III													
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			
ESC6	ME201	Material Engineering	3	2	-	35	35	30	0	50	150	4	
DC01	CH221	Material and Energy Balance	3	0	-	35	35	30	0	0	100	3	
DC02	CH222	Inorganic and Analytical Chemistry	3	2	-	35	35	30	50	0	150	4	
DC03	CH223	Momentum transfer	3	2	-	35	35	30	50	0	150	4	
DC04	CH224	Chemical Engineering Thermodynamics	3	0	-	35	35	30	0	0	100	3	
SDP3	ET235	Rapid Prototyping	0	4	-	0	0	0	0	75	75	2	
SDP4	CH230	Minor Project I	0	2	-	0	0	0	0	50	50	1	
ESC7	CV203	Environmental Sciences	1	0	-	-	-	-	-	-	Audit		
TOTAL			16	12	0	175	175	150	100	175	775	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			
NSC5	AS203	Applied Mathematics	3	2	-	35	35	30	50	0	150	4	
DC05	CH231	Heat Transfer	3	2	-	35	35	30	50	0	150	4	
DC06	CH232	Advanced Chemistry	3	2	-	35	35	30	50	0	150	4	
DC07	CH233	Mass Transfer	3	2	-	35	35	30	50	0	150	4	
HSS3	HP202	Professional Communication	0	4	-	0	0	25	0	50	75	2	
SDP5	ET224	Digital Prototyping	0	4	-	0	0	0	0	50	75	2	
SDP6	CH240	Minor Project II	0	2	-	0	0	0	0	50	50	1	
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 MECHANICAL AND CIVIL ENGINEERING	W.E.F 2019-2020
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 : <hr/> Engineering Physics, Science of Nature
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COURSE OBJECTIVES: <hr/> 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.
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COURSE OUTCOMES: <hr/> 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
<p>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)</p> <p>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.</p> <p>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.</p> <p>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</p> <p>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).</p> <p>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</p>		
UNIT 2	Non-metallic materials-Polymers, Ceramics and Composites	8 HOURS
<p>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</p> <p>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.</p>		

UNIT 3	Strength of materials	6 HOURS
<p>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</p>		
UNIT 4	Powder metallurgical materials	8 HOURS
<p>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.</p>		
UNIT 5	Corrosion and its prevention techniques	6 HOURS
<p>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.</p>		
UNIT 6	Introduction to Advanced Materials-Nanomaterials, Magnetic, Piezoelectric materials	6 HOURS
<p>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</p>		

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 from 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 (An Autonomous Institute Affiliated to SPPU)	Academy of Engineering		COURSE SYLLABI (2019 – 2023)	
	SCHOOL OF CHEMICAL ENGINEERING		W.E.F	AY: 2020 - 2021
SECOND YEAR BACHELOR OF TECHNOLOGY CHEMICAL ENGINEERING		COURSE NAME		Material and Energy Balance
		COURSE CODE		CH221
		COURSE CREDITS		3
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			
3	NIL	35	35	30	NIL	NIL	100

PRE-REQUISITE : NIL

COURSE OBJECTIVES :

CH221.CEO.1: Develop ideas in dimensional analysis and to be familiar with different unit systems and conversion from one set of system to another.

CH221.CEO.2: Understand the various unit operations and unit processes performed in chemical industry.

CH221.CEO.3: Learn the fundamentals of stoichiometry.

CH221.CEO.4: Apply different laws of conservation to solve material and energy balance problems.

CH221.CEO.5: Learn the general energy balance equation to precisely calculate the energy requirement for the given unit operation or process.

COURSE OUTCOMES :

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

CH221.CO.1: Interpret the data presented in different unit systems.

CH221.CO.2: Apply the various gas laws to calculate the unknowns in the given system.

CH221.CO.3: Develop the material balance equation for the given system.

CH221.CO.4: Analyze the heating value of the given fuel.

CH221.CO.5: Calculate the heat of reaction for the given reaction at the specific conditions.


CH221.CO.6: Calculate the energy requirement for the given system.

THEORY COURSE CONTENT		
UNIT 1	Mathematical Principles and Physical Properties of Systems	7 HOURS
Introduction to unit processes and operations and their symbols, process flow sheet. Concept of steady and unsteady state operations, Units and dimensions. Properties of pure substances, PVT behavior, ideal and real gas laws. Mole fractions and partial pressures, concept of vapor pressure, Raoult's law and its applications.		
UNIT 2	Material Balance for Physical Systems	7 HOURS
Concept of material balance calculations, recycling and bypass and Purge operations. Introduction to unsteady state processes, accumulation of inert components, etc.		
UNIT 3	Unit Operations	7 HOURS
Distillation, humidification, extraction, crystallization, psychrometry, drying, evaporation and industrial problems.		
UNIT 4	Stoichiometry	7 HOURS
Introduction to stoichiometry, Concept of limiting reactant, excess reactant, % excess, Conversion and yield calculations, recycle and By-pass, purging operations in reacting systems.		
UNIT 5	Energy Balance	7 HOURS
Concept, energy and Thermochemistry, Energy balances, heat capacity of pure substances and mixtures. Latent heats, enthalpy of pure substances and mixtures, absolute enthalpy, heat of reaction, adiabatic reactions, thermochemistry of mixing processes, dissolution, liquid-liquid mixtures, gas-liquid systems.		
UNIT 6	Fuels and Combustion	7 HOURS
Calorific values, coal, liquid fuels, gaseous fuels, air requirement and flue gases, combustion calculations.		

TEXT BOOKS
1. Bhatt B.I. and Vora S.M., Stoichiometry, 2nd Edition, Tata McGraw Hill, New Delhi, 2004, ISBN: 0070964041.
2. Hougen O.A., Watson R.M. and Ragatz R.A., Chemical Process Principles Part I, 2nd Edition, CBS Publications, 1976, ISBN: 9798123909539.
3. David M. Himmelblau, Basic Principles and Calculations in Chemical Engineering, 8th Edition, Prentice Hall of India, New Delhi, 2012, ISBN : 0132346605.

REFERENCE BOOKS

1. Narayanan. K.V. and Lakshmikutty.B, Stoichiometry and Process Calculations, 2nd Edition, Prentice Hall of India, New Delhi, 2009, ISBN: 8120329929.
2. Venkatramani V, Ananatharaman N, Sheriffa Begum, Process Calculations, 2nd Edition, Prentice Hall of India, 2011, ISBN: 9788120341999.
3. Richard M. Felder, Ronald W. Rousseau, Elementary Principles of Chemical Processes, 3rd Edition, John Wiley and Sons, 2005, ISBN : 9780471697596.

 MIT (An Autonomous Institute Affiliated to SPPU)	Academy of Engineering		COURSE SYLLABI (2019 – 2023)	
	SCHOOL OF CHEMICAL ENGINEERING		W.E.F	AY: 2020 - 2021
SECOND YEAR BACHELOR OF TECHNOLOGY CHEMICAL ENGINEERING		COURSE NAME		Inorganic and Analytical Chemistry
		COURSE CODE		CH222
		COURSE CREDITS		4
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			
3	2	35	35	30	50	NIL	150

PRE-REQUISITE : CH101 - Science of Nature

COURSE OBJECTIVES :

- CH222.CEO.1: Understand the basic concepts of bonding of molecules in organic and inorganic compounds.
- CH222.CEO.2: Learn transition metals and coordination compounds.
- CH222.CEO.3: State the formation of different types of solutions.
- CH222.CEO.4: Learn the technique of identification of organic molecules.
- CH222.CEO.5: Study the different analytical techniques.
- CH222.CEO.6: Impart the basic concept of biomolecules.

COURSE OUTCOMES :

- The students after completion of the course will be able to,
- CH222.CO.1: Predict the geometry of various chemical compounds.
- CH222.CO.2: Appreciate the importance and applications of transition metals and coordination compounds in our day to day life.
- CH222.CO.3: Describe Colligative properties of solutions and correlate these with molar masses of the solutes.
- CH222.CO.4: Describe the basic principle of different analytical techniques.
- CH222.CO.5: Suggest possible analytical techniques for identification and quantification of organic compounds.
- CH222.CO.6: Apply the knowledge of various Biomolecules used in biochemical processes.

THEORY COURSE CONTENT		
UNIT 1	Chemical Bonding and Molecular Structure	7 HOURS
Valence Bond theory VSEPR and Molecular orbital theory, MO structures of s-s, s-p, p-p overlaps, molecular orbital structure of butadiene, benzene, MO energy diagrams for diatomic molecules H ₂ , N ₂ , O ₂ , CO and NO.		
UNIT 2	Transition Metals and Co-ordination Chemistry	7 HOURS
Electronic configuration of first series transition metals shapes of d- orbital characteristics (variable oxidation states, magnetic property, colour of transition metal compounds) Nomenclature of complexes, Chelates, Theories of co-ordination- i) Werner ii) EAN iii) CFT (including crystal field splitting in octahedral field and tetrahedral field, CFSE for octahedral complexes , applications of CFT) electronic and magnetic properties of the complexes. Metal-metal bonds in alloys.		
UNIT 3	Solutions	7 HOURS
Solution of gas in gas, gases in liquid, Henry's law, the ideal solution, Raoult's law of ideal solution, solutions of liquids in liquids, theory of dilute solution. Colligative properties, osmosis, osmotic pressure, Colligative properties of dilute solution- lowering of vapor pressure, elevation of boiling point and thermodynamic derivation, depression in freezing point and thermodynamic derivation. Abnormal behavior of solutions of electrolytes, vant Hoff factor. Numericals on all above. Solid-Solid solutions and concept of alloys for use in metallurgy.		
UNIT 4	Spectroscopy Techniques	7 HOURS
Spectroscopic Techniques: Infra-Red Spectroscopy & FTIR, Basic Principles, working & Applications & Interpretation of IR Spectra.		
UNIT 5	Chromatographic Techniques	7 HOURS
TLC, GC, GPC, HPLC. Theory, instrumentation and applications.		
UNIT 6	Bio Molecules	7 HOURS
Four major biomolecules- Carbohydrates, Proteins, Introduction to Enzymes, fermentation and bio-catalysis Lipids and Nucleic acids: Molecular structure, classification and biological role.		
PRACTICAL		
PRACTICAL NO.01		2 HOURS
Preparation of tris ethylene diamine nickel (II) thiosulphate.		
PRACTICAL NO.02		2 HOURS
Preparation of tetramine copper (II) sulphate, pot. trioxalato aluminate.		
PRACTICAL NO.03		2 HOURS
To determine molecular weight of solid by Elevation in B.P		


PRACTICAL NO.04		2 HOURS
To find molecular wt. of solute by depression in freezing point of solvent.		
PRACTICAL NO.05		2 HOURS
Estimation of Cu ²⁺ /Ni ²⁺ ions by spectrophotometer.		
PRACTICAL NO.06		2 HOURS
Preparation of osazone derivative of glucose.		
PRACTICAL NO.07		2 HOURS
Interpretation of IR Spectrum.		
PRACTICAL NO.08		2 HOURS
Analysis of sample on GC.		
PRACTICAL NO.09		2 HOURS
Analysis of sample on HPLC.		
PRACTICAL NO.10		2 HOURS
Separation of organic compound by column chromatography		
PRACTICAL NO.11		2 HOURS
Preparation and Properties of Biodiesel		

TEXT BOOKS

1. Puri, Sharma & Pathania, Inorganic Chemistry, Shoban Lal Nagin Chand & Co.
ISBN : 9788188646999.
2. Gary D. Christian, Analytical Chemistry, 6th Edition, John Wiley and Sons Inc.
ISBN : 9780471214724.
3. Soni P. L. Physical Chemistry, S. Chand & Company. ISBN 9788180545870.
4. David L Nelson, Lehninger Principles of Biochemistry 4th edition. ISBN 9780716743392.

REFERENCE BOOKS

1. Lee J.D, Inorganic chemistry , 5th Edition, (ELBS) Chapman & Hall.ISBN : 9780412402906.
2. Cotton, Wilkinson, Basic Inorganic chemistry , 3rd Edition, Wiley India Pvt. Ltd.
ISBN 9780471505327.
3. Skoog and West, Fundamentals of Analytical Chemistry, 8th Edition, Thomson Asia.
ISBN : 9780495558286.
4. P. S. Kalsi, Spectroscopy of Organic compounds New age international ISBN: 8122415431.

 MIT (An Autonomous Institute Affiliated to SPPU)	Academy of Engineering		COURSE SYLLABI (2019 – 2023)	
	SCHOOL OF CHEMICAL ENGINEERING		W.E.F	AY: 2020 - 2021
SECOND YEAR BACHELOR OF TECHNOLOGY CHEMICAL ENGINEERING		COURSE NAME		Momentum Transfer
		COURSE CODE		CH223
		COURSE CREDITS		4
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			
3	2	35	35	30	50	NIL	150

PRE-REQUISITE : NIL

COURSE OBJECTIVES :

CH223.CEO.1: Understand the basic concepts of fluid mechanics and its application.
 CH223.CEO.2: Understand the fluid statics and principles of various pressure measuring devices.
 CH223.CEO.3: Learn the fundamentals of fluid, valves and pumps used in pipelines.
 CH223.CEO.4: Know about dimensional analysis and principles of similarity.
 CH223.CEO.5: Understand the basic energy balance equations and their applications.
 CH223.CEO.6: Learn the basic concepts of flow through pipelines.

COURSE OUTCOMES :

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

CH223.CO.1: Apply concepts of momentum transfer to different processes in chemical engineering.
 CH223.CO.2: Find out the dimensions of unknown variable by using dimensional analysis.
 CH223.CO.3: Calculate pressure drop by setting momentum balance.
 CH223.CO.4: Perform design calculations related to flow measurements and pumping of fluids.
 CH223.CO.5: Calculate different losses in piping.
 CH223.CO.6: Apply the equation of motion.

THEORY COURSE CONTENT		
UNIT 1	Introduction	7 HOURS
Properties of fluids: Characteristics of fluids. Fluid Kinematics: Types of flows- visualization of flow-field (stream, path and streak Line), Stream function and velocity potential function, Newtons law of viscosity, rheological classification of fluids. Concept of atmospheric, gauge and absolute pressure, manometers, pressure measurement by simple and differential manometer.		
UNIT 2	Fluid Dynamics	7 HOURS
Continuity equation, equation of motion, Bernoulli equation, Eulers and Navier - Stokes equations, flow measurement using venturimeter, orificemeter, rotameter and pitot tube, flow through notches and weirs.		
UNIT 3	Flow of incompressible Fluid through Pipe	7 HOURS
Shear stress distribution, relation between skin friction and wall shear, friction factor, laminar flow through circular pipe, on inclined plane, relation between average and maximum velocity, major And minor losses, Darcy Weisbach equation, friction factor chart.		
UNIT 4	Boundary Layer and Dimensional Analysis	7 HOURS
Concept of hydrodynamic boundary layer, growth over a flat plate, different thickness of boundary layer. Fundamental dimensions of quantities, dimensional homogeneity, dimensional analysis by Rayleighs method and Buckingham's method, dimensionless numbers.		
UNIT 5	Fluid Moving Machinery	8 HOURS
Pumps: Types of pumps, centrifugal pump, performance of centrifugal pump. Compressors: Working and applications of Centrifugal and reciprocating compressors Valves : Gate Valve, Globe Vale, Butterfly valve, etc.		
UNIT 6	Introduction to CFD	6 HOURS
Governing equations of fluid flow, mass conservation, momentum and energy equation, differential and integral forms, conservation and non-conservation form. Characteristics of turbulent flows, time averaged Navier Stokes equations.		


PRACTICAL		
PRACTICAL NO.01		2 HOURS
Estimation of kinematic viscosity of Oil		
PRACTICAL NO.02		2 HOURS
Calibration of Venturimeter & Orifice meter		
PRACTICAL NO.03		2 HOURS
Reynolds Experiment		
PRACTICAL NO.04		2 HOURS
Verification of Bernouli's equation		
PRACTICAL NO.05		2 HOURS
Calibration of Rotameter		
PRACTICAL NO.06		2 HOURS
Calibration of Notches		
PRACTICAL NO.07		2 HOURS
Minor & Major losses in Pipe flow		
PRACTICAL NO.08		2 HOURS
Characteristics of Centrifugal Pump		
PRACTICAL NO.09		2 HOURS
Introduction to Ansys - Geometry Modelling, Meshing Approach & Mesh and Creating a Structured Grid		
PRACTICAL NO.10		2 HOURS
Basic approaches to integrating experiments in fluid mechanics with CFD		
PRACTICAL NO.11		2 HOURS
Study of flow through circular pipe using CFD		
PRACTICAL NO.12		2 HOURS
Study of flow in inclined plane using CFD		

TEXT BOOKS

1. Dr Bansal R.K, A Text book of Fluid Mechanics and Hydraulic Machines , 6th edition, Laxmi Publications, 1997. ISBN : 8131808157.
2. Dr Modi P.N and Dr Seth S.M, Hydraulics and Fluid Mechanics , 11th Edition, Standard Book House, 2004. ISBN : 8190089374
3. Yunus A. Cengel, Fluid Mechanics: Fundamentals and Applications 3rd Edition, Tata McGraw-Hill Education. ISBN 9789339204655.

REFERENCE BOOKS

1. White F.M., "Fluid Mechanics , 3rd Edition, McGraw Hill Inc., 1994. ISBN : 9780070696730.
2. Shames I.H, "Mechanics of Fluids", 3rd Edition, McGraw Hill Inc., 1992.ISBN : 9780070563872.
3. Noel de Nevers, Fluid Mechanics for Chemical Engineers , 2nd Edition, McGraw Hill Inc, 1991. ISBN : 0070163758.
4. Daugherty R.L, Franzini J.B and Finnemore E.J., "Fluid Mechanics with Engineering Applications", 10th Edition, McGraw Hill Book Company, 2006.ISBN : 9781259002274.
5. Streeter V.L, Wylie E.B, "Fluid Mechanics", 9th Edition, McGraw Hill Book Company, 2010. ISBN : 0070625379.
6. Liggett J.A, Fluid Mechanics", International Edition, McGraw Hill Inc., 1994.ISBN: 9780070378056

 MIT (An Autonomous Institute Affiliated to SPPU)	Academy of Engineering		COURSE SYLLABI (2019 – 2023)	
	SCHOOL OF CHEMICAL ENGINEERING		W.E.F	AY: 2020 - 2021
SECOND YEAR BACHELOR OF TECHNOLOGY CHEMICAL ENGINEERING		COURSE NAME		Chemical Engineering Thermodynamics
		COURSE CODE		CH224
		COURSE CREDITS		3
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			
3	NIL	35	35	30	NIL	NIL	100

PRE-REQUISITE : 11th and 12th Standard Chemistry

COURSE OBJECTIVES :

- CH224.CEO.1: Know the concept of thermodynamics and its applications in chemical engineering.
 CH224.CEO.2: Get information about the various thermodynamic properties and their applications.
 CH224.CEO.3: Get knowledge about heat effects and applications.
 CH224.CEO.4: Understand the phase and chemical reaction equilibrium with its applications.
 CH224.CEO.5: Learn the various thermodynamic relations.
 CH224.CEO.6: Know the real thermodynamic applications.

COURSE OUTCOMES :

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


- CH224.CO.1: State the importance of thermodynamic laws and their applications in chemical engineering.
 CH224.CO.2: Evaluate the thermodynamic properties of pure substances as well as mixtures.
 CH224.CO.3: Apply the knowledge of thermodynamics in chemical engineering problems.
 CH224.CO.4: Use appropriate thermodynamic models to predict the equilibrium characteristics of a system.
 CH224.CO.5: Implement knowledge of heat cycles in day to day applications.
 CH224.CO.6: Evaluate the feasibility of a reaction using thermodynamic concepts.

THEORY COURSE CONTENT		
UNIT 1	Basic Concepts and Laws of Thermodynamics	7 HOURS
First law for thermodynamics - flow process, non-flow process, cyclic process; Internal energy, Enthalpy, Heat capacity, Processes involving ideal gases isochoric process, isobaric process, isothermal process, adiabatic process; Second law of thermodynamics, Entropy, Carnot principle, Clausius inequality, Third law of thermodynamics.		
UNIT 2	Applications of Thermodynamic Laws	7 HOURS
PVT behavior of pure fluids, Equations of state - Van der Waals equation, Soave-Redlich-Kwong equation, Peng-Robinson equation, virial equation; Compressibility charts, Heat effects accompanying chemical reactions - heat of formation, heat of combustion, heat of reaction, Hess's law of constant heat summation; Refrigeration - vapour compression, air refrigeration, absorption refrigeration; Heat pumps.		
UNIT 3	Thermodynamic Properties of Pure Fluids	7 HOURS
Helmholtz free energy, Gibbs free energy, Fundamental property relations, Maxwell's equations, Clapeyron equation, Entropy-heat capacity relationships, Joule-Thomson coefficient, Gibbs-Helmholtz equation, Fugacity, Fugacity coefficient, Activity, Residual properties.		
UNIT 4	Solution Thermodynamics	7 HOURS
Partial molar properties, Chemical potential, Fugacity in solutions, Lewis-Randall rule, Raoult's law, Henry's law, Activity in solutions, Activity coefficients, Gibbs-Duhem equations, Property changes of mixing, Excess properties.		
UNIT 5	Phase Equilibrium	7 HOURS
Phase equilibria in single component systems, Phase equilibria in multi-component systems, Phase rule for non-reacting systems, Duhem's theorem, Vapour-Liquid equilibria, Phase diagrams, Consistency tests for VLE data, VLE for systems of limited miscibility, Liquid-Liquid equilibria.		
UNIT 6	Chemical Reaction Equilibrium	7 HOURS
Equilibrium constant and standard free energy change, Effect of temperature on equilibrium constant, Effect of pressure on equilibrium constant, Other factors affecting equilibrium conversion, Heterogeneous reaction equilibria, Simultaneous reactions, Phase rule for reacting systems.		

TEXT BOOKS
<ol style="list-style-type: none"> 1. Narayanan K. V., A Textbook of Chemical Engineering Thermodynamics, PHI Learning Pvt. Ltd., 2nd Edition, 2013, ISBN: 9788120347472. 2. Rao Y. V. C., Chemical Engineering Thermodynamics, Universities Press, 1st Edition, 1997, ISBN:9788173710483.

REFERENCE BOOKS

1. Smith J. M., Van Ness H. C., Abbott M. M., Swihart M. T., Introduction to Chemical Engineering Thermodynamics, McGraw-Hill Education, 8th Edition, 2017, ISBN:9781259696527.
2. Koretsky M. D., Engineering and Chemical Thermodynamics, Wiley, 2nd Edition, 2012, ISBN: 9780470259610.
3. Daubert T. E., Chemical Engineering Thermodynamics, McGraw-Hill, 1st Edition, 1985, ISBN:9780070154131.
4. Sandler S. I., Chemical and Engineering Thermodynamics, John Wiley & Sons, 3rd Edition, 1998, ISBN1:9780471182108.
5. Walas S. M., Phase Equilibria in Chemical Engineering, Butterworth-Heinemann, 1st Edition, 1985, ISBN1:9780750693134.

 MIT (An autonomous Institute Affiliated to SPPU)	Academy of Engineering			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/ PRACTICAL	PRESENTATION/ DEMONSTRATION	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA			
NIL	4	NIL	NIL	NIL	NIL	75	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
<ol style="list-style-type: none"> 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
<ol style="list-style-type: none"> 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
<ol style="list-style-type: none"> 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
<ol style="list-style-type: none"> 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
<ol style="list-style-type: none"> 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
<ol style="list-style-type: none"> 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
<ol style="list-style-type: none"> 1. Final Presentation and demonstration of models. 2. Report submission (assessment). 		

REFERENCE BOOK
<ol style="list-style-type: none"> 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 (An Autonomous Institute Affiliated to SPPU)	Academy of Engineering		COURSE SYLLABI (2019 – 2023)	
	SCHOOL OF CHEMICAL ENGINEERING		W.E.F	AY: 2020 - 2021
SECOND YEAR BACHELOR OF TECHNOLOGY CHEMICAL ENGINEERING		COURSE NAME		Minor Project- Design
		COURSE CODE		CH230
		COURSE CREDITS		1
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			
NIL	2	NIL	NIL	NIL	NIL	50	50

PRE-REQUISITE : NIL

COURSE OBJECTIVES :

CH230.CEO.1: To categorize and define a problem to be solved.
 CH230.CEO.2: To realize the ethical principles in general and its importance.
 CH230.CEO.3: To make the students aware of project requirement analysis, design and planning.
 CH230.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,

CH230.CO.1: Delineate the problem to be solved.
 CH230.CO.2: Comprehend the paramount of the health, safety and welfare of the public in the practice of engineering profession.
 CH230.CO.3: Embark project planning and design.
 CH230.CO.4: Inculcate problem solving skills and critically analyze the options available to solve the problem.
 CH230.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 (1st week and 2nd week)
2. Finalizing title, feasibility study and approval: 3 Weeks (3th week to 5th week)
3. Engineering Ethics: 3rd week
4. Project Review 1 Presentation: 6th week
5. Analysis and Design of the Project: 3 Weeks (7th week to 9th week)
6. Project Review 2 Presentation: 10th week
7. Report Writing, Documentation and Presentation: 2 Weeks (11th week and 12th week)
8. Project Review 3 Presentation: 13th week (Assessment by Guide)
9. Final Evaluation/Examination Presentation: 14th 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 <ul style="list-style-type: none"> • 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
<p>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.</p>	
Activity No. 2A	Students has to perform any one of the following activities : 2A or 2B)
<p>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:</p> <ol style="list-style-type: none"> 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
<p>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:</p> <ol style="list-style-type: none"> 1. Reuse, Recycle and Reduce 2. Environmental Pollution Monitoring and Control 3. Material Balance Concept 4. Sustainable Development 5. Environmental Innovations <p>The evaluation is based on at least one number of project presentation reviews apart from the final project presentation.</p>	

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 (An Autonomous Institute Affiliated to SPPU)	Academy of Engineering		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/ PRACTICAL	PRESENTATION/ DEMONSTRATION	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA			
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 Transform 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 (An Autonomous Institute Affiliated to SPPU)	Academy of Engineering		COURSE SYLLABI (2019 – 2023)	
	SCHOOL OF CHEMICAL ENGINEERING		W.E.F	AY: 2020 - 2021
SECOND YEAR BACHELOR OF TECHNOLOGY CHEMICAL ENGINEERING		COURSE NAME		Heat Transfer
		COURSE CODE		CH231
		COURSE CREDITS		4
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			
3	2	35	35	30	50	NIL	150

PRE-REQUISITE : NIL

COURSE OBJECTIVES :

CH231.CEO.1: Learn the different modes of heat transfer and the concept of conductive heat transfer..

CH231.CEO.2: Understand the concept of convection and overall combined heat transfer coefficient for conduction-convection in process heat exchangers.

CH231.CEO.3: Learn heat transfer involving phase changes such as condensation and boiling.

CH231.CEO.4: Study concept of radiation energy and the radiation between surfaces including various theories related to heat radiation.

CH231.CEO.5: Study various heat exchange equipment used in process industry.

CH231.CEO.6: Provide the basic tools those are used in thermal system design and to expose students to heat transfer applications in industry.

COURSE OUTCOMES :

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

CH231.CO.1: Identify the different modes of heat transfer and use the conduction calculations for various geometries.

CH231.CO.2: Apply the principles of convection for thermal systems.

CH231.CO.3: Implement the concepts of heat transfer with phase changes.

CH231.CO.4: Analyze the systems involving radiation and to solve problems pertaining to them.

CH231.CO.5: Analyze different types of heat exchangers based on fundamental concepts.

CH231.CO.6: Develop the basic designs of heat transfer equipment.

THEORY COURSE CONTENT		
UNIT 1	Conduction	7 HOURS
Importance of heat transfer in chemical engineering operations, modes of heat transfer, concept of heat conduction, Fouriers law of heat conduction, one dimensional steady state heat conduction equation for flat plate, hollow cylinder, hollow sphere, heat conduction through a series of resistances, analogy between flow of heat and flow of electricity, thermal conductivity measurement, effect of temperature on thermal conductivity, conduction through liquids, two dimensional steady state conduction, transient heat conduction, conduction with heat source.		
UNIT 2	Convection	7 HOURS
Concept of heat transfer by convection, natural and forced convection, application of dimensional analysis for convection, equations for forced convection under laminar, transition and turbulent conditions, equations for natural convection, individual and overall heat transfer coefficients and the relationship between them , Combined natural and forced convection.		
UNIT 3	Heat Transfer with Phase Change	7 HOURS
Heat transfer from condensing vapors, heat transfer to boiling liquids, influence of boundary layer on heat transfer, heat transfer to molten metals, heat transfer in packed and fluidized beds, thermal contact resistance, Heat conduction in bodies with heat sources.		
UNIT 4	Radiation	7 HOURS
Basic ideas, spectrum, basic definitions, laws of radiation, black body radiation, plancks law, Stefan boltzman law, wiens displacement law, lambert cosine law, radiation exchange between black surfaces, shape factor, radiation exchange between gray surfaces radiosity-Irradiation method, Parallel plates, enclosures, radiation shields, basics of radiative heat transfer and application to furnace design, electrical network for radiation through absorbing and transmitting medium.		
UNIT 5	Heat Exchangers	8 HOURS
Parallel and counter flow heat exchangers, log mean temperature difference, single pass and multi pass heat exchangers, plate heat exchangers, use of correction factor charts, heat exchangers effectiveness, number of transfer unit, chart for different configurations, fouling factors and Wilsons plot, design of various types of heat exchangers, design of furnaces, design of condensers, design of tubular reactors, Heat transfer effectiveness and number of transfer units.		
UNIT 6	Heat Transfer in Agitated Vessels	6 HOURS
Heat transfer in agitated vessels: coils, jackets, limped coils, calculation of heat transfer coefficients, heating and cooling times, applications to batch reactors and batch processes, Agitation of liquids or heterogeneous systems.		


PRACTICAL		
PRACTICAL NO.01	Thermal conductivity of metallic and non metallic materials	2 HOURS
To study variation of thermal conductivity of metal rod and insulating powder with temperature		
PRACTICAL NO.02	Thermal conductivity of composite slab	2 HOURS
To determine the thermal conductivity of composite wall		
PRACTICAL NO.03	Heat transfer in Forced Convection	2 HOURS
To study the variation of heat transfer coefficient over a horizontal circular pipe in forced convection		
PRACTICAL NO.04	Heat transfer in pin fin apparatus	2 HOURS
To study the temperature distribution in pin fin and to evaluate the fin performance under natural convection		
PRACTICAL NO.05	Emissivity measurement apparatus	2 HOURS
Emissivity measurement apparatus		
PRACTICAL NO.06	Critical heat flux apparatus	2 HOURS
To demonstrate the boiling phenomenon and to calculate the critical heat flux		
PRACTICAL NO.07	Study of film wise and drop wise condensation	2 HOURS
To study the phenomenon of film wise and drop wise condensation		
PRACTICAL NO.08	Stefan Boltzmanns apparatus	2 HOURS
To determine the value of Stefan Boltzmanns constant for black bodies		
PRACTICAL NO.09	Heat transfer in agitated vessel	2 HOURS
To study the effect of flow rate of heating/cooling media, temperature and agitation speed on calculation of overall heat transfer coefficient for heating/cooling in agitated vessel		
PRACTICAL NO.10	Plate type heat exchanger	2 HOURS
To determine Logarithmic Mean Temperature Difference (LMTD), overall heat transfer coefficient and effectiveness of plate type heat exchanger		
PRACTICAL NO.11	Shell and tube heat exchanger	2 HOURS
To determine Logarithmic Mean Temperature Difference (LMTD), overall heat transfer coefficient and effectiveness of shell and tube heat exchanger for co-current and counter current flow.		
PRACTICAL NO.12	Transient heat conduction	2 HOURS
To calculate Biot and Fourier numbers and the determination of heat transfer coefficient		

TEXT BOOKS

1. McCabe W.L, Smith J.C, Unit Operations in Chemical Engineering, McGraw-Hill, 7th Edition, 2014. ISBN : 9339213238.
2. Sukhatme S.P, A Text Book on Heat Transfer, Universities Press, 4th Edition, 2005. ISBN : 8173715440.

REFERENCE BOOKS

1. Coulson J.M, Richardson J.F, Chemical Engineering, Vol.1, Butterworth and Heinemann Publishers, 6th Edition, 1970. ISBN : 9780750644440.
2. Binay K.Dutta, Heat Transfer Principles and Applications, Prentice Hall of India, 2001. ISBN: 8120316258.
3. Kern D.Q, Process Heat Transfer , McGraw Hill Revised edition, 1st Edition, 1999. ISBN 007085353.
4. Holman J.P, Heat Transfer, McGraw Hill, 9th Edition, 2008. ISBN : 0070634513.
5. Yunus A. Cengel, Heat and Mass Transfer, Tata McGraw Hill Publications, New Delhi, 3rd Edition, (2007). ISBN 007245893.

 MIT (An Autonomous Institute Affiliated to SPPU)	Academy of Engineering		COURSE SYLLABI (2019 – 2023)	
	SCHOOL OF CHEMICAL ENGINEERING		W.E.F	AY: 2020 - 2021
SECOND YEAR BACHELOR OF TECHNOLOGY CHEMICAL ENGINEERING		COURSE NAME		Advanced Chemistry
		COURSE CODE		CH232
		COURSE CREDITS		4
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			
3	2	35	35	30	50	NIL	150

PRE-REQUISITE : CH222: Inorganic and Analytical Chemistry

COURSE OBJECTIVES :

- CH232.CEO.1: Study the kinetics of various possible chemical reactions and the factors that influences them.
- CH232.CEO.2: Impart the basic concepts of physical and analytical chemistry.
- CH232.CEO.3: Develop understanding about concepts on mechanisms of organic reactions.
- CH232.CEO.4: Study the different optical, analytical and thermal characterization methods.

COURSE OUTCOMES :

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

- CH232.CO.1: Predict the rates of given chemical and photochemical processes.
- CH232.CO.2: Recognize how the MSDS improves your access to vital safety, health, and environmental information about chemicals used in the workplace.
- CH232.CO.3: Apply adsorption & catalysis technique for purification & unit processes.
- CH232.CO.4: Predict the mechanism of given organic reaction.
- CH232.CO.5: Interpret spectral data and identify unknown compounds.
- CH232.CO.6: Interpret the thermograms, analyze and present the result of the measurements.


THEORY COURSE CONTENT		
UNIT 1	KInetics and Photochemistry	7 HOURS
<p>A) Kinetics: Rate of reaction, rate constant, order of reaction, kinetics of first and second order reactions, numerical on above, Activated complex theory of reaction rates, kinetics of complex reactions, Unimolecular reactions.</p> <p>B) Introduction and importance, Stark-Einstein law, photochemical rate law, examples of photochemical reactions kinetics of i) H₂, Cl₂ reaction ii) dimerization of anthracene.</p>		
UNIT 2	Material Safety Data Sheet and Phase Rule	7 HOURS
<p>A) Understanding the Material Safety Data Sheet, first aid measures, fire and fire fighting, handling and storage of chemicals and good safety practices.</p> <p>B) Phase Rule: Gibbs Phase rule & terms involved it with examples. Phase rule for Chemical reaction equilibrium. One component system- water. Reduced phase rule. Applications & limitations of phase rule.</p>		
UNIT 3	Adsorption and Catalysis	7 HOURS
<p>Adsorption: Introduction to Freundlich and Langmuir theories of adsorption, adsorption from solution, B.E.T. Theory of adsorption of gases, activation energy, numerical on above.</p> <p>Catalysis: characteristics, types, adsorption theory of catalysis, promoters, poisons, industrial applications of catalysts; acid base catalysis Biological catalysis- Kinetics of enzyme catalyzed reaction. Zeolites- structure, properties applications as catalyst for various reactions</p>		
UNIT 4	Reaction Mechanisms	7 HOURS
<p>Substitution at saturated carbon (SN₁, SN₂) (Self Study) - mechanism, kinetics, stereochemistry, factors favoring it. Electrophilic aromatic substitution in benzene and mono substituted benzenes, activating and deactivating groups, nitration, Friedel-Craft reactions, sulphonation, and diazotization. Nucleophilic substitution on carbonyl carbon. Addition of HX on C=C, 1, 2-Eliminations- E₁ mechanism, E₂, (Saytzeff, Hoffman products), factors favoring it. Rearrangement reactions.</p>		
UNIT 5	Advanced Spectroscopy	7 HOURS
<p>Diamagnetism and paramagnetism, nuclear spin, NMR spectroscopy, chemical shift, nuclear spin - spin coupling, Interpretation of NMR spectra. Introduction to mass spectroscopy.</p>		
UNIT 6	Atomic Spectrometric and Thermal Methods	7 HOURS
<p>Atomic Absorption Spectrophotometry & SEM Principles, Instrumentation & applications Thermal Methods: Thermogravimetric Analysis (TGA) Differential thermal Analysis (DTA), Differential Scanning Calorimetry (DSC).</p>		

PRACTICAL		
PRACTICAL NO.01		2 HOURS
Rate constant of first order reaction of acid catalyzed hydrolysis of ester		
PRACTICAL NO.02		2 HOURS
Adsorption of acetic acid on charcoal to verify Freundlich isotherm		
PRACTICAL NO.03		2 HOURS
Purification of organic compounds by crystallization and sublimation (one each)		
PRACTICAL NO.04		2 HOURS
Preparation of m-dinitro benzene from nitrobenzene, crystallization and purity checking by TLC		
PRACTICAL NO.05		2 HOURS
Determination of the percent purity of sodium bicarbonate (NaHCO ₃) by gravimetry		
PRACTICAL NO.06		2 HOURS
Interpretation of NMR Spectrum		
PRACTICAL NO.07		2 HOURS
To determine the energy of activation of reaction between K ₂ S ₂ O ₈ & KI		
PRACTICAL NO.08		2 HOURS
Identification of given organic compound (with maximum one functional group) by systematic analysis		
PRACTICAL NO.09		2 HOURS
Identification of given organic compound (with maximum one functional group) by systematic analysis		

TEXT BOOKS
1. Mehta & Mehta, Organic Chemistry, PHI Learning Pvt. Ltd., 2005, ISBN : 9788120324411.
2. Puri, Sharma & Pathania, Inorganic Chemistry, Shoban Lal Nagin Chand & Co. ISBN : 9788188646999.
3. Gary D. Christian, Analytical Chemistry, 6th Edition, John Wiley and Sons Inc. ISBN : 9780471214724.
4. Soni P. L. Physical Chemistry, S. Chand & Company, ISBN 9788180545870.
5. Br.Puri, Lr Sharma, Madan S Pathania, Principles of Physical Chemistry, Vishal Publishing Co. ISBN-13: 9789382956785.

REFERENCE BOOKS

1. Finar I.L, Organic chemistry, Vol. I and II, ELBS Longman Limited.ISBN :9788177585421.
2. Lee J.D, Inorganic chemistry, 5th Edition, (ELBS) Chapman & Hall.ISBN :9780412402906.
3. Cotton, Wilkinson, Basic Inorganic chemistry, 3rd Edition, Wiley India Pvt. Ltd. ISBN: 9780471505327.
4. Skoog and West, Fundamentals of Analytical Chemistry, 8th Edition, Thomson Asia, ISBN: 9780495558286.
5. P. S. Kalsi, Spectroscopy of Organic compounds New age international, ISBN:8122415431.
6. Sykes Peter, Reaction mechanism, 6th Edition, Orient Longman Private Ltd.ISBN: 9780582266445.

 MIT (An Autonomous Institute Affiliated to SPPU)	Academy of Engineering	COURSE SYLLABI (2019 – 2023)	
		SCHOOL OF CHEMICAL ENGINEERING	W.E.F
SECOND YEAR BACHELOR OF TECHNOLOGY CHEMICAL ENGINEERING	COURSE NAME		Mass Transfer
	COURSE CODE		CH233
	COURSE CREDITS		4
RELEASED DATE : 01/07/2020		REVISION NO 0.1	

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

PRE-REQUISITE : CH223: Momentum Transfer

COURSE OBJECTIVES :

CH233.CEO.1: Understand the concept and use of separation processes.
 CH233.CEO.2: Learn the basics of diffusion and the empirical laws that govern diffusion.
 CH233.CEO.3: Understand the analogies between momentum, mass and heat transfer.
 CH233.CEO.4: Understand the concept and importance of mass transfer coefficient.
 CH233.CEO.5: Understand the mechanism of all simultaneous heat and mass transfer operations.
 CH233.CEO.6: Understand the uses and design concept of separation processes.

COURSE OUTCOMES :

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

CH233.CO.1: Calculate the molar flux for different systems.
 CH233.CO.2: Determine the individual and overall transfer coefficients.
 CH233.CO.3: Use the Psychrometric chart for humidification operations.
 CH233.CO.4: Analyze the drying rate of the given material.
 CH233.CO.5: Develop the equilibrium data for crystallization operation.
 CH233.CO.6: Design equipment for various mass transfer operations.

THEORY COURSE CONTENT		
UNIT 1	Diffusion	7 HOURS
Introduction to mass transfer operations, their uses and classification. Molecular and eddy diffusion, Ficks law, measurement and calculation of diffusivity, diffusion in multi-component gaseous mixtures, diffusion in solids and its applications, steady state diffusion under stagnant and laminar flow conditions.		
UNIT 2	Interphase Mass transfer	7 HOURS
Concept of mass transfer co-efficient, interphase and overall mass transfer coefficient in binary and multi-component systems, mass transfer under laminar and turbulent flow, theories of mass transfer and their applications, boundary layer, correlation of mass transfer co-efficient, analogies between momentum, heat and mass transfer, Jh & Jd factor.		
UNIT 3	Humidification	7 HOURS
Basic concepts & definitions, psychrometric chart, wet-bulb temperature and Lewis relation, methods of humidification and dehumidification, design calculation, cooling towers principle and operation, equipment.		
UNIT 4	Drying	7 HOURS
Principles of drying and mechanism of drying, drying characteristics, classification of dryers, working principles of dryers, design and performance of batch and continuous dryers, estimation of drying rates.		
UNIT 5	Crystallization	7 HOURS
Theory of crystallization, Miers theory of supersaturation, factors governing nucleation and crystal growth, growth coefficient, mass and energy balance, batch and continuous crystallizers, industrial crystallizer.		
UNIT 6	Evaporation	8 HOURS
Evaporation, single and multiple effect evaporation, types of evaporators, design calculation for single and multiple effect evaporators.		


PRACTICAL		
PRACTICAL NO.01	Solid Liquid Diffusion	2 HOURS
Estimation of the diffusion coefficient for solid liquid diffusion using benzoic acid in water system.		
PRACTICAL NO.02	Molecular Diffusion in Liquids	2 HOURS
Estimation of the mass transfer coefficient for liquid liquid diffusion (Molecular).		
PRACTICAL NO.03	Eddy diffusion in Liquids	2 HOURS
Estimation of the mass transfer coefficient for liquid liquid diffusion (Eddy).		
PRACTICAL NO.04	Liquid Air Diffusion	2 HOURS
Estimation of the diffusion coefficient for liquid diffusion in air.		
PRACTICAL NO.05	Psychrometric chart	2 HOURS
Estimation of properties of air water system using Psychrometric chart.		
PRACTICAL NO.06	Tray Dryer	2 HOURS
Design of tray dryer for the given system (Sand / Saw dust).		
PRACTICAL NO.07	Crystallizer	2 HOURS
Design of crystallizer for the given capacity.		
PRACTICAL NO.08	Equilibrium data for Crystallizer	2 HOURS
Batch studies on solubility and yield of crystallizer.		
PRACTICAL NO.09	Fluidized Bed Dryer	2 HOURS
Studies on fluidized bed dryer.		
PRACTICAL NO.10	Humidifier	2 HOURS
Estimation of mass transfer flux for the humidification column.		
PRACTICAL NO.11	Single Effect Evaporator	2 HOURS
Design of single effect evaporator for the given system.		
PRACTICAL NO.12	Cooling Tower	2 HOURS
Studies on Cooling tower.		

TEXT BOOKS

1. Warren L McCabe, Julian C Smith and Peter Harriott, Unit Operations of Chemical Engineering, McGraw Hill International Edition, 6th Edition, New York 2001, ISBN 9780070448285.
2. Robert E Treybal, Mass Transfer Operations, McGraw Hill International Edition, 3rd Edition, Singapore, 1980, ISBN 9780070651760.
3. Geankoplis C.J, Transport Processes and Unit Operations, Prentice Hall Inc., 4th Edition, New Jersey, 2003, ISBN 013101367X.

REFERENCE BOOKS

1. Coulson J.M, Richardson J.F. Backhurst J.R. and. Harker J.M, Chemical Engineering, Vol. 1 & 2, Butter worth Heinemann, 6th Edition, 1999, ISBN 9780080494227.
2. Foust A.S, Principles of Unit Operations, John Wiley, ISBN 9780471268963.
3. Seader J.D & Henley E.J, Separation Process Principles, John Wiley, 2nd Edition, 2006, ISBN 9780471586265.
4. Welty J.R, Wicks C.E. & Wilson R.E, Fundamentals of Momentum, Heat & Mass Transfer, John Wiley, ISBN 9780471874973.
5. King C.J, Separation Processes, Tata McGraw Hill, 2nd Edition, 1980, ISBN 9780070993860.

 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/ PRACTICAL	PRESENTATION/ DEMONSTRATION	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA			
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		
<ol style="list-style-type: none"> 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 . 		

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 (An autonomous Institute Affiliated to SPPU)	Academy of Engineering		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/ PRACTICAL	PRESENTATION/ DEMONSTRATION	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA			
NIL	4	NIL	NIL	NIL	NIL	75	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
<ol style="list-style-type: none"> 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
<ol style="list-style-type: none"> 1. Soldering <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • 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
<ol style="list-style-type: none"> 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
<ol style="list-style-type: none"> 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
<ol style="list-style-type: none"> 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
<ol style="list-style-type: none"> 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, <ol style="list-style-type: none"> 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 (An autonomous Institute Affiliated to SPPU)	Academy of Engineering		COURSE SYLLABI (2019 – 2023)	
	SCHOOL OF CHEMICAL ENGINEERING		W.E.F	AY: 2020 - 2021
SECOND YEAR BACHELOR OF TECHNOLOGY CHEMICAL ENGINEERING		COURSE NAME		Minor Project-Implementaion
		COURSE CODE		CH240
		COURSE CREDITS		1
RELEASED DATE : 01/07/2020		REVISION NO		2.0

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

PRE-REQUISITE : NIL

COURSE OBJECTIVES :

CH240.CEO.1: To disseminate different methodical approaches to make solution.

CH240.CEO.2: To explain different conventional and modern engineering tools/techniques.

CH240.CEO.3: To engage them in creative thinking to improve the project performance using recent trends.

CH240.CEO.4: To educate about different types of prototyping.

CH240.CEO.5: To be more self efficient to solve problem in real time design environment.

CH240.CEO.6: To create awareness about Intellectual Property Rights(IPR).

COURSE OUTCOMES :

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

CH240.CO.1: Select appropriate method for making of solution.

CH240.CO.2: Compare various engineering tools/technique to develop solution.

CH240.CO.3: Justify the selected method/tools opted for making of solution.

CH240.CO.4: Develop tangible solution to defined problem.

CH240.CO.5: Test the developed solution.

CH240.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 (1st ,2nd week)
2. Presentation of Project Review -1- Finalizing title with feasibility study and approval: 2 Weeks (4th , 5th week)
3. Presentation of Project Review -2 Analysis and Design of Project: 2 weeks (9th , 10th week)
4. Preparation of Project Progress Report – I (week 11th and 12th) Project Phase-II
5. Project Review III (10 marks) (11th week)
6. Evaluation by external examiner (End Semester by 12th , 13th 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 <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • 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 (An Autonomous Institute Affiliated to SPPU)	Academy of Engineering	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		EXAMINATION SCHEME AND MARKS					
(HOURS/WEEK)		THEORY			TUTORIAL/ PRACTICAL	PRESENTATION/ DEMONSTRATION	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA			
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.

<p>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.</p>		
Track 8	Yoga and Meditation	12 HOURS
<p>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.</p>		
Track 9	Automotive Skills	12 HOURS
<p>Introduction to Automotive system, Brake system, Power train of automotive, Suspension system, Computer Aided Engineering, Manufacturing and safety, Assembly and finishing.</p>		
Track 10	Empathy & Compassion	12 HOURS
<p>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.</p>		
Track 11	Singing	12 HOURS
<p>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.</p>		
Track 12	Chess	12 HOURS
<p>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.</p>		
Track 13	RC Plane	12 HOURS
<p>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.</p>		

Track 14	Drone Making	12 HOURS
<p>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.</p>		

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



MIT ACADEMY OF ENGINEERING, ALANDI

An Autonomous Institute Affiliated to

Savitribai Phule Pune University

Curriculum


For

Third Year

**Bachelor of Technology in
Chemical 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 CHEMICAL ENGINEERING	W.E.F	:	2021-2022
THIRD YEAR BACHLEOR OF TECHNOLOGY IN CHEMICAL ENGINEERING	RELEASE DATE	:	01/07/2021
	REVISION NO.	:	1.0

SEMESTER: V													
COURSE			TEACHING SCHEME			EXAMINATION SCHEME AND MARKS						C R E D I T	
TYPE	CODE	NAME	Hour/Week			THEORY			PRACT		T O T A L		
			L	P	T	MS E	ES E	IA	T/P	DM			
DC08	CH341	Chemical Engineering Operations	3	2	-	35	35	30	50	0	150	4	
DC09	CH342	Separation Process	3	2	-	35	35	30	50	0	150	4	
DC10	CH 343	Chemical Reaction Engineering	3	2	-	35	35	30	50	0	150	4	
OE01	CH 351	Process Engineering	3	2	-	35	35	30	50	0	150	4	
HSS5	HP304	Project Management	2	0	-	0	50	25	0	0	75	2	
SDP7	CH344	Skill Development Lab (CFD)	0	4	-	0	0	25	50	0	75	2	
SDP8	CH345	Project Design	0	4	-	0	0	25	0	50	75	2	
TOTAL			14	16	0	140	190	195	250	50	825	22	

SEMESTER: VI													
COURSE			TEACHING SCHEME			EXAMINATION SCHEME AND MARKS						C R E D I T	
TYPE	CODE	NAME	Hour/Week			THEORY			PRACT		T O T A L		
			L	P	T	MSE	ESE	IA	T/P	DM			
DC11	CH361	Process Dynamics and Control	3	2	-	35	35	30	50	0	150	4	
DC12	CH362	Chemical Equipment Design I	3	2	-	35	35	30	50	0	150	4	
DC13	CH363	Chemical Process Technology	3	0	-	35	35	30	0	0	100	3	
OE02	CH371	Process Modelling and Simulation	3	2	-	35	35	30	50	0	150	4	
HSS6	HP305	Professional Skills	0	4	-	0	0	25	0	50	75	2	
SDP9	CH364	Skill Development Lab (ASPEN ONE)	0	4	-	0	0	25	50	0	75	2	
SDP10	CH365	Mini Project Implementation	0	4	-	0	0	25	0	50	75	2	
TOTAL			12	16	0	140	140	195	200	100	775	21	

 MIT (An Autonomous Institute Affiliated to SPPU)	Academy of Engineering		COURSE SYLLABI (2019 – 2023)	
	SCHOOL OF CHEMICAL ENGINEERING		W.E.F	AY: 2021 - 2022
THIRD YEAR BACHELOR OF TECHNOLOGY CHEMICAL ENGINEERING		COURSE NAME		Chemical Engineering Operations
		COURSE CODE		CH341
		COURSE CREDITS		4
RELEASED DATE : 01/07/2021		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	50	NIL	150

PRE-REQUISITE : CH223: Momentum Transfer, CH231: Heat Transfer

COURSE OBJECTIVES :

- CH341.CEO.1: Understand solid storage and transportation systems.
 CH341.CEO.2: Demonstrate parts of various equipments used in solid-fluid operation.
 CH341.CEO.3: Calculate energy required for size reduction and for mixing operation.
 CH341.CEO.4: Apply various mathematical equations for calculate pressure drop across systems.
 CH341.CEO.5: Select proper impellers and mixer for given application
 CH341.CEO.6: Select Proper equipments for solid-solid and solid- fluid separation

COURSE OUTCOMES :

- The students after completion of the course will be able to,
- CH341.CO.1: Explain parts of equipments used in Solid-solid, solid-fluid separation.
 CH341.CO.2: Distinguish between various solid transportation equipments.
 CH341.CO.3: Calculate power requirement for various equipments with laws.
 CH341.CO.4: Classify size reduction, mixing and solid-fluid separation equipments.
 CH341.CO.5: Calculate pressure drop across solid- fluid systems.
 CH341.CO.6: Select appropriate equipments for solid-solid and solid-fluid separation.

THEORY COURSE CONTENT		
UNIT 1	Particle Screening and size reduction	10 HOURS
Particle size and shape, Mixtures of particles, Determination of particle size, Standard screen series, screen analysis, Screen effectiveness and capacity, Industrial screening equipments. Crushing efficiency, energy requirements calculations by using different crushing laws, Size reduction equipments: Primary crushers, secondary crushers, Intermediate & fine grinders, Ultra fine grinders, Cutting machines.		
UNIT 2	Handling And Transport of Solids	6 HOURS
Storage of solids, characteristics of Bulk solids. Conveyors: Working principles, Construction, Advantages, Disadvantages and design calculation of Screw conveyors, Belt Conveyors, Chain & Flight conveyors, Bucket elevators, Pneumatic conveyors. Introduction to two phase flow and slurry flow pumps.		
UNIT 3	Mixing and Agitation	6 HOURS
Necessity of mixing & agitation in chemical industries, Types of Impellers & propellers, Different flow patterns in mixing, Calculation of power requirement of mixing equipment, Mixing equipment of pastes & viscous material, Solid Solid Mixing, segregation mechanisms for solid mixture, mixing mechanisms for mixing solids, Agitator selection		
UNIT 4	Fluidization	4 HOURS
Flow through packed beds (Kozeny-Carman and Erguns Equation), characteristics of fluidized systems, minimum fluidization velocity, Types of fluidization (homogenous and bubbling fluidization) spouted beds and fixed bed.		
UNIT 5	Filtration	7 HOURS
Filter media and filter aids, classification of filtration, pressure drop through filter cake, filter medium resistance, specific cake resistance, Continuous Filtration, Washing and dewatering of filter cakes, Centrifugal filtration.		
UNIT 6	Fluid Solid systems	10 HOURS
A: Liquid Solid Separation Gravity settling method: Terminal velocity, Stokes law and Newtons law, free settling, sink and float method, differential settling. Sedimentation and thickening: Batch sedimentation, equipments for sedimentation, Kynch theory of sedimentation, calculation of area and depth of continuous thickeners, batch thickeners, and continuous thickeners. B: Gas Solid Separation Different types of separation efficiency (Target efficiency, grade efficiency, Total efficiency of separation), Gas-cyclone, Bag house filter, Electrostatic Precipitator, Venturi scrubber.		


PRACTICAL		
PRACTICAL NO.01		2 HOURS
Jaw Crusher		
PRACTICAL NO.02		2 HOURS
Batch Ball Mill		
PRACTICAL NO.03		2 HOURS
Trommel		
PRACTICAL NO.04		2 HOURS
Power Consumption in Agitated Vessels		
PRACTICAL NO.05		2 HOURS
Plate and Frame Filter Press		
PRACTICAL NO.06		2 HOURS
Vacuum Leaf Filter		
PRACTICAL NO.07		2 HOURS
Cyclone Separator		
PRACTICAL NO.08		2 HOURS
Simulation of Cyclone Separator		
PRACTICAL NO.09		2 HOURS
Simulation Screening of Solid		
PRACTICAL NO.10		2 HOURS
Simulation of Filtration		

TEXT BOOKS

1. McCabe W. L. and Smith J.C. Unit Operations in Chemical Engineering, 5th Edition, McGraw Hill Publications, 1993, ISBN 007448442.
2. Badger W. L and Banchero J.T. Introduction to Chemical Engineering, McGraw Hill Publications, ISBN 0070029954.
3. George G. Brown, Unit operations, CBS publishers and distributors, 2005, ISBN 9788123910994.

REFERENCE BOOKS

1. Coulson J.M. and Richardson J.F., Chemical Engineering, Vol. 2, Butterworth Heinemann Publishers, ISBN 9780750644457.
2. Foust A.S, Principles of Unit Operation, 2nd Edition, John Wiley and Sons, ISBN 0471047872.
3. Levy A, Kalman H, Handbook of conveying and handling of particulate solids, Elsevier Science, 2001, ISBN 0444502351.

 MIT (An Autonomous Institute Affiliated to SPPU)	Academy of Engineering		COURSE SYLLABI (2019 – 2023)	
	SCHOOL OF CHEMICAL ENGINEERING		W.E.F	AY: 2021 - 2022
THIRD YEAR BACHELOR OF TECHNOLOGY CHEMICAL ENGINEERING		COURSE NAME		Separation Process
		COURSE CODE		CH342
		COURSE CREDITS		4
RELEASED DATE : 01/07/2021		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	50	NIL	150

PRE-REQUISITE : CH233: Mass Transfer

COURSE OBJECTIVES :

CH342.CEO.1: Understand the concept of vapor-liquid equilibrium and distillation.
 CH342.CEO.2: Learn the various separation processes used in chemical industry.
 CH342.CEO.3: Understand the equilibrium data and its application in the design.
 CH342.CEO.4: Understand the mechanism of absorption, extraction, leaching & adsorption.
 CH342.CEO.5: Introduce advanced separation techniques.
 CH342.CEO.6: Study the working and design concept of various separation processes.

COURSE OUTCOMES :

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

CH342.CO.1: Generate the vapor - liquid equilibrium data for the given system.
 CH342.CO.2: Perform material balance for batch and continuous distillation.
 CH342.CO.3: Calculate the mass transfer coefficient for the different system.
 CH342.CO.4: Analyze the effectiveness of the given separation column.
 CH342.CO.5: Perform material balance calculations for different types of extraction units.
 CH342.CO.6: Design equipment for various separation process.

THEORY COURSE CONTENT		
UNIT 1	Distillation	8 HOURS
Distillation principle, vapor liquid equilibria, Raoult's law and deviations from ideality, relative volatility, methods of distillation, batch, continuous, flash, steam, vacuum, azeotropic, extractive and molecular distillation, reactive distillation.		
UNIT 2	Design of Distillation Column	8 HOURS
Continuous rectification, reflux, minimum and optimum reflux, number of ideal stages by McCabe Thiele method, Ponchon - Savorit method, Fenske's equation, Fenske Underwood equation, introduction to multi-component distillation.		
UNIT 3	Absorption	8 HOURS
Equilibrium and operating line concept in absorption calculations, absorption and stripping factors, calculation of NTU, HTU, number of stages, packed and plate type absorbers, absorption with chemical reaction, HETP, operating characteristics of stage wise and differential contactors.		
UNIT 4	Liquid Liquid Extraction / Leaching	8 HOURS
Liquid - liquid extraction, ternary liquid equilibria, stage wise contact equipment, calculations for batch and continuous extractors, calculation of number of stages. solid liquid equilibrium, equipment, batch and continuous type, calculation of number of stages.		
UNIT 5	Adsorption	12 HOURS
Types of adsorption, nature of adsorption, theories of adsorption, adsorption isotherms, operation of adsorption columns, introduction to pressure swing adsorption (PSA), and temperature swing adsorption (TSA) batch and continuous operations, equipment.		
UNIT 6	Advanced Separation Techniques	12 HOURS
Recent advances in separation techniques, supercritical fluid extraction, Chromatography fundamentals, ion exchange, reactive distillation. Types of membrane separation processes, applications and advantages of membrane separation.		


PRACTICAL		
PRACTICAL NO.01	Refractive Index Vs Composition	2 HOURS
Estimation of the composition Vs Refractive Index for the given system		
PRACTICAL NO.02	Simple Distillation	2 HOURS
Simple Distillation to verify Rayleighs equation		
PRACTICAL NO.03	Steam Distillation	2 HOURS
Steam Distillation to find actual distillation temperature, thermal and vaporization efficiency		
PRACTICAL NO.04	Vapour Liquid Equilibria	2 HOURS
Estimation of VLE data for given system (Methanol Water) and determination of Van - Laar constants		
PRACTICAL NO.05	Wetted Wall Column	2 HOURS
Estimation of mass transfer coefficient in wetted wall column for air water system		
PRACTICAL NO.06	Simple Leaching	2 HOURS
Estimation of separation efficiency for single / multi stage leaching		
PRACTICAL NO.07	Counter Current Leaching	2 HOURS
Counter current leaching in 3 stages for the given system		
PRACTICAL NO.08	LLE for extraction	2 HOURS
Liquid - Liquid Equilibrium for the given system and plot the binodal curve		
PRACTICAL NO.09	Plait Point Estimation	2 HOURS
Identification of plait point for the given system		
PRACTICAL NO.10	Adsorption	2 HOURS
Batch adsorption studies and identification of Langmuir isotherm constants		
PRACTICAL NO.11	Simulation of Distillation Column	2 HOURS
Simulation studies of distillation column using Aspen One		
PRACTICAL NO.12	Simulation of Absorption column	2 HOURS
Simulation studies of absorption column using Aspen One		

TEXT BOOKS

1. Warren L McCabe, Julian C Smith and Peter Harriott, Unit Operations of Chemical Engineering, McGraw Hill International Edition, 6th Edition, New York 2001, ISBN 9780070448285.
2. Robert E Treybal, Mass Transfer Operations, McGraw Hill International Edition, 3rd Edition, Singapore, 1980, ISBN 9780070651760.
3. Geankoplis C.J, Transport Processes and Unit Operations, Prentice Hall Inc., 4th Edition, New Jersey, 2003, ISBN 013101367X.

REFERENCE BOOKS

1. Coulson J.M, Richardson J.F. Backhurst J.R. and. Harker J.M, Chemical Engineering, Vol. 1 & 2, Butter worth Heinemann, 6th Edition, 1999, ISBN 9780080494227.
2. Foust A.S, Principles of Unit Operations, John Wiley, ISBN 9780471268963.
3. Seader J.D & Henley E.J, Separation Process Principles, John Wiley, 2nd Edition, 2006, ISBN 9780471586265.
4. Welty J.R, Wicks C.E. & Wilson R.E, Fundamentals of Momentum, Heat & Mass Transfer, John Wiley, ISBN 9780471874973.
5. King C.J, Separation Processes, Tata McGraw Hill, 2nd Edition, 1980, ISBN 9780070993860.

 MIT (An Autonomous Institute Affiliated to SPPU)	Academy of Engineering			COURSE SYLLABI (2019 – 2023)	
	SCHOOL OF CHEMICAL ENGINEERING			W.E.F	AY: 2021 - 2022
THIRD YEAR BACHELOR OF TECHNOLOGY CHEMICAL ENGINEERING			COURSE NAME		Chemical Reaction Engineering
			COURSE CODE		CH343
			COURSE CREDITS		4
RELEASED DATE : 01/07/2021			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	50	NIL	150

PRE-REQUISITE : CH224: Chemical Engineering Thermodynamics; CH232: Advanced Chemistry

COURSE OBJECTIVES :

CH343.CEO.1: Learn about reaction kinetics for different types of reactions.
 CH343.CEO.2: Solve problems involving mass and energy balance with reaction.
 CH343.CEO.3: Design chemical reactors such as batch reactor, mixed reactor and plug flow reactor.
 CH343.CEO.4: Determine reaction mechanism using experimental data.
 CH343.CEO.5: Develop critical and creative thinking skills related to reaction engineering.

COURSE OUTCOMES :

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

CH343.CO.1: Identify different reaction types and mechanisms.
 CH343.CO.2: Classify the various reactor types and their applications.
 CH343.CO.3: Apply rate equations to determine the kinetic parameters of a reaction.
 CH343.CO.4: Compare the behavior of different reaction order systems.
 CH343.CO.5: Analyze the data obtained for different reactor systems.
 CH343.CO.6: Design a reactor based on the reaction kinetic data.

THEORY COURSE CONTENT		
UNIT 1	Interpretation of Batch Reactor Data	7 HOURS
Constant volume and variable volume batch reactor, liquid phase and gas phase reactions, integral method and differential method of analysis, irreversible and reversible reactions, single and multiple reactions, elementary and non-elementary reactions rate equation, fractional conversion, zero order reactions, first order reactions, second order reactions, fractional order reactions, reactions in series, parallel reactions, homogeneous catalyzed reactions.		
UNIT 2	Ideal Reactors and Non-idealities in Real Reactors	7 HOURS
Introduction to flow reactors, constant density and changing density systems, ideal batch reactor, steady state mixed flow reactor, steady state plug flow reactor performance equation, space time & space velocity, size comparison of single reactors. Non-ideal flow, Residence Time Distribution (RTD), State of aggregation, Earliness of mixing, Exit age distribution, dispersion model, tanks-in-series model.		
UNIT 3	Reactor Combinations and Multiple Reactions	7 HOURS
Plug flow reactors in series/parallel, mixed flow reactors in series, reactors of different types in series, recycle reactor, parallel reactions, reactions in series, two step irreversible series-parallel reactions contacting patterns, selectivity, product distribution, instantaneous and overall fractional yield, operating conditions.		
UNIT 4	Solid Catalyzed Reactions	10 HOURS
Rate equation for solid catalyzed reaction, measures of reaction rates, pore diffusion resistance with surface kinetics, Thiele modulus, effectiveness factor, Wagner modulus, pore resistance limits, particles of different sizes, spherical and cylindrical particles, arbitrary reaction kinetics, performance equations for reactors containing catalyst particles, adiabatic packed bed reactor, slurry reactor.		
UNIT 5	Fluid-Solid Reactions	6 HOURS
Progressive conversion model (PCM), shrinking core model (SCM), spherical particles of changing and unchanging sizes, determination of rate controlling step gas film diffusion, ash layer diffusion, surface reaction, combination of resistances, mixture of particles of different sizes, fluidized bed reactor.		
UNIT 6	Fluid-Fluid Reactions	5 HOURS
Rate equation for mass transfer with reaction, kinetic regimes, liquid film enhancement factor, significance of Hatta number, towers for absorption.		


PRACTICAL		
PRACTICAL NO.01	Isothermal Batch Reactor	2 HOURS
To study the kinetics of a reaction at isothermal conditions using batch reactor.		
PRACTICAL NO.02	Continuous Stirred Tank Reactor (CSTR)	2 HOURS
To study the kinetics of a reaction at ambient conditions using CSTR.		
PRACTICAL NO.03	Plug Flow Reactor (PFR)	2 HOURS
To study the kinetics of a reaction at ambient conditions using PFR.		
PRACTICAL NO.04	Combined Flow Reactor	2 HOURS
To study the kinetics of a reaction using a PFR followed by CSTR.		
PRACTICAL NO.05	Cascade CSTR	2 HOURS
To study the kinetics of a reaction using three CSTRs in series.		
PRACTICAL NO.06	RTD Studies in PFR (Pulse input)	2 HOURS
To study the residence time distribution in PFR for pulse input.		
PRACTICAL NO.07	RTD Studies in CSTR (Step input)	2 HOURS
To study the residence time distribution in CSTR for step input.		
PRACTICAL NO.08	Packed Bed Reactor	2 HOURS
To study the kinetics of a homogeneous reaction using a packed bed reactor.		
PRACTICAL NO.09	Catalytic Reactor	2 HOURS
To study the kinetics of a homogeneous/solid catalyzed reaction.		
PRACTICAL NO.10	Stirred Cell Reactor	2 HOURS
To study the kinetics of a gas-liquid reaction using a stirred cell reactor.		
PRACTICAL NO.11	Simulation of Reactors - I	2 HOURS
To study the steady state simulation of equilibrium and conversion reactors in Aspen Hysys.		
PRACTICAL NO.12	Simulation of Reactors - II	2 HOURS
To study the steady state simulation of CSTR and PFR in Aspen Hysys.		

TEXT BOOK

1. O Levenspiel, Chemical Reaction Engineering, 3rd edition, John Willey & sons, 1998, ISBN-13:9788126510009.

REFERENCE BOOKS

1. H Scott Fogler, "Elements of Chemical Reaction Engineering" , Prentice Hall; 4th edition, 2005, ISBN-13: 9780130473943.
2. J M Smith, Chemical Engineering Kinetics, 3rd edition, McGraw-Hill Inc., 1990, ISBN-13:9780070665743.
3. C G Hill, "An Introduction to Chemical Reaction Kinetics and Reactor Design", John Wiley & sons; 1st edition, 1977, ISBN-13: 978-1118368251.

 MIT (An Autonomous Institute Affiliated to SPPU)	Academy of Engineering		COURSE SYLLABI (2019 – 2023)	
	SCHOOL OF CHEMICAL ENGINEERING		W.E.F	AY: 2021 - 2022
THIRD YEAR BACHELOR OF TECHNOLOGY CHEMICAL ENGINEERING		COURSE NAME		Process Engineering
		COURSE CODE		CH351
		COURSE CREDITS		4
RELEASED DATE : 01/07/2021		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	50	NIL	150

PRE-REQUISITE : CH223: Momentum Transfer, CH231: Heat Transfer, CH233: Mass Transfer

COURSE OBJECTIVES :

- CH351.CEO.1: Learn the fundamentals of process engineering and understand the role of process engineer.
- CH351.CEO.2: Know the basis of PFD and P&ID diagrams.
- CH351.CEO.3: Learn the process for design of piping, fluid moving devices and flow meters.
- CH351.CEO.4: Understand the sizing and designing of equipment.
- CH351.CEO.5: Learn the selection of equipment as per requirement.
- CH351.CEO.6: Understand the design procedure of process equipment.

COURSE OUTCOMES :

- The students after completion of the course will be able to,
- CH351.CO.1: Relate the role of process engineer.
- CH351.CO.2: Implement the appropriate symbol in process diagram.
- CH351.CO.3: Correlate the devices in process designing.
- CH351.CO.4: Calculate the process synthesis and equipment data.
- CH351.CO.5: Evaluate the data for process development.
- CH351.CO.6: Design the process equipment as per given requirement.


THEORY COURSE CONTENT		
UNIT 1	Introduction to Process Engineering & Operation	7 HOURS
Overview of process industry and role & responsibilities of process engineer, alternate routes in process engineering, generalized approach to chemical plant design, preparation of operating instructions manual, conductance of performance test runs, troubleshooting, cost cutting measures, green engineering.		
UNIT 2	Process Synthesis & Development	8 HOURS
Preliminary database creation- Thermo-physical-chemical property data, Safety data, Prices data, Experiments, Process synthesis, Synthesis steps / tree. Expertise for chemical process synthesis: selection of raw materials & reaction paths, distribution (excess / inert) of constituents, separation processes, reactor heating & cooling systems, heat exchangers & fired heaters.		
UNIT 3	Process Diagram in Process Engineering	8 HOURS
Relevant codes and standards used in industry, symbols for P&ID, PFD and P&ID for process equipments, need of PFD and P&ID, block diagram, development and utility of PFD , piping and instrumentation diagram. Material selection, MSD (Material selection Diagram), DPDT Diagram (Design Pressure, Design Temperature Diagram)		
UNIT 4	Process design of Piping and Fluid Moving Devices	7 HOURS
Process design of piping, fluid moving devices, pumps performances with viscous liquids, power required in fan, blower & compressors.		
UNIT 5	Sizing and Design of Equipments	7 HOURS
Sizing of valve, Safety valve sizing; pump selection and sizing; reactor sizing, pump design, pumps and control valve hydraulic calculations, process designing calculations guidelines for separators, columns, HE, etc, utility packages / utility selection / utility sizing.		
UNIT 6	Process Design of Equipment	8 HOURS
Design of Liquid-Liquid Extractor: Industrial applications of Liquid-Liquid Extraction, phase equilibrium, desirable solvent properties, design of counter current multistage extractor, industrially importance extractors. Design and Operation of Adsorption Equipment: Selection criteria and design of selection, pressure swing adsorption.		

PRACTICAL		
PRACTICAL NO.01	Process Flow Diagram	2 HOURS
Development of PFD for a given process.		
PRACTICAL NO.02	Process & Instrumentation Diagram	2 HOURS
Development of P&ID for a given process		
PRACTICAL NO.03	Process Data Sheet	2 HOURS
Development of process data sheets		
PRACTICAL NO.04	Design of Jackets	2 HOURS
Design of various types of jackets		
PRACTICAL NO.05	Creating a Material Stream	2 HOURS
Defining Simulation Configuration Wizard window & adding a stream to the flow sheet in DWSIM		
PRACTICAL NO.06	Introduction to Flow sheeting	2 HOURS
Adding mixer to the flow sheet adding streams connecting the material streams defining single phase and two phase streams in DWSIM		
PRACTICAL NO.07	Simulation of Reactors	2 HOURS
Simulation and defining reaction of Plug Flow Reactor (PFR) /Continuous Stirred Tank Reactor (CSTR) / Equilibrium Reactor with DWSIM		
PRACTICAL NO.08	Absorption Column	2 HOURS
DWSIM Simulation of Absorption column		
PRACTICAL NO.09	Unit Operation and Developing Process Simulation	2 HOURS
Adding various unit operation and developing process simulation with PRO II		
PRACTICAL NO.10	Comprehensive Process Simulation	2 HOURS
PRO II Comprehensive Process Simulation		

TEXT BOOKS
<ol style="list-style-type: none"> 1. Thakore & Bhatt, Introduction to Process Engineering and Design, Tata McGraw-Hill Education, 2007, ISBN: 0070634157, 9780070634152. 2. A. Kayode Coker, Ludwig's Applied Process Design for Chemical and Petrochemical Plants, Gulf Professional Publishing; 4th edition, 2007, ISBN : 075067766X, 9780750677660. 3. Stanley M. Walas, Chemical Process Equipment - Selection and Design, Butterworth-Heinemann, 1988, ISBN: 0750693851, 9780750693851. 4. Robin Smith, Chemical Process: Design and Integration, WileyBlackwell; Subsequent edition , 2005, ISBN : 978-0471486817.

REFERENCE BOOKS

1. Harry Silla, Chemical Process Engineering Design and Economics, CRC Press, 2003, ISBN: 0824756444, 9780824756444.
2. James Douglas, Conceptual Design of Chemical Processes, McGraw-Hill Chemical Engineering Series, 1988, ISBN: 0070177627, 978-0070177628.
3. Dale F. Rudd, Charles Churchill Watson, Strategy of Process Engineering Paperback, John Wiley & Sons Inc, 1971, ISBN: 0471744506, 9780471744504.
4. Daniel R. Lewin, J.D. Seader and Warren D Seider, Product and Process Design Principles: Synthesis, Analysis and Design, 2015, ISBN: 9780470472910.
5. Richard Turton, Joseph A. Shaeiwitz, Debangsu Bhattacharyya, Wallace B. Whiting, Analysis, Synthesis and Design of Chemical Processes, 5th Edition, Prentice Hall, 2018, ISBN: 0134177657, 9780134177656.

 MIT (An autonomous Institute Affiliated to SPPU)	Academy of Engineering		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		HP304
		COURSE CREDITS		2
RELEASED DATE : 01/07/2021		REVISION NO		1.0

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

PRE-REQUISITE : NIL

COURSE OBJECTIVES :

HP304.CEO.1: Create awareness of organizational strategy for project implementation.
 HP304.CEO.2: Understand the rules for creating a Work Breakdown Structure for a Project. .
 HP304.CEO.3: Illustrate approaches for risk identification, analysis, and assessment.
 HP304.CEO.4: Identify key characteristics of a high-performance project team.
 HP304.CEO.5: Understand the critical success factors in project management.

COURSE OUTCOMES :

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

HP304.CO.1: Identify the Project Management Knowledge Areas and Processes.
 HP304.CO.2: Classify the responsibilities while designing the Project Master Plan.
 HP304.CO.3: Outline the Cost Estimating and Cost Escalation Process.
 HP304.CO.4: Demonstrate and highlight The Processes of Project Quality Management.
 HP304.CO.5: Analyze Management of a Project and Maturity Models.


THEORY :		
UNIT 1	Basics of Project Management	6 HOURS
<p>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</p> <p>Case Study:</p>		
UNIT 2	Systems and Procedures for Planning and Control	5 HOURS
<p>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)</p> <p>Case Study:</p>		
UNIT 3	Cost Estimating, Budgeting and Risk Management	5 HOURS
<p>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</p> <p>Case Study:</p>		
UNIT 4	Project Quality Management and Organization Behavior	5 HOURS
<p>Contents: The Concept of Quality, The Processes of Project Quality Management, Techniques for Quality Assurance during System Development, Stakeholders, Managing Participation, Teamwork and Conflict.</p> <p>Case Study:</p>		
UNIT 5	The Corporate Context	5 HOURS
<p>Contents: Project Management Maturity and Maturity Models, Knowledge and Time Management, International Projects and associated problems, Entrepreneurs and Startup.</p> <p>Case Study:</p>		

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 (An Autonomous Institute Affiliated to SPPU)	Academy of Engineering	COURSE SYLLABI (2019 – 2023)	
		SCHOOL OF CHEMICAL ENGINEERING	W.E.F
THIRD YEAR BACHELOR OF TECHNOLOGY CHEMICAL ENGINEERING		COURSE NAME	Skill Development Lab (CFD)
		COURSE CODE	CH344
		COURSE CREDITS	2
RELEASED DATE : 01/07/2021		REVISION NO	1.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME AND MARKS					
		THEORY			TUTORIAL/ PRACTICAL	PRESENTATION/ DEMONSTRATION	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA			
NIL	2	NIL	NIL	25	50	NIL	75

PRE-REQUISITE : CH223: Momentum Transfer; CH231: Heat Transfer

COURSE OBJECTIVES :

CH344.CEO.1: Introduction to Computational Fluid Dynamics (CFD).
 CH344.CEO.2: CFD workflow or steps involved in CFD analysis.
 CH344.CEO.3: CAD preparation and Mesh generation in CFD.
 CH344.CEO.4: Simulation and Post-processing in CFD.
 CH344.CEO.5: Turbulence modeling basics.
 CH344.CEO.6: Heat transfer modeling.

COURSE OUTCOMES :

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

CH344.CO.1: Use a CAD tool for preparing CFD specific CAD models.
 CH344.CO.2: Create high quality CFD simulation meshes from imported CAD geometry.
 CH344.CO.3: Complete a basic CFD simulation including defining the problem, calculating the solution and post-processing the results.
 CH344.CO.4: Learn to interpret the results by qualitative and quantitative post-processing.
 CH344.CO.5: Perform all steps of a CFD simulation from CAD import to meshing to solution to results.
 CH344.CO.6: Perform a flow and heat transfer simulation.


PRACTICAL		
PRACTICAL NO.01	Creating a T-Junction CAD Model	4 HOURS
Understanding the GUI layout and basics of sketching for creating a simple T-Junction CAD model		
PRACTICAL NO.02	Repairing Imported CAD and Fluid Volume Extraction	4 HOURS
Importing a CAD file, repairing the model and extracting the fluid volume for internal flow		
PRACTICAL NO.03	Mesh generation: T-Junction model	4 HOURS
Understand the mesh generation workflow for a simple T-Junction model. Mesh sizes to be given and different mesh types that could be used.		
PRACTICAL NO.04	Mesh generation: Imported CAD model	4 HOURS
Generate mesh for the previously imported CAD model wherein fluid volume is already extracted. Apply inflation layers on the boundaries and region-specific surface and volume refinement.		
PRACTICAL NO.05	Solution workflow: T-Junction model	4 HOURS
Solution workflow with regards to problem definition, specifying boundary conditions, material specification, specifying type of flow and performing simulation with the default solver settings.		
PRACTICAL NO.06	Solution: Imported CAD model	4 HOURS
Simulating the imported CAD model and understanding the effect of different solver parameters on the results.		
PRACTICAL NO.07	Post-processing: T-Junction model	4 HOURS
Understanding different qualitative and quantitative post-processing that could be done on a CFD simulation.		
PRACTICAL NO.08	Turbulence modeling: T-Junction model	4 HOURS
Understanding turbulence modeling and simulating the effect of different turbulence models on the results.		
PRACTICAL NO.09	Heat transfer simulation: T-Junction model	4 HOURS
Understanding heat transfer modeling and simulating a simple heat transfer problem for the T-Junction model.		
PRACTICAL NO.10	Project Work	4 HOURS
Students will be given the Project Topics / Case Studies related to preferably Fluid Flow and Heat Transfer applications in Chemical Engineering. The results from the simulation would be compared with literature or hand calculation values. Examples: Flow in different types of Static Mixers, CSTR, Flow and Heat transfer in double pipe heat exchangers.		

TEXT BOOKS

1. H K Versteeg and W Malalasekera. (2008), An Introduction to Computational Fluid Dynamics, 2nd Ed., Pearson Education, ISBN-13: 978-8131720486.
2. Joel H. Ferziger, Milovan Peri, Robert L. Street, Computational Methods for Fluid Dynamics, Springer Publication, ISBN-13: 978-3319996912.

REFERENCE BOOKS

1. Elizabeth Marden Marshall and Andr Bakker (2002), Computation Fluid Mixing, 1st Ed., Fluent, Incorporated, ISBN 0971953201, 9780971953208.
2. John Matsson (2019), An Introduction to ANSYS Fluent 2019, SDC Publications, ISBN-13: 978-1630573300.

 Academy of Engineering (An Autonomous Institute Affiliated to SPPU)		COURSE SYLLABI (2019 – 2023)	
SCHOOL OF CHEMICAL ENGINEERING		W.E.F	AY: 2021 - 2022
THIRD YEAR BACHELOR OF TECHNOLOGY IN CHEMICAL ENGINEERING		COURSE NAME	Project Design
		COURSE CODE	CH345
		COURSE CREDITS	2
RELEASED DATE : 01/07/2021		REVISION NO	0.0

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

PRE-REQUISITE : NIL

COURSE OBJECTIVES :

CH345.CEO.1: To embrace innovation and creativity in project design while empathizing real world needs.

CH345.CEO.2: To acquaint with requirement analysis process and techniques.

CH345.CEO.3: To inculcate the agile project management tools for project design and planning.

CH345.CEO.4: To upskill in quality technical writing and related tools for project documentation.

COURSE OUTCOMES :

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

CH345.CO.1: Delineate the problem to be solved.

CH345.CO.2: Inculcate problem solving skills by critically analyzing real world needs, possible solutions and challenges.

CH345.CO.3: Carry out systematic literature review, planning and project design.

CH345.CO.4: Cognize the importance of documentation and report writing.

COURSE ABSTRACT

The project is most important part of undergraduate curriculum and enables students to develop analytical, critical thinking, problem solving, and communication, cooperation, leadership skills. Project enable students to assimilate their learning to address a real-world interdisciplinary problems. The objective of undergraduate project is to analyze, design, implement, compelling solution to real world problems, and do performance evaluation with relevant documentation. To enhance the effectiveness and achieve worthwhile outcome of engineering knowledge that the student has acquired, the entire project process is divided in three phases, viz., Project Design, Project Implementation and Project Evaluation. The first phase of Project Design mainly focuses on formulating systems requirement, background/literature review, and defining scope, objective and apply project management/modeling tools to design proposed solution. This enables students to apply their technical acumen and innovativeness in proposing methodology, milestones, and expected outcome.

GUIDELINES

1. Every project group should consist of minimum 03 and maximum of 04 students.
2. The group members may be from different programs to support the interdisciplinary functioning.
3. Project group members and title of the project need to be approved by Project Guide and School.
4. Projects should preferably have a national/international industry/academic/research collaboration.
5. User Oriented Collaborative Design: The students need to identify the problem by discussion with various stakeholders, site visits, expert-opinions and various research articles.
6. The relevance and criticality of the problem to be solved, need to be established by collecting sufficient information and background study.
7. Define proposed solution and apply project management/modeling tools for project planning and design.
8. Critically analyze various solutions/techniques to solve real world problems and perform feasibility study to select and justify proposed solution.
9. Define outcome, milestones, definite roadmap for project design, implementation, evaluation and documentation.

Collaborative/Sponsored Project

1. Students are encouraged to take real time problems from national/international industry/academic/research organizations of repute (like NCL, BARC, IISER, DRDO, CDAC, etc) for final project work.
2. Project statement, scope of the work, objectives and final outcomes must be decided and approved by faculty mentor and collaborative organization, anytime before the commencement of the sixth semester.
3. Proposed Collaborative Project work need to reviewed by team of faculty reviewers to ensure assigned work is equivalent to the final undergraduate project work of minimum 12 months to 18 months.
4. Final assessment will be carried out in presence of faculty mentor, external mentor and examiner.

TIMELINE

1. Exploration of fore front research/specialization areas and opportunities in the various fields.
2. Formation of Project Group. Finalization of area of work/title as per forefront areas.
3. Exploration of abridged courses, valid resources, challenges, relevance with current opportunities.
4. Project Review I Presentation.
5. Background study Systematic literature review.
6. Literature review documentation for Project Report and Research Article.
7. Define problem statement and objectives.
8. Define scope of the work and Outline of the work.
9. Project Review II Presentation.
10. Project Design, Modelling, Simulation etc.
11. Proposed Methodology of the solution and its documentation.
12. Project Documentation: Project Report Writing, Final Synopsis
13. Project Documentation: Ethics in Writing
14. Project Review III Presentation

ASSESSMENT and EVALUATION

The three 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. Internal Assessment (25 Marks)
 - (a) Project Review I: Problem Identification, Motivation and Relevance
 - (b) Synopsis
 - (c) Project Review II: Background Study, Literature Review and Problem Definition
 - (d) Background Study and Literature Review
 - (e) Project Review III: Project Planning, Analysis and Design
2. Project Demonstration (50 Marks)
 - (a) Project Report
 - (b) Final Presentation and Demonstration

REFERENCE BOOKS

1. Nicholas John M., "Project Management for Engineering, Business and Technology", Butterworth Heinemann, ISBN: 9780080967042
2. Michelle Reid, "Report Writing (Pocket Study Skills)", Second Edition, Macmillan Education.
3. Sara Efrat Efron, Ruth David, "Writing the Literature Review : A Practical Guide", Guilford Press, ISBN-13: 978-1462536894.
4. Leslie Lamport, "LaTeX: A document preparation system, Users guide and reference manual", Second Edition 1994, Addison Wesley, ISBN: 978-0201529838.
5. Michel Goossens, Frank Mittelbach, Sebastian Raatz, Denis Roegel and Herbert Voss, "The LaTeX Graphics Companion", Second Edition 2007, Addison-Wesley Professional, ISBN: 078-5342508925.