SONA COLLEGE OF TECHNOLOGY, SALEM-5

(An Autonomous Institution)

B.E- Mechanical Engineering

CURRICULUM and SYLLABI

[For students admitted in 2023-2024]

B.E / B.Tech Regulations 2023

Approved by BOS and Academic Council meetings

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester I under Regulations 2023 (CBCS)
Branch: Mechanical Engineering

S.No	Course Code	Course Title	L	T	P	J	C	Category	Total Contact Hours	Course Type*
	Theory Courses									
1.	U23ENG101B	Technical English	2	0	0	0	2	HS	30	T
2.	U23MAT102A	Linear Algebra and Calculus with MATLAB	3	0	2	0	4	BS	75	TL
3.	U23CHE104D	Chemistry For Mechanical Engineering	3	0	0	0	3	BS	45	T
4.	U23PPR105	Problem Solving Using Python Programming	3	0	0	0	3	ES	45	T
5.	U23BEE106B	Basics of Electrical and Electronics for Mechanical Engineering	2	0	2	0	3	ES	60	TL
6.	U23EGR107	Engineering Graphics	3	0	0	0	3	ES	45	T
7.	U23TAM101	தமிழர் மரபு / Heritage of Tamils	1	0	0	0	1	HS	15	T
8.	U23GE101	Basic Aptitude I	2	0	0	0	0	AC	30	T
	Practical Courses									
9.	U23CHL111B	Chemistry Laboratory	0	0	2	0	1	BS	30	L
10.	U23PPL112	Python Programming Laboratory	0	0	2	0	1	ES	30	L
						Total Credits	**21**			
	Optional Language Courses**									
11.	U23OL1101	French	1	0	0	0	1	OL	15	T
12.	U23OL1102	German							15	T
13.	U23OL1103	Japanese							15	T
14.	U23OL1104	Korean							15	T

*T- Theory, TT- Theory with Tutorial, TL- Theory with Laboratory,TP- Theory with Project, TLP- Theory with Laboratory and Project, L-Laboratory, LT- Laboratory with Theory, LP- Laboratory with Project

**Students may opt for foreign languages viz., German/French/Japanese/Korean with additional one credit (Not accounted for CGPA calculation)

Approved By

Chairperson, Science and Humanities BoS	Chairperson, Mechanical BoS	Member Secretary, Academic Council	Dean-Academics	Chairperson, Academic Council & Principal
Dr.M.Renuga	Dr. D. Senthilkumar	Dr.R.Shivakumar	Dr.J.Akilandeswari	Dr.S.R.R.Senthil Kumar

Copy to:-
HOD/ Mechanical Engineering, First Semester B.E. Mech, Students and Staff, COE

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester II under Regulations 2023 (CBCS)
Branch: Mechanical Engineering

S.No	Course Code	Course Title	L	T	P	J	C	Category	Total Contact Hours	Course Type*
Theory courses										
1.	U23ENG201B	Communication Skills in English	2	0	2	0	3	HS	60	TL
2.	U23MAT202C	Vector Calculus and Differential Equations	3	1	0	0	4	BS	60	TT
3.	U23PHY203F	Physics for Mechanical Engineering	3	0	0	0	3	BS	45	T
4.	U23ME201	Engineering Mechanics for Mechanical Engineering	3	1	0	0	4	ES	60	TT
5.	U23ME202	Manufacturing Process	3	0	0	0	3	PC	45	T
6.	U23TAM201	தமிழரும் தொழில்நுட்பமும்/ Tamils and Technology	1	0	0	0	1	HS	15	T
7.	U23GE201	Basic Aptitude- II	2	0	0	0	0	AC	30	T
Practical courses										
8.	U23PHL210A	Physics Laboratory	0	0	2	0	1	BS	30	L
9.	U23ME203	Workshop Practices for Mechanical Engineering	0	0	2	0	1	PC	30	L
Total Credits							**20**			
Optional Language Courses**										
10.	U23OL1201	French - II	1	0	0	0	1	OL	15	T
11.	U23OL1202	German - II							15	T
12.	U23OL1203	Japanese - II							15	T
13.	U23OL1204	Korean - II							15	T

*T- Theory, TT- Theory with Tutorial, TL- Theory with Laboratory,TP- Theory with Project, TLP- Theory with Laboratory and Project, L-Laboratory, LT- Laboratory with Theory, LP- Laboratory with Project

**Students may opt for foreign languages viz., German/French/Japanese/Korean with additional one credit

(Not accounted for CGPA calculation)

Approved By

Chairperson, Science and Humanities BoS	Chairperson, Mech BoS	Member Secretary, Academic Council	Dean-Academics	Chairperson, Academic Council & Principal
Dr.M.Renuga	Dr. D.Senthilkumar	Dr.R.Shivakumar	Dr.J.Akilandeswari	Dr.S.R.R.Senthil Kumar

Copy to:-

HOD/ Mechanical Engineering, Second Semester B.E. Mech, Students and Staff, COE

PRINCIPAL
SONA COLLEGE OF TECHNOLOGY
SALEM-636 005

mech

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester III under Regulations 2023 (CBCS)
Branch: Mechanical Engineering

S.No	Course Code	Course Title	L	T	P	J	C	Category	Total Contact Hours	Course Type*
Theory courses										
1.	U23MAT301D	Probability and Statistics	3	1	0	0	4	BS	60	TT
2.	U23ME301	Engineering Thermodynamics	3	0	0	0	3	PC	45	T
3.	U23ME302	Fluid Mechanics and Machinery	3	0	2	0	4	PC	60	TL
4.	U23ME303	Conventional and Modern Manufacturing	3	0	2	0	4	PC	60	TL
5.	U23ME304	Instrumentation and Control Systems	3	0	0	0	3	ES	45	T
6.	U23ME305	Kinematics of Machines	3	0	0	0	3	PC	45	T
7.	noc24-mg72	**NPTEL**: Design Thinking- A Primer	1	0	0	0	1	ES	15	T
8.	U23GE302	**Audit Course**: Environment and Climate Science	2	0	0	0	0	AC	30	T
Practical courses										
9.	U23GE301	Soft Skills and Aptitude-I	0	0	2	0	1	EEC	30	L
						Total Credits	23			

*T- Theory, TT- Theory with Tutorial, TL- Theory with Laboratory, TP- Theory with Project, TLP- Theory with Laboratory and Project, L-Laboratory, LT- Laboratory with Theory, LP- Laboratory with Project, P- Project

Approved By

Chairperson, Mechanical Engineering BoS	**Member Secretary, Academic Council**	**Dean-Academics**	**Chairperson, Academic Council & Principal**
Dr.D.Senthilkumar	**Dr.R.Shivakumar**	**Dr.J.Akilandeswari**	**Dr.S.R.R.Senthil Kumar**

Copy to:-
HOD/ Mechanical Engineering, Third Semester B.E. Mechanical Students and Staff, COE

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester IV under Regulations 2023 (CBCS)
Branch: Mechanical Engineering

S.No	Course Code	Course Title	L	T	P	J	C	Category	Total Contact Hours	Course Type*
Theory courses										
1.	U23ME401	Thermal Engineering	3	0	0	0	3	PC	45	T,
2.	U23ME402	Strength of Materials	3	0	0	0	3	PC	45	T
3.	U23ME403	Engineering Materials and Metallurgy	3	0	0	0	3	PC	45	T
4.	U23ME404	Machine Learning	3	0	0	0	3	ES	45	T
5.	U23ME405	Dynamics of Machinery	3	0	2	0	4	PC	75	TL
6.	U23ME406	Metrology, Inspection and Quality Control	3	0	2	0	4	ES	75	TL
7.	U23GE402	**Audit Course**: Essence of Indian Traditional Knowledge	2	0	0	0	0	AC	30	T
Practical courses										
8.	U23ME407	Thermal Engineering Laboratory	0	0	3	0	1.5	PC	45	L
9.	U23ME408	Strength of Materials Laboratory	0	0	3	0	1.5	PC	45	L
10.	U23ME409	Machine Learning Laboratory	0	0	2	0	1	ES	30	L
11.	U23GE401	Soft Skills and Aptitude-II	0	0	2	0	1	EEC	30	L
Total Credits							25			

*T- Theory, TT- Theory with Tutorial, TL- Theory with Laboratory, TP- Theory with Project, TLP- Theory with Laboratory and Project, L-Laboratory, LT- Laboratory with Theory, LP- Laboratory with Project, P-Project

Approved By

Chairperson, Mechanical Engineering BoS	Member Secretary, Academic Council	Dean-Academics	Chairperson, Academic Council & Principal
Dr.D.Senthilkumar	Dr.R.Shivakumar	Dr.J.Akilandeswari	Dr.S.R.R.Senthil Kumar

Copy to:-

HOD/ Mechanical Engineering, Fourth Semester B.E. Mechanical Students and Staff, COE

Prof. Dr. S. R. R. SENTHILKUMAR,
M.E.(Struct), Ph.D., MISTE,FIE, C. ENG(I), MICI,
PRINCIPAL,
SONA COLLEGE OF TECHNOLOGY,
JUNCTION MAIN ROAD, SALEM-636 005.

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester V under Regulations 2023 (CBCS)
Branch: Mechanical Engineering

S.No	Course Code	Course Title	L	T	P	J	C	Category	Total Contact Hours	Course Type*
Theory courses										
1.	U23ME501	Heat and Mass Transfer	3	0	0	0	3	PC	45	T
2.	U23ME502	Design of Machine Elements	3	0	0	0	3	PC	45	T
3.	U23ME503	Computer Aided Design and Analysis	3	0	0	0	3	PC	45	T
4.	U23ME504	Computer Integrated Manufacturing	3	0	0	0	3	PC	45	T
5.	noc25- cs147	**NPTEL:** Introduction to Internet of Things	3	0	0	0	3	PE	45	T
6.	U23ME940	**Professional Elective-** Fundamentals of Automotive Systems	3	0	0	0	3	PE	45	T
	U23ME908	Additive Manufacturing	3	0	0	0				
Practical courses										
7.	U23ME505	Heat and Mass Transfer Laboratory	0	0	4	0	2	PC	60	L
8.	U23ME506	Computer Aided Design Laboratory	0	0	4	0	2	PC	60	L
9.	U23GE501	Soft Skills and Aptitude-III	0	0	2	0	1	EEC	30	L
Total Credits							23			

*T- Theory, TT- Theory with Tutorial, TL- Theory with Laboratory, TP- Theory with Project, TLP- Theory with Laboratory and Project, L-Laboratory, LT- Laboratory with Theory, LP- Laboratory with Project, P-Project.

Approved By

Chairperson, Mechanical Engineering BoS	Member Secretary, Academic Council	Dean-Academics	Chairperson, Academic Council & Principal
Dr.D.Senthilkumar	Dr.R.Shivakumar	Dr.J.Akilandeswari	Dr.S.R.R.Senthil Kumar

Copy to:- HOD/ Mechanical Engineering, Fifth Semester B.E. Mechanical Students and Staff, COE

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester VI under Regulations 2023 (CBCS)
Branch: Mechanical Engineering

S.No	Course Code	Course Title	L	T	P	J	C	Category	Total Contact Hours	Course Type*
Theory courses										
1	U23ME601	Operations Research	3	0	0	0	3	PC	45	T
2	U23ME602	Design of Transmission Systems	3	0	0	0	3	PC	45	T
3	U23ME603	Industrial Automation	3	0	0	0	3	PC	45	T
4	U23ME941	**Professional Elective:** Energy Conservation In Industries	3	0	0	0	3	PE	45	T
	U23ME926	Data Analytics								
	U23ME939	Production Planning and Control								
5	U23ME942	**Professional Elective:** Surface Engineering and coating Technologies	3	0	0	0	3	PE	45	T
	U23ME943	Hydraulics and Pneumatics								
	U23ME936	Industrial Engineering and Management								
6		**Open Elective:**	3	0	0	0	3	OE	45	T
	U23ADS1003	Software engineering								
	U23BM1002	Basic Life Support								
	U23BM1004	Hospital Management								
	U23CE1008	Municipal Solid Waste Management								
	U23CE1009	Energy Efficiency and Green Building								
	U23CS1010	Cloud Computing								
	U23EC1009	Sensors And Smart Structures Technologies								
	U23EE1013	Energy Conservation and auditing								
	U23EE1021	Innovation, IPR And Entrepreneurship Development								
	U23FT1001	Fundamentals of Fashion Design								
	U23IT1002	Introduction To Database Technology								
	U23MC1008	Fundamentals of Robotics								
	U23MC1009	Smart Automation								
7	U23GE602B	Comprehension	1	0	0	0	1	AC	15	T
Practical courses										
8	U23ME604	Automation and Simulation Laboratory	0	0	4	0	2	PC	60	L
9	U23ME605	Computer Aided Analysis Laboratory	0	0	4	0	2	PC	60	L
10	U23ME606	Mini Project	0	0	0	2	1	PC	30	P
11	U23GE601	Soft Skills and Aptitude-IV	0	0	2	0	1	EEC	30	L
Total Credits							**25**			

*T- Theory, TT- Theory with Tutorial, TL- Theory with Laboratory, TP- Theory with Project, TLP- Theory with Laboratory and Project, L-Laboratory, LT- Laboratory with Theory, LP- Laboratory with Project, P-Project.

Approved By

Chairperson, Mechanical Engineering BoS	**Member Secretary, Academic Council**	**Dean-Academics**	**Chairperson, Academic Council & Principal**
Dr.D.Senthilkumar	**Dr.R.Shivakumar**	**Dr.J.Akilandeswari**	**Dr.S.R.R.Senthil Kumar**

Copy to:-

HOD/ Mechanical Engineering, Sixth Semester B.E. Mechanical Students and Staff, COE

SONA COLLEGE OF TECHNOLOGY, SALEM 5

DEPARTMENT OF MECHANICAL ENGINEERING

LIST OF PROFESSIONAL ELECTIVES (also for HONOURS Degree) courses - B.E/B.Tech Regulations 2023 Date:25.06.2025

S.No	Vertical:1 MODERN MOBILITY SYSTEMS	Vertical:2 PRODUCT AND PROCESS DEVELOPMENT	Vertical:3 DIGITAL AND GREEN MANUFACTURING	Vertical:4 CLEAN AND GREEN ENERGY TECHNOLOGIES	ADDITIONAL PROFESSIONAL ELECTIVES	
1.	Automotive Materials, Components, Design and Testing	Value Engineering	Digital Manufacturing and IoT	Bioenergy Conversion Technologies	Design and selection of Heat Transfer Equipment	Robotics and Automation
2.	Conventional and Futuristic Vehicle Technology	Additive Manufacturing	Lean Manufacturing	Carbon Footprint Estimation and Reduction Techniques	Data Analytics	Product design and Development
3.	Renewable Powered Off Highway Vehicles and Emission Control Technology	Design For Manufacturing	Green Manufacturing Design and Practices	Energy Efficient Buildings	Data structure using python	Customer Relationship Management
4.	Vehicle Health Monitoring, Maintenance and Safety	Ergonomics in Design	Environment Sustainability and Impact Assessment	Energy Storage Devices	Heating Ventilation and air conditioning Design	Industrial Engineering
5.	Hybrid and Electric Vehicle Technology	New Product Development	Energy Saving Machinery and Components	Renewable Energy Technologies	Modern Vehicle Technology and automotive testing	Non Destructive Testing
6.	Thermal Management of Batteries and Fuel Cells	Product Life Cycle Management	Green Supply Chain Management	Equipment for Pollution Control	Quality and Reliability Engineering	Micro and Nano Machining
7.	NPTEL	NPTEL	NPTEL	NPTEL	Enterprise Resource Planning	Production Planning and control
8.	NPTEL	NPTEL	NPTEL	NPTEL	Supply chain Management and Analytics	Fundamentals of automotive systems

Signature of HOD

Dr. D. SENTHIL KUMAR, M.E., Ph.D
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5

SONA COLLEGE OF TECHNOLOGY, SALEM-5

Department of Mechanical Engineering

Professional Elective / Honours Degree- Verticals & Courses

(Offered to UG students admitted during AY 2023- 2024 onwards, Regulations 2023)

Vertical 1: MODERN MOBILITY SYSTEMS

S. No	Course Code		Course Name	L	T	P	J	C
	Professional elective code	Honors course code						
1	U23ME901	U23ME2001	Automotive Materials, Components, Design and Testing	3	0	0	0	3
2	U23ME902	U23ME2002	Conventional and Futuristic Vehicle Technology	3	0	0	0	3
3	U23ME903	U23ME2003	Renewable Powered Off Highway Vehicles and Emission Control Technology	3	0	0	0	3
4	U23ME904	U23ME2004	Vehicle Health Monitoring, Maintenance and Safety	3	0	0	0	3
5	U23ME905	U23ME2005	Hybrid and Electric Vehicle Technology	3	0	0	0	3
6	U23ME906	U23ME2006	Thermal Management of Batteries and Fuel Cells	3	0	0	0	3
7			NPTEL	3	0	0	0	3
8			NPTEL	3	0	0	0	3

Vertical 2: PRODUCT AND PROCESS DEVELOPMENT

S. No	Course Code		Course Name	L	T	P	J	C
	Professional elective code	Honors course code						
1	U23ME907	U23ME2007	Value Engineering	3	0	0	0	3
2	U23ME908	U23ME2008	Additive Manufacturing	3	0	0	0	3
3	U23ME909	U23ME2009	Design For Manufacturing	3	0	0	0	3
4	U23ME910	U23ME2010	Ergonomics in Design	3	0	0	0	3
5	U23ME911	U23ME2011	New Product Development	3	0	0	0	3
6	U23ME912	U23ME2012	Product Life Cycle Management	3	0	0	0	3
7			NPTEL	3	0	0	0	3
8			NPTEL	3	0	0	0	3

Vertical 3: DIGITAL AND GREEN MANUFACTURING

S. No	Course Code		Course Name	L	T	P	J	C
	Professional elective code	Honors course code						
1	U23ME913	U23ME2013	Digital Manufacturing and IoT	3	0	0	0	3
2	U23ME914	U23ME2014	Lean Manufacturing	3	0	0	0	3
3	U23ME915	U23ME2015	Green Manufacturing Design and Practices	3	0	0	0	3
4	U23ME916	U23ME2016	Environment Sustainability and Impact Assessment	3	0	0	0	3
5	U23ME917	U23ME2017	Energy Saving Machinery and Components	3	0	0	0	3
6	U23ME918	U23ME2018	Green Supply Chain Management	3	0	0	0	3
7			NPTEL	3	0	0	0	3
8			NPTEL	3	0	0	0	3

Vertical 4: CLEAN AND GREEN ENERGY TECHNOLOGIES

S. No	Course Code		Course Name	L	T	P	J	C
	Professional elective code	Honors course code						
1	U23ME919	U23ME2019	Bioenergy Conversion Technologies	3	0	0	0	3
2	U23ME920	U23ME2020	Carbon Footprint Estimation and Reduction Techniques	3	0	0	0	3
3	U23ME921	U23ME2021	Energy Efficient Buildings	3	0	0	0	3
4	U23ME922	U23ME2022	Energy Storage Devices	3	0	0	0	3
5	U23ME923	U23ME2023	Renewable Energy Technologies	3	0	0	0	3
6	U23ME924	U23ME2024	Equipment for Pollution Control	3	0	0	0	3
7			NPTEL	3	0	0	0	3
8			NPTEL	3	0	0	0	3

ADDITIONAL PE Courses Diversified

S. No	Course Code		Course Name	L	T	P	J	C
	Professional elective code	Honors course code						
1	U23ME925	U23ME2025	Design and selection of Heat Transfer Equipment	3	0	0	0	3
2	U23ME926	U23ME2026	Data Analytics	3	0	0	0	3
3	U23ME927	U23ME2027	Data structure using python	3	0	0	0	3
4	U23ME928	U23ME2028	Heating Ventilation and air conditioning Design	3	0	0	0	3
5	U23ME929	U23ME2029	Modern Vehicle Technology and automotive testing	3	0	0	0	3

6	U23ME930	U23ME2030	Quality and Reliability Engineering	3	0	0	0	3
7	U23ME931	U23ME2031	Enterprise Resource Planning	3	0	0	0	3
8	U23ME932	U23ME2032	Supply chain Management and Analytics	3	0	0	0	3
9	U23ME933	U23ME2033	Robotics and Automation	3	0	0	0	3
10	U23ME934	U23ME2034	Product design and Development	3	0	0	0	3
11	U23ME935	U23ME2035	Customer Relationship Management	3	0	0	0	3
12	U23ME936	U23ME2036	Industrial Engineering	3	0	0	0	3
13	U23ME937	U23ME2037	Non Destructive Testing	3	0	0	0	3
14	U23ME938	U23ME2038	Micro and Nano Machining	3	0	0	0	3
15	U23ME939	U23ME2039	Production Planning and control	3	0	0	0	3
16	U23ME940	U23ME2040	Fundamentals of automotive systems	3	0	0	0	3

Signature of HOD

DR. D. SENTHIL KUMAR, M.E., Ph.D
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5

SONA COLLEGE OF TECHNOLOGY, SALEM-5

Department of Mechanical Engineering

Minor Degree- Verticals & Courses

(Offered to UG students admitted during AY 2023- 2024 onwards, Regulations 2023)

Minor Vertical : Intelligent Industrial Automation

S. No	Course Code		Course Name	L	T	P	J	C
	Open Elective course code	Minor degree course code						
1	U23MEC1001	U23MEC3001	Robotic Systems I – Sensors & Actuators	3	0	0	0	3
2	U23MEC1002	U23MEC3002	Robot Programming and Applications	3	0	0	0	3
3	U23MEC1003	U23MEC3003	Digital Manufacturing and Factory Automation	3	0	0	0	3
4	U23MEC1004	U23MEC3004	Additive Manufacturing	3	0	0	0	3
5	U23MEC1005	U23MEC3005	Machine Learning with Python Programming	3	0	0	0	3
6	U23MEC1006	U23MEC3006	Robotics and Automation	3	0	0	0	3
7			NPTEL	3	0	0	0	3
8			NPTEL	3	0	0	0	3

29/1/25

Signature of HOD

Dr. D. SENTHIL KUMAR, M.E.,Ph.D
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester I under Regulations 2023 (CBCS)
Branch: Mechanical Engineering

S.No	Course Code	Course Title	L	T	P	J	C	Category	Total Contact Hours	Course Type*
	Theory Courses									
1.	U23ENG101B	Technical English	2	0	0	0	2	HS	30	T
2.	U23MAT102A	Linear Algebra and Calculus with MATLAB	3	0	2	0	4	BS	75	TL
3.	U23CHE104D	Chemistry For Mechanical Engineering	3	0	0	0	3	BS	45	T
4.	U23PPR105	Problem Solving Using Python Programming	3	0	0	0	3	ES	45	T
5.	U23BEE106B	Basics of Electrical and Electronics for Mechanical Engineering	2	0	2	0	3	ES	60	TL
6.	U23EGR107	Engineering Graphics	3	0	0	0	3	ES	45	T
7.	U23TAM101	தமிழர் மரபு / Heritage of Tamils	1	0	0	0	1	HS	15	T
8.	U23GE101	Basic Aptitude I	2	0	0	0	0	AC	30	T
	Practical Courses									
9.	U23CHL111B	Chemistry Laboratory	0	0	2	0	1	BS	30	L
10.	U23PPL112	Python Programming Laboratory	0	0	2	0	1	ES	30	L
						Total Credits	**21**			
	Optional Language Courses**									
11.	U23OL1101	French	1	0	0	0	1	OL	15	T
12.	U23OL1102	German							15	T
13.	U23OL1103	Japanese							15	T
14.	U23OL1104	Korean							15	T

*T- Theory, TT- Theory with Tutorial, TL- Theory with Laboratory,TP- Theory with Project, TLP- Theory with Laboratory and Project, L-Laboratory, LT- Laboratory with Theory, LP- Laboratory with Project

**Students may opt for foreign languages viz., German/French/Japanese/Korean with additional one credit (Not accounted for CGPA calculation)

Approved By

Chairperson, Science and Humanities BoS	Chairperson, Mechanical BoS	Member Secretary, Academic Council	Dean-Academics	Chairperson, Academic Council & Principal
Dr.M.Renuga	Dr. D. Senthilkumar	Dr.R.Shivakumar	Dr.J.Akilandeswari	Dr.S.R.R.Senthil Kumar

Copy to:-
HOD/ Mechanical Engineering, First Semester B.E. Mech, Students and Staff, COE

U23ENG101B	Technical English	L	T	P	J	C
		2	0	0	0	2

Course Outcomes

At the end of the course, the student will be able to

CO1:	Frame sentences correctly, both in written and spoken forms of language with accuracy and fluency.
CO2:	Develop effective reading skills and reinforce language skills required for using grammar and building vocabulary
CO3:	Organise ideas and supporting arguments logically.
CO4:	Develop skills for writing conversations, proposals, reports and transcoding.
CO5:	Read for understanding and interpreting information and to utilise information accordingly.

Pre-requisite:

- Knowledge and Understanding of Grammar
- Fundamental Language Skills (LSRW)

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	2	2	2	3	3	2	3	3	3	3	3	3
CO2	1	2	2	3	2	3	3	2	3	3	2	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	1	3	1	2	2	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Course Assessment methods

Direct		Indirect
CIE test I (8) CIE test II (8) CIE test III (8) Assignment/seminar/Quiz (5)	Objectives Test (6) Attendance (5) Total CIE: 40 marks Semester End Examination (60)	Course end survey

Unit 01: **6 Hours**

- Comparative adjectives
- Recommendations
- Conversation writing
- Reading passages for specific information transfer

Unit 02: **6 Hours**

- Prepositions, adverbs
- Note making
- Reading passage with multiple choice questions, reading for gist and reading for specific information

Unit 03 **6 Hours**

- Collocations, direct and indirect speech

• Memo • Proposal: establishing a lab, introducing a subject in the curriculum, training programme for students • Short reading passage: gap-filling exercise related to grammar				
Unit 04:				**6 Hours**
• Cause and effect • Technical report writing – feasibility report, accident report, survey report • Short reading passages for sentence matching exercises, picking out specific information in a short text				
Unit 05:				**6 Hours**
• Pronouns • Transcoding – bar chart, pie chart, tabular column				
Theory: 30 Hrs	**Tutorial: --**	**Practical: --**	**Project:--**	**Total Hours: 30 Hrs**

TEXT BOOKS	
1.	Technical English I & II, Dr. M. Renuga et al. Sonaversity, 2016
2.	**Extensive Reading** 1. Who Moved my Cheese? – Spencer Johnson-G. P. Putnam's Sons 2. Discover the Diamond in You – Arindham Chaudhari – Vikas Publishing House Pvt. Ltd.
REFERENCES	
1.	Norman Whitby, Business Benchmark – Pre-Intermediate to Intermediate, Students Book, Cambridge University Press, 2006.
2.	A Course in Communication Skills, P. Kiranmai Dutt, Geetha Rajeevan, C. L. N. Prakash, published by Cambridge University Press India Pvt. Ltd.

HOD

Dr. M.RENUGA,
Professor & Head,
Department of Humanities & Languages,
Sona College of Technology,
SALEM.

B. E. / MECHANICAL ENGINEERING						
SEMESTER - I	LINEAR ALGEBRA AND CALCULUS WITH MATLAB	L	T	P	J	C
U23MAT102A		3	0	2	0	4

Course Outcomes

At the end of the course, the student will be able to

CO1:	find the rank of the matrix and solve linear system of equations by direct and indirect methods
CO2:	apply the concepts of vector spaces and linear transformations in real world applications
CO3:	apply the concepts of eigenvalues and eigenvectors of a real matrix and their properties to diagonalize the matrix.
CO4:	find the Taylor's series expansion, Jacobians and the maxima and minima of functions of two variables
CO5:	apply the appropriate techniques of multiple integrals to find the area and volume.

Pre-requisites:

- Fundamentals of elementary algebra
- Fundamentals of calculus
- Fundamentals of geometry
- Fundamentals of trigonometry

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		2	3							2	2		3
CO2	3		2	3							2	2		3
CO3	3		2	3							2	2		3
CO4	3		2	3							2	2		3
CO5	3		2	3							2	2		3

Course assessment methods [Theory with laboratory course]

Direct		Indirect
CIE test I (10) (Theory) CIE test II (10) (Theory) CIE test III (10) (Theory) CIE test IV (10) (Practical) Attendance (5) Assignment/Quiz/Seminar (5)	Total CIE: 50 marks Semester End Examination (50) [SEE- Theory (35) + Lab(15) marks]	Course end survey

Unit 01	LINEAR SYSTEM OF EQUATIONS	9 Hours

Rank of a matrix – solution of linear system of equations by matrix method, Gauss elimination, Gauss-Jordan, Gauss-Jacobi and Gauss-Seidel methods.

Unit 02	VECTOR SPACES	9 Hours

Vector space – linear independence and dependence of vectors – basis – dimension – linear transformations (maps) – matrix associated with a linear map – range and kernel of a linear map.

Unit 03	EIGENVALUES AND EIGENVECTORS	9 Hours

Eigenvalues and eigenvectors of real matrices – properties of eigenvalues and eigenvectors – Cayley-Hamilton theorem – diagonalization of real symmetric matrices.

Unit 04	MULTIVARIABLE CALCULUS	9 Hours
Functions of several variables – partial differentiation – total derivative – Jacobians – Taylor's theorem for functions of two variables – maxima and minima of functions of two variables without constraints – constrained maxima and minima by Lagrange's method of undetermined multipliers.		
Unit 05	**MULTIPLE INTEGRALS**	**9 Hours**
Double integrals – change of order of integration – change of variables from Cartesian to polar coordinates – area as double integrals in Cartesian coordinates – triple integrals – volume as triple integrals in Cartesian coordinates.		

List of MATLAB Programs

1.	Programs based on elementary operations on matrices
2.	Computing the rank of a matrix
3.	Finding eigenvalues and eigenvectors of a matrix
4.	Finding partial derivatives of functions of several variables
5.	Computing stationary points of functions of two variables
6.	Taylors series expansion of functions of two variables
7.	Evaluating double integrals
8.	Finding area as double integrals
9.	Evaluating triple integrals
10.	Finding volume as triple integrals

Theory: 45 Hrs	Tutorial: -	Practical: 30 Hrs	Project:--	Total Hours: 75 Hrs

TEXT BOOKS:

1. T. Veerarajan, "Linear Algebra and Partial Differential Equations", McGraw Hill Publishers, 1st Edition, 2018.
2. T. Veerarajan, "Engineering Mathematics for Semesters I & II", McGraw Hill Publishers, 1st Edition, 2019.
3. W. Yang, Y. K. Choi, K. Jaekwon, M. C. Kim, H. J. Kim and T. Im, "Engineering Mathematics with MATLAB", CRC Press Publishers, 1st Edition, 2017.

REFERENCE BOOKS:

1. S. Lipschutz and M. L. Lipson, "Linear Algebra", McGraw Hill Publishers, 6th Edition, 2018.
2. E. Kreyszig, "Advanced Engineering Mathematics", Wiley Publishers, 10th Edition, Reprint, 2017.
3. C. Prasad and R. Garg, "Advanced Engineering Mathematics", Khanna Publishers, 1st Edition, 2018.
4. B. V. Ramana, "Higher Engineering Mathematics", McGraw Hill Publishers, 29th Reprint, 2017.
5. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, 2018.
6. D. Xu, "Calculus problem solutions with MATLAB", Walter de Gruyter Publishers, 1st Edition, 2020.

Dr. S. JAYABHARATHI
Head / Department of Mathematics
Sona College of Technology
Salem – 636 005

Dr. M. RENUGA
BoS - Chairperson
Science and Humanities
Sona College of Technology
Salem – 636 005

U23CHE104D	CHEMISTRY FOR MECHANICAL ENGINEERING	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1:	Understand the principle, applications of electrochemistry and types of corrosion.
CO2:	Summarize the working principle and applications of energy storage devices.
CO3:	Describe the basic concepts and real time applications of surface chemistry and catalysis in engineering and technology.
CO4:	Analyse the composition, calorific values, uses of natural fuels and the manufacture of synthetic and bio fuels.
CO5:	Understand the statement, industrial importance of phase rule, types, compositions and applications of alloys.

Pre-requisite: Basic knowledge on the concepts of organic, inorganic and physical chemistry.

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2					2							3
CO2	2	2					2							3
CO3	3	2												3
CO4	3	3					2							3
CO5	3	3												3

Course Assessment methods

Direct		Indirect
CIE test I (8) CIE test II (8) CIE test III (8) Assignment/seminar/Quiz (5)	Objectives Test (6) Attendance (5) Total CIE: 40 marks Semester End Examination (60)	Course end survey

Unit 01: ELECTROCHEMISTRY AND CORROSION — **9 Hours**

Electrode potential – Nernst Equation – derivation and problems based on single electrode potential calculation – reference electrodes – standard hydrogen electrode – calomel electrode – Ion selective electrode – glass electrode – measurement of pH – electrochemical series – significance – electrolytic and electrochemical cells – EMF – measurement of emf – potentiometric titrations (redox – Fe^{2+} vs dichromate) – conductometric titrations (acid-base – HCl vs NaOH) – Corrosion – types – dry and wet corrosion – examples.

Unit 02: CHEMISTRY OF ENERGY STORAGE DEVICES	9 Hours
Reversible and Irreversible Cells – Batteries-Types of Batteries – Battery Characteristics-Voltage-Current-Capacity-Electricity Storage Density-Power-Discharge Rate-Cycle Life-Energy Efficiency and Shelf Life – Fabrication and Working of Alkaline Battery-Lead-Acid Battery-Ni-Cd - Lithium Ion Batteries and Solar cells - Fuel Cells – Hydrogen-Oxygen fuel cell – Nano Batteries- Construction-Working-Advantages and Applications.	
Unit 03: SURFACE CHEMISTRY AND CATALYSIS	**9 Hours**
Adsorption – types-physical and chemical adsorption – adsorption of gases on solids- adsorption isotherms – Freundlich and Langmuir isotherms-adsorption of solutes from solution – applications of adsorption-role of adsorption in catalytic reactions – adsorption in industrial waste water treatment by activated carbon – catalysis - types – homogeneous and heterogeneous catalysis – autocatalysis – definition and examples.	
Unit 04: FUELS	**9 Hours**
Fuels – calorific value – gross and net calorific values - problems based on the calculation of calorific value of a fuel – coal – proximate and ultimate analyses – metallurgical coke – manufacture by Otto-Hoffmann method – Petroleum processing and fractions – cracking – types – synthesis of petrol – Bergius process - knocking – octane number and cetane number – power alcohol – manufacture, advantages and disadvantages – biodiesel manufacture by Transesterification process – advantages and disadvantages - Gaseous fuels – Water gas, producer gas, CNG and LPG.	
Unit 05: PHASE RULE AND ALLOYS	**9 Hours**
Statement and explanation of terms involved - limitations and applications of phase rule - Construction of phase diagram for one component system; water system – condensed phase rule – construction of phase diagram by thermal analysis – simple eutectic systems Construction of phase diagram for lead – silver system Alloys: Introduction- Definition- Properties of alloys- Significance of alloying, Functions and effect of alloying elements - ferrous alloys – nichrome and stainless steel – heat treatment of steel, non-ferrous alloys – brass and bronze.	

Theory: 45 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 45 Hrs

TEXT BOOKS

1. P.C.Jain and Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub, Co., New Delhi , 17th edition, 2018.
2. Wiley Editorial Board, "Wiley Engineering Chemistry", 2nd Edition, Wiley India Pvt.Ltd, New Delhi, Reprint 2019

REFERENCES

1. O G Palana, Engineering Chemistry", Tata McGraw Hill Education (India) Private Limited, Chennai, Second Edition, 2017.
2. B Sivasankar, "Engineering Chemistry", Tata McGraw-Hill Pub. Co. Ltd., New Delhi, 2008.
3. B.K. Sharma, "Engineering Chemistry", Krishna Prakasan Media (P) Ltd., Meerut, 2001.
4. N. Krishnamurthy, K. Jeyasubramanian and P. Vallinayagam, "Applied Chemistry", Tata McGraw-Hill Publishing Company Limited, New Delhi, 1999.

Dr. C. SHANTHI, M.Sc.,M.E.,Ph.D.,
Professor of Physics
Head, Department of Sciences
Sona College of Technology (Autonomous)
SALEM-636 005.

Dr. M.RENUGA,
Professor & Head,
Department of Humanities & Languages,
Sona College of Technology,
SALEM - 636 005.

U23CHL111B	CHEMISTRY LABORATORY (Common to Mechanical, EEE, & FT branches)	L	T	P	J	C
		0	0	2	0	1

Course Outcomes

At the end of the course, the student will be able to

CO1:	Analyse the given water sample to determine the amount of hardness and alkalinity.
CO2:	Analyse the quality of brass by estimating copper and estimate the amount of HCl in given sample by pH metry, conductometry.
CO3:	Estimate the amount of ferrous ion in the given water sample and determine the molecular weight of water soluble polymer.

Pre-requisite: Capable of using Screw gauge, Vernier calliper, Travelling microscope, Spectrometer, able to handle burette, pipette and standard measuring flask.

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2		1		1			1					2
CO2	3	2		1		1			1					2
CO3	3	2		1		1			1					2

Course Assessment methods

Direct		Indirect
CIE test I (15)	RTPS (10)	Course end survey
Quiz 1 (5)	Record (10)	
CIE test II (15)	Total CIE:60 marks	
Quiz 2 (5)	Semester End Examination (40 marks)	

LIST OF EXPERIMENTS

1	Estimation of hardness of water sample by EDTA method.
2	Estimation of alkalinity of water sample by indicator method.
3	Estimation of copper in brass by EDTA method.

4	Estimation of HCl acid by pH metry.	
5	Estimation of HCl by conductometry. (HCl vs NaOH)	
6	Estimation of mixture of acids by conductometry. (HCl + CH_3COOH vs NaOH)	
7	Estimation of ferrous ion by potentiometric titration.	
8	Determination of molecular weight of a polymer by viscosity measurements.	
		TOTAL : 30 HOURS

Dr. C. SHANTHI, M.Sc., M.E., Ph.D.,
Professor of Physics
Head, Department of Sciences
Sona College of Technology (Autonomous)
SALEM-636 005

Dr. M. RENUGA,
Professor & Head,
Department of Humanities & Languages,
Sona College of Technology,
SALEM - 636 005.

U23PPR105	PROBLEM SOLVING USING PYTHON PROGRAMMING (Common to ADS, IT, CSE, CSE(AIML), CSD, CIVIL, BME, ECE, EEE, MECH and MCT Branches)	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1:	Develop algorithmic solutions to simple computational problems
CO2:	Write simple Python programs
CO3:	Write programs with the various control statements and handling strings in Python
CO4:	Develop Python programs using functions and files
CO5:	Analyze a problem and use appropriate data structures to solve it.

Pre-requisite: NIL

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	1	1									1
CO2	2	2	3	1	1									1
CO3	2	2	3	1	1									1
CO4	2	2	3	1	1									1
CO5	2	2	3	1	1									1

Course Assessment methods

Direct		Indirect
CIE test I (8) CIE test II (8) CIE test III (8) Assignment/seminar/Quiz (5)	Objectives Test (6) Attendance (5) Total CIE: 40 marks Semester End Examination (60)	Course end survey

Unit 01: ALGORITHMIC PROBLEM SOLVING — **9 Hours**

Need for computer languages, Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion).

Unit 02: BASICS OF PYTHON PROGRAMMING — **9 Hours**

Introduction-Python Interpreter-Interactive and script mode -Values and types, variables, operators, expressions, statements, precedence of operators, Multiple assignments, comments, input function, print function, Formatting numbers and strings, implicit/explicit type conversion.

Unit 03: CONTROL STATEMENTS AND STRINGS — **9 Hours**

Conditional (if), alternative (if-else), chained conditional (if-elif-else). Iteration-while, for, infinite loop, break, continue, pass, else. Strings-String slices, immutability, string methods and operations.

Dr. J. AKILANDESWARI
PROFESSOR & HEAD
Department of Information Technology
SONA COLLEGE OF TECHNOLOGY
SALEM-636 005

Unit 04: FUNCTIONS, FILES AND MODULES	9 Hours
Functions - Introduction, inbuilt functions, user defined functions, passing parameters - positional arguments, default arguments, keyword arguments, return values, local scope, global scope and recursion. Files -Text files, reading and writing files. Modules – create – import.	
Unit 05: DATA STRUCTURES: LISTS, SETS, TUPLES, DICTIONARIES	**9 Hours**
Lists-creating lists, list operations, list methods, mutability list functions, searching and sorting, Sets-creating sets, set operations. Tuples-Tuple assignment, Operations on Tuples, lists and tuples, Tuple as return value- Dictionaries-operations and methods, Nested Dictionaries, Union Operation.	

Theory: 45 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 45 Hrs

TEXT BOOKS

1.	Reema Thareja, "Problem Solving and Programming with Python" Oxford University Press, 2nd Edition 2023.

REFERENCES

1.	Ashok Namdev Kamthane, Amit Ashok Kamthane, "Programming and Problem Solving with Python" Mc-Graw Hill Education, 2018.
2.	Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem Solving Focus" Wiley India Edition, 2013.
3.	Allen Downey, "Think Python: How to Think Like a Computer Scientist" O'Reilly Media, 2nd Edition 2016.
4.	Timothy A. Budd," Exploring Python" Mc-Graw Hill Education (India) Private Ltd., 2015.

J. Akil and T.
Dr. J. AKILANDESWARI
PROFESSOR & HEAD
Department of Information Technology
SONA COLLEGE OF TECHNOLOGY
SALEM-636 005

U23PPL112	PYTHON PROGRAMMING LABORATORY (Common to ADS, IT, CSE, CSE(AIML), CSD, CIVIL, BME, ECE, EEE, MECH and MCT Branches)	L	T	P	J	C
		0	0	2	0	1

Course Outcomes

At the end of the course, the student will be able to

CO1:	Implement the algorithms using basic control structures in Python
CO2:	Develop Python programs to use functions, strings and data structures to solve different types of problems
CO3:	Implement persistent storing information through file operations

Pre-requisite: NIL

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	3	2	1								1
CO2	3	3	3	3	2	2								1
CO3	3	3	3	3	2	2								1

Course Assessment methods

Direct		Indirect
CIE test I (15) Quiz I- (5) CIE test II (15) Quiz II- (5)	RTPS (10) Record (10) Total CIE: 60 marks Semester End Examination (40 marks)	Course end survey

LIST OF EXPERIMENTS

1. Draw flowchart using any open source software.
2. Implement programs with simple language features.
3. Implement various branching statements in python.
4. Implement various looping statements in python.
5. Develop python programs to perform various string operations like concatenation, slicing, indexing.
6. Implement user defined functions using python.
7. Implement recursion using python.
8. Implement python program to perform operations on file and module.
9. Develop python programs to perform operations on list and tuples.
10. Implement dictionary and set in python.

Theory: --	Tutorial: --	Practical: 30Hrs	Project: --	Total Hours: 30 Hs

Dr. J. AKILANDESWARI
PROFESSOR & HEAD
Department of Information Technology
SONA COLLEGE OF TECHNOLOGY

U23BEE106B	BASICS OF ELECTRICAL AND ELECTRONICS FOR MECHANICAL ENGINEERING	L	T	P	J	C
		2	0	2	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1:	Analyse the various DC and AC circuits and find the circuit parameters.
CO2:	Discuss the construction and working principles of DC machines.
CO3:	Explain the construction and working principles of transformers and induction motors
CO4:	Explain the basics of semiconductor devices for various applications.
CO5:	Discuss the types of electric drive and the solid state speed control of DC motors and AC motors.

Pre-requisite: Physics

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	1	-	-	-	-	-	1	1	3	3
CO2	3	3	3	3	1	-	-	-	-	-	1	1	3	3
CO3	3	3	2	3	1	-	-	-	-	-	1	1	3	3
CO4	3	3	2	3	1	-	-	-	-	-	2	3	3	3
CO5	3	3	1	3	1	-	-	-	-	-	2	3	3	3

Course Assessment methods

Direct		Indirect
CIE test I (10) (Theory) CIE test II (10) (Theory) CIE test III (10) (Theory) CIE test IV (10) (Practical) Attendance (5) Assignment/Quiz/Seminar (5)	Total CIE: 50 marks Semester End Examination (50 marks) [SEE- Theory (25) + Lab(25)]	Course end survey

Unit 01: DC & AC FUNDAMENTALS — **6 Hours**

Electrical components and parameters – Resistance, Conductance – Ohm's law, Kirchhoff's law – Power – Energy – resistors in series and parallel – comparison of series and parallel circuits – standard terminologies in AC circuits – RMS and average value of Sinusoidal waveform.

Unit 02: DC MACHINES	6 Hours
DC Generator: Construction of DC generator – Working principle of DC generator – EMF equation – Types of DC generator- Applications DC Motor: Working principle of DC motor – Back EMF- Types of DC motor- Applications.	
Unit 03: TRANSFORMER AND INDUCTION MOTORS	**6 Hours**
Transformer: Construction and working principle of single phase transformer – EMF equation – Applications. Induction Motors: Construction and working principle of single phase & three phase induction motor- Applications.	
Unit 04: SEMICONDUCTOR DEVICES AND APPLICATIONS	**6 Hours**
Introduction to semiconductors - PN junction Diode– V-I characteristics- Applications: half wave rectifier, full wave rectifier- SCR- V-I characteristics of SCR.	
Unit 05: ELECTRIC DRIVES	**6 Hours**
Basic Elements – Types of Electric Drives – Factors influencing the choice of electric drives –Single phase half controlled and fully controlled bridge rectifier fed DC drives- voltage source inverter (VSI) and current source inverter (CSI) fed induction motor drives.	

LIST OF EXPERIMENTS

1. Verification of Ohm's law.
2. Verification of Kirchhoff's laws.
3. V-I characteristics of PN junction diode.
4. V-I characteristics of SCR.
5. Load test on DC Shunt motor.
6. Speed control of DC shunt motor.
7. Load test on single phase transformer.
8. Speed control of three phase induction Motor.
9. Single phase half controlled converter using R, RL Loads.
10. Single phase fully controlled converter using R, RL Loads.

Theory: 30 Hrs	Tutorial: --	Practical: 30 Hrs	Project:--	Total Hours: 60 Hrs

TEXT BOOKS

1. B.L. Theraja, "Fundamentals of Electrical Engineering & Electronics", S. Chand & Co Ltd, 2022.
2. Gopal K.Dubey, Fundamentals of Electrical Drives", 2nd Edition, Alpha Science International Ltd, 2022

REFERENCES

1. Mehta V.K, Rohit Mehta, "Principles of Electrical Engineering & Electronics", S.Chand & Co. Ltd., 2020.
2. S.K. Bhattacharya, "Electrical Machines", 3rd Edition , Tata MC Graw Hill & Co ltd, 2017
3. Smarajit Ghosh, "Fundamentals of Electrical and Electronics Engineering", 2nd revised edition , PHI publications, 2010
4. Vedam Subrahmanyam, "Electric Drives: Concept and Applications" , 2nd Edition, Tata MC Graw Hill & Co ltd, 2017

S.Padma

Dr.S.PADMA, M.E., Ph.D.,
Professor and Head,
Department of EEE,
Sona College of Technology
Salem-636 005, Tamil Nadu.

U23EGR107	ENGINEERING GRAPHICS	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1:	Construct –Ellipse, Parabola, Hyperbola, Cycloids and Involutes.
CO2:	Draw the projection of Point, Line and Plane surfaces.
CO3:	Draw the projection of simple solids by rotating object method.
CO4:	Develop the section of simple solids and lateral surface of truncated solids.
CO5:	Draw the isometric view to orthographic projection.

Pre-requisite: Nil

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	1							3		2			1	
CO2					3			2		2		2		2
CO3					3			2		2		2	1	2
CO4					3			2		2		2	1	2
CO5			2					2		2		2	1	

Course Assessment methods

Direct		Indirect
CIE test I (8) CIE test II (8) CIE test III (8) Assignment/seminar/Quiz (5)	Objectives Test (6) Attendance (5) Total CIE: 40 marks Semester End Examination (60)	Course end survey

CONCEPTS AND CONVENTIONS - (Not for Examination).

Importance of graphics in engineering applications - Use of drafting instruments - BIS conventions and specifications — Size, layout and folding of drawing sheets — Lettering and dimensioning.

Unit 01: PLANE CURVES - (Manual drafting). **9 Hours**

Basic Geometrical constructions, Curves used in engineering practices: Conics — Construction of ellipse, parabola and hyperbola by eccentricity method — Construction of cycloid — construction of Involute of circle — Drawing of tangents and normal to the above curves.

Dr. D. SENTHIL KUMAR, M.E.,Ph.D
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5.

Unit 02: PROJECTION OF POINTS, LINES AND PLANE SURFACES (CAD software). Orthographic projection- principles-principal planes-First angle projection-projection of points. Projection of straight lines **(only First angle projections)** inclined to both the principal planes -Determination of true lengths and true inclinations by rotating line method. Projection of planes (polygonal and circular surfaces) inclined to one of the principal plane by rotating object method.	**9 Hours**
Unit 03: PROJECTION OF SOLIDS (CAD software). Projection of simple solids - prisms, pyramids, cylinder and cone, when the axis is inclined to one of the principal planes and parallel to the other by change of position method.	**9 Hours**
Unit 04: PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES (CAD software). Section of solids in simple vertical position when the cutting plane is inclined to one of the principal planes and perpendicular to the other — **(obtaining true shape of section is not required)**. Development of lateral surfaces of truncated solids — Prisms, pyramids cylinders and cones.	**9 Hours**
Unit 05: ISOMETRIC TO ORTHOGRAPHICS PROJECTION- (Manual drafting). Representation of three dimensional objects – General Principles - Need for importance of multiple views – First angle projection – layout of views – Conversion of isometric view to orthographic views. Practicing three dimensional modelling of simple objects using CAD Software **(Not for examination)**	**9 Hours**

Theory: 45 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 45 Hrs

TEXT BOOKS

1.	Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 53rd Edition, 2019.
2.	Natrajan K.V., "A Text Book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2018.
3.	Parthasarathy, N. S. and Vela Murali, "Engineering Drawing", Oxford University Press, 2015
4.	P.Suresh., "Engineering Graphics and Drawing", Sonaversity, Sona College of Technology, Salem, Revised edition, 2012.

Dr. D. SENTHIL KUMAR, M.E.,Ph.D
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5.

REFERENCES	
1.	BasantAgarwal and Agarwal C.M.,"Engineering Drawing", McGraw Hill, 2nd Edition, 2019.
2.	Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Publications, Bangalore, 27thEdition, 2017.
3.	Luzzader, Warren.J. and Duff, John M., "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
4.	Parthasarathy N. S. and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015.
5.	Shah M.B., and Rana B.C., "Engineering Drawing", Pearson Education India, 2nd Edition, 2009.
6.	Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2008.

Dr.D.SENTHIL KUMAR, M.E.,Ph.D
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5.

U23TAM101	தமிழர் மரபு / Heritage of Tamils	L	T	P	J	C
		1	0	0	0	1

Course Outcomes

At the end of the course, the student will be able to

CO1:	Describe Tamil Language and Literature
CO2:	Analyse Heritage - Rock Art Paintings To Modern Art – Sculpture
CO3:	Explain Folk and Martial Arts
CO4:	Describe Thinai Concept of Tamils
CO5:	Analyse Contribution of Tamils to Indian National Movement and Indian Culture

Course Assessment methods

Direct		Indirect
CIE test I (30) CIE test II (30) CIE test III (40)	Total CIE: 100 marks Semester End Examination: NIL	Course end survey

அலகு 1 : மொழி மற்றும் இலக்கியம் — 3 Hours

இந்திய மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி -தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை - சங்க இலக்கியத்தில் பகிர்தல் அறம் - திருக்குறளில் மேலாண்மைக் கருத்துக்கள் - தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றிலக்கியங்கள் - தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி - தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

அலகு 2 : மரபு – பாறை ஓவியங்கள் முதல் ஓவியங்கள் வரை – சிற்பக் கலை — 3 Hours

நடுகல் முதல் சிற்பங்கள் வரை – ஐம்பொன் சிலைகள் - பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் - தேர் செய்யும் கலை- சுடுமண் சிற்பங்கள் - நாட்டுப்புறத் தெய்வங்கள் - குமரிமுனையில் திருவள்ளுவர் சிலை - இசைக் கருவிகள் - மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் - தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு

அலகு 3: நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள் — 3 Hours

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோலபாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

அலகு 4: தமிழர்களின் திணைக் கோட்பாடுகள் — 3 Hours

தமிழகத்தின் தாவரங்களும், விலங்குகளும் - தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் – தமிழர்கள் போற்றிய அறக்கோட்பாடு – சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் -

சங்ககால நகரங்களும் துறை முகங்களும் - சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.				
அலகு 5: இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு				**3 Hours**
இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு – கல்வெட்டுகள் கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.				
Theory: 15 Hrs	**Tutorial: --**	**Practical: --**	**Project:--**	**Total Hours: 15 Hrs**

REFERENCES

1	தமிழக வரலாறு – மக்களும் பண்பாடு – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2	கணினித் தமிழ் - முனைவர் இல.சுந்தரம்.(விகடன் பிரசுரம்).
3	கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4	பொருநை –ஆற்றங்னரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies
7	Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9	Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12	Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

HOD

Dr. M.RENUGA,
Professor & Head,
Department of Humanities & Languages,
Sona College of Technology,
SALEM - 636 005.

U23TAM101	தமிழர் மரபு / Heritage of Tamils	L	T	P	J	C
		1	0	0	0	1

Course Outcomes

At the end of the course, the student will be able to

CO1:	Describe Tamil Language and Literature
CO2:	Analyse Heritage - Rock Art Paintings To Modern Art – Sculpture
CO3:	Explain Folk and Martial Arts
CO4:	Describe Thinai Concept of Tamils
CO5:	Analyse Contribution of Tamils to Indian National Movement and Indian Culture

Course Assessment methods

Direct		Indirect
CIE test I (30) CIE test II (30) CIE test III (40)	Total CIE: 100 marks Semester End Examination: NIL	Course end survey

Unit 01: **LANGUAGE AND LITERATURE**	3 Hours
Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan..	
Unit 02: **HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE**	3 Hours
Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils	
Unit 03: FOLK AND MARTIAL ARTS	**3 Hours**
Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils	
Unit 04: THINAI CONCEPT OF TAMILS	**3 Hours**
Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.	
Unit 05: CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE	**3 Hours**
Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books	

Theory: 15 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 15 Hrs

REFERENCES

1	தமிழக வரலொறு – மக்களும் பண் பொடும் – மக.மக. பிள்மள (தவளியீடு: தமிழ்நொடு பொடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2	கணினித ் தமிழ் – முமனவர ்இல. சுந்தரம் . (விகடன் பிரசுரம்).

3	கீழடி – மவமக நதிக்கமரயில் ொங்ககொல நகர நொகரிகம் (ததொல்லியல் துமறதவளியீடு)
4	பொருமந – ஆற்றங்கமர நொகரிகம். (ததொல்லியல் துமற தவளியீடு)
5	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies
7	Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9	Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12	Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

HOD

Dr. M.RENUGA,
Professor & Head,
Department of Humanities & Languages,
Sona College of Technology,
SALEM - 636

U23GE101	BASIC APTITUDE-1	L	T	P	J	C
		2	0	0	0	0

Course Outcomes

At the end of the course, the student will be able to

CO1:	Solve the problems in Divisibility , Division algorithm ,Successive Division and HCF & LCM. Identify Synonyms and Antonyms.
CO2:	Elucidate the problems in BODMAS rule, Approximation, Surds and Indices, Algebraic Simplification and Square root and Cube root. Choose appropriate Verbal Analogies and edit the given passages.
CO3:	Crack the problems involving Ratio and Proportion, and discuss Proportionality Theorems. Comprehend the given passages for Reading Comprehension activity and answer the questions correctly.
CO4:	Deduce the problems involving Linear equation and Quadratic equation. Demonstrate good vocabulary skill by doing the one word substitution and sentence filler exercise with high degree of accuracy.
CO5:	Interpret the logical reasoning problems from Number series ,Coding and Decoding and Exhibit good expertise in detecting errors in the given sentences.

Pre-requisite:

- Basic English language and Grammar knowledge
- Knowledge in Basic Mathematics

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO 11	PO12
CO1	3	3	3	2	1	1	1	3	3	3	2	3
CO2	3	3	3	2	1	1	1	3	3	3	2	3
CO3	3	3	3	2	1	1	1	3	3	3	2	3
CO4	3	3	3	2	1	1	1	3	3	3	2	3
CO5	3	3	3	2	1	1	1	3	3	3	2	3

Course Assessment methods

Direct		Indirect
CIE test I (30) - Theory CIE test II (30) - Theory CIE test III (40) – Theory	Total CIE: 100 marks Semester End Examination – NIL	Course end survey

Unit 01	6 Hours
Number Properties: Classification of numbers - Divisibility - Division algorithm -Successive Division - HCF and LCM –Problems Verbal Aptitude: Synonyms and b. Antonyms	
Unit 02	**6 Hours**
Simplification: BODMAS Rule - Approximation - Surds and Indices - Algebraic Simplification - Square root and Cube root – Problems Verbal Aptitude: Verbal analogy, Editing passages	
Unit 03	**6 Hours**
Ratio and Proportion : Ratio - Properties of Ratios - Compound Ratio - Coin based problems - Proportion - Proportionality Test - Proportionality Theorems - Inverse Proportion - Variation - Problems Verbal Aptitude: Reading Comprehension	
Unit 04	**6 Hours**
Equations: a. Linear equation: Simultaneous Linear Equations - Consistent System - Inconsistent System - Problems b. Quadratic Equation: Different Ways to Express the Quadratic Equation - Discriminant of the Quadratic Equations - Roots - Nature of the Roots - Relation between roots and coefficient of equation - Formation of a Quadratic Equation – Problems Verbal Aptitude: One word substitution , Sentence filler words	
Unit 05	**6 Hours**
Logical Reasoning : Number series – Coding and Decoding – Problem Verbal Aptitude: Error detection	

Theory: 30 Hrs	Tutorial: 0	Practical: 0	Project: 0	Total Hours: 30 Hrs

TEXT BOOKS

1. S.Chand and Dr.R.S.Aggarwal, "Quantitative Aptitude for competitive examinations", S Chand and Company Limited 2019.
2. Nishit K.Sinha, "Logical Reasoning and Data Interpretation", Pearson 2021.

15/09/2023

Dr.S.Anita

Head/Training

Dr. S. ANITA
Professor and Head
Department of Training,
SONA COLLEGE OF TECHNOLOGY,
SALEM-636 005.

U23OL1101	French	L	T	P	J	C
		1	0	0	0	1

Course Outcomes

At the end of the course, the student will be able to

CO1:	Read French phrases, Spell French phonitis, practice French accents, differentiate French and English sounds
CO2:	Introduce oneself, talk about someone, ask others personal information, identify an object, ask and respond politely in a conversation
CO3:	Read and write a small annoncement, describe about neighbours, write a small portrait
CO4:	Express one's wishes, talk about one's hobbies, ask time, describe one's status of life in a blog, justify a choice, express one's preferences, write a list of needs
CO5:	Suggest to do something, appreciate something, talk about a movie, write a postal card

Course Assessment methods

Direct		Indirect
CIE test I (30) CIE test II (30) CIE test III (40)	Total CIE: 100 marks Semester End Examination: NIL	Course end survey

Unit 01:	**3 Hours**
Hr 2: Alphabets, Basic wishes, self-introduction, basic verbs: avoir and être Hr 4: Nationalities and countries, colors, days & months Hr 6: Definite articles, numbers 0-20, write about one's identification	
Unit 02:	**3 Hours**
Hr 8: Professions, conjugation: 1st group verbs, indefinite articles Hr 10: Preposition of place, identity card, negative sentence Hr 12: Things around us, subjective and ephatitic pronouns, self-introduction online	
Unit 03:	**3 Hours**
Hr 14: Talk about accommodation, conjugation: aller and venir, possessive adjectives Hr 16: Adjective's gender, noun's gender, things in a room, simple prepositions Hr 18: Physical description, speak about accommodation, writing a self-potrait	
Unit 04:	**3 Hours**
Hr 20: Hobbies, conjugation: vouloir, pouvoir and devoir, connected articles Hr 22: Interrogative adjectives, daily activities, time and seasons, pronominal verbs Hr 24: Near future tense, talk about preferences, write a mail	
Unit 05:	**3 Hours**
Hr 26: Outing activities, conjugation: faire and sortir, demonstrative adjectives Hr 28: Adverbs of frequency, family members, past tenses (passé composé and imparfait) Hr 30: French arts, talk about a film, and write a postal card	

Theory: 15 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 15 Hrs

TEXT BOOKS

1.	The course faculty will provide relevant audios, videos, handouts and notes
2.	Books : Saison (Méthode de français, cachier d'activités)
3.	Reference books : La conjugaison, Dondon, Echo

HOD
Dr. M.RENUGA,
Professor & Head,
Department of Humanities & Lang... s,
Sona College of Technology,
SALEM - 63...

U23OL1102	German	L	T	P	J	C
		1	0	0	0	1

Course Outcomes

At the end of the course, the student will be able to

CO1:	Use common, everyday expressions to greet others and introduce themselves.
CO2:	Construct simple sentences /questions.
CO3:	Initiate and sustain basic conversation based on family, professions,
CO4:	Hobbies and food.
CO5:	Identify differences in using nouns based on gender.

Course Assessment methods

Direct		Indirect
CIE test I (30) CIE test II (30) CIE test III (40)	Total CIE: 100 marks Semester End Examination: NIL	Course end survey

Unit 01:	**3 Hours**
• Greeting and taking leave, introducing oneself, introducing others	
Unit 02:	**3 Hours**
• Alphabets, spelling, numbers	
Unit 03:	**3 Hours**
• Age, Telephone/mobile numbers, Month, Date, Time	
Unit 04:	**3 Hours**
• Languages, Family, Asking/giving information about family members	
Unit 05:	**3 Hours**
• Hobbies, Professions	

Theory: 15 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 15 Hrs

TEXT BOOKS

1.	Netzwerk A1

HOD
Dr. M.RENUGA,
Professor & Head,
Department of Humanities & Languages,
Sona College of Technology,
SALEM - 63.

U23OL1103	Japanese	L	T	P	J	C
		1	0	0	0	1

Course Outcomes

At the end of the course, the student will be able to

CO1:	Use words and phrases of greeting in Japanese, write the letters of the alphabet, identify names of objects and do a self-introduction using short and simple sentences
CO2:	Demonstrate the use of time-related words and verb conjunctions and make light conversation asking for directions and answering questions
CO3:	Use different kinds of verbs through the day and those used for giving things, and demonstrate the use of adjectives
CO4:	Express liking for the Japanese language, describe the locations of different things and demonstrate counting in Japanese
CO5:	Make comparisons of stated things, express a willingness to go to Japan and use 'Te-form' verbs

Course Assessment methods

Direct		Indirect
CIE test I (30) CIE test II (30) CIE test III (40)	Total CIE: 100 marks Semester End Examination: NIL	Course end survey

Unit 01:	**3 Hours**
Hr 1-2: Greeting words and phrases; the Japanese alphabet: 104 Hiragana and 104 Katakana letters Hr 3-4: Identifying words from pictures or objects shown Hr 5-6: Self-introduction	
Unit 02:	**3 Hours**
Hr 7-8: Asking for directions when shopping Hr 9-10: Time words and Verb Conjugations Hr 11-12: Making light conversation	
Unit 03:	**3 Hours**
Hr 13-14: Expressions to use verbs from morning to night Hr 15-16: Verbs used for giving things Hr 17-18: Adjectives	
Unit 04:	**3 Hours**
Hr 19-20: Ways to show liking for the Japanese language Hr 21-22: Describing the location of things (or where things are) Hr 23-24: Japanese numbers and counting	
Unit 05:	**3 Hours**
Hr 25-26: Making comparisons Hr 27-28: Expressions wishing for something, like 'I want to go to Japan …!' Hr 29-30: Using 'Te-form' Verb	

Theory: 15 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 15 Hrs

TEXT BOOKS

1.	The course faculty will provide handouts / notes / course material.
2.	Books on Basic Japanese language available in the college library.

HOD
Dr. M.RENUGA,
Professor & Head,
Department of Humanities & La

U23OL1104	Korean	L	T	P	J	C
		1	0	0	0	1

Course Outcomes

At the end of the course, the student will be able to

CO1:	Use single vowels and consonants syllable structure.
CO2:	Greet others and introduce themselves.
CO3:	Identify time , date and week
CO4:	Explain location and places
CO5:	Construct simple sentences / questions.

Course Assessment methods

Direct		Indirect
CIE test I (30) CIE test II (30) CIE test III (40)	Total CIE: 100 marks Semester End Examination: NIL	Course end survey

Unit 01: Hangeul	3 Hours
Single Vowels & Consonants Syllable Structure Tense Consonants Aspirated Consonants Double Vowels Final Consonants Double Final Consonants Liaison	
Unit 02: Introduction	3 Hours
Greetings Talking about names Self-introduction Introducing my family members	
Unit 03: Time and Date	**3 Hours**
Talking about location Talking about dates and days of the week Talking about doing something in the past	
Unit 04: Location and Places	**3 Hours**
Talking about location Talking about doing something at a location Talking about directions	
Unit 05: Future	**3 Hours**
Talking about doing something in the future Talking about plans for the future Talking about hope for the future	

Theory: 15 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 15 Hrs

REFERENCES

1	Vitamin Korean - 1

HOD
Dr. M.RENUGA,
Professor & Head,
Department of Humanities & Languages,
Sona College of Technology,

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester II under Regulations 2023 (CBCS)
Branch: Mechanical Engineering

S.No	Course Code	Course Title	L	T	P	J	C	Category	Total Contact Hours	Course Type*
Theory courses										
1.	U23ENG201B	Communication Skills in English	2	0	2	0	3	HS	60	TL
2.	U23MAT202C	Vector Calculus and Differential Equations	3	1	0	0	4	BS	60	TT
3.	U23PHY203F	Physics for Mechanical Engineering	3	0	0	0	3	BS	45	T
4.	U23ME201	Engineering Mechanics for Mechanical Engineering	3	1	0	0	4	ES	60	TT
5.	U23ME202	Manufacturing Process	3	0	0	0	3	PC	45	T
6.	U23TAM201	தமிழரும் தொழில்நுட்பமும்/ Tamils and Technology	1	0	0	0	1	HS	15	T
7.	U23GE201	Basic Aptitude- II	2	0	0	0	0	AC	30	T
Practical courses										
8.	U23PHL210A	Physics Laboratory	0	0	2	0	1	BS	30	L
9.	U23ME203	Workshop Practices for Mechanical Engineering	0	0	2	0	1	PC	30	L
Total Credits							**20**			
Optional Language Courses**										
10.	U23OL1201	French - II	1	0	0	0	1	OL	15	T
11.	U23OL1202	German - II							15	T
12.	U23OL1203	Japanese - II							15	T
13.	U23OL1204	Korean - II							15	T

*T- Theory, TT- Theory with Tutorial, TL- Theory with Laboratory,TP- Theory with Project, TLP- Theory with Laboratory and Project, L-Laboratory, LT- Laboratory with Theory, LP- Laboratory with Project

**Students may opt for foreign languages viz., German/French/Japanese/Korean with additional one credit

(Not accounted for CGPA calculation)

Approved By

Chairperson, Science and Humanities BoS	Chairperson, Mech BoS	Member Secretary, Academic Council	Dean-Academics	Chairperson, Academic Council & Principal
Dr.M.Renuga	Dr. D.Senthilkumar	Dr.R.Shivakumar	Dr.J.Akilandeswari	Dr.S.R.R.Senthil Kumar

Copy to:-

HOD/ Mechanical Engineering, Second Semester B.E. Mech, Students and Staff, COE

PRINCIPAL
SONA COLLEGE OF TECHNOLOGY
SALEM-636 005

U23ENG201B	Communication Skills in English	L	T	P	J	C
		2	0	2	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1:	Use grammatical components effectively in both written and spoken communication
CO2:	Develop speaking skills for self-introduction, delivering speeches and technical presentation
CO3:	Demonstrate effective listening skills for academic and professional purposes
CO4:	Write emails and formal letters and build resumes and construct paragraphs
CO5:	Develop speaking skills both in terms of fluency and comprehensibility

Pre-requisite:

- Knowledge and Understanding of Grammar
- Fundamental Language Skills (LSRW)

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	1	1	3	3	2	3	3	2	3	2	3
CO2	1	1	1	1	1	3	3	3	3	3	3	3	3	3
CO3	1	2	3	2	2	3	3	2	3	3	3	3	3	3
CO4	1	2	1	2	2	3	3	3	3	3	3	3	3	3
CO5	1	2	2	3	2	3	3	3	3	3	3	3	3	3

Course Assessment methods

Direct		Indirect
CIE test I (10) (Theory) CIE test II (10) (Theory) CIE test III (10) (Theory) CIE test IV (10) (Practical) Assignment/seminar/Quiz (5)	Attendance (5) Total CIE: 50 marks Semester End Examination (50) (SEE – Theory (25 marks + Lab (25 marks)	Course end survey

Unit 01: **6 Hours**

- General vocabulary, Parts of Speech, Articles
- Email, fixing an appointment, cancelling appointments, conference details, hotel accommodation, order for equipment, training programme details, paper submission for seminars and conferences
- Paragraph writing – Describing – defining – providing examples or evidences

Unit 02: **6 Hours**

- Tenses, Sentence Patterns

- Instructions
- Letter Writing - calling for quotations, placing orders

Unit 03:	6 Hours

- Prefixes and Suffixes
- Cover letter and resume writing

Unit 04:	6 Hours

- Modal verbs, concord
- Checklist
- Letter Writing - Business communication, complaints, replies to queries from business customers

Unit 05:	6 Hours

- If conditionals
- Letter Writing - inviting dignitaries, accepting and declining invitations

Lab component:

1. Self-introduction, personal information, name, home background, study details, area of interest, hobbies, strengths and weaknesses, projects and paper presentations, likes and dislikes in food, travel, clothes, special features of home town.
2. Mini presentation - Office Arrangements, Facilities, Office Functions, Sales, Purchases, Training Recruitment, Advertising, Applying for financial assistance, applying for a job.
3. Listening - understanding short conversations or monologues, taking down phone messages, orders, notes, etc.
4. Listening – entering information in tabular form
5. Loud Reading

Theory: 30 Hrs	Tutorial: --	Practical: 30 hours-	Project:--	Total Hours: 60 Hrs

TEXT BOOKS

1.	Technical English I & II, Dr. M. Renuga et al. Sonaversity, 2016
2.	**Extensive Reading** 1. She is Dancing Back to Life – A Short Story 2. The Story of Google – Sara Gilbert, published by Jaico 3. The Story of Amazon.com- Sara Gilbert, published by Jaico

REFERENCES

1.	Norman Whitby, Business Benchmark – Pre-Intermediate to Intermediate, Students Book, Cambridge University Press, 2006.
2.	A Course in Communication Skills, P. Kiranmai Dutt, Geetha Rajeevan, C. L. N. Prakash, published by Cambridge University Press India Pvt. Ltd.

HOD 13/2/24.

Dr. M.RENUGA,
Professor & Head,
Department of Humanities & Langua
Sona College of Technology,
SALEM - 63

SEMESTER - II	VECTOR CALCULUS AND DIFFERENTIAL EQUATIONS	L	T	P	J	C
U23MAT202C	Common to CIVIL, MECHANICAL and MECHATRONICS	3	1	0	0	4

Course Outcomes

At the end of the course, the student will be able to

CO1:	apply the concepts of vector differentiation and integration to determine the line, surface and volume integrals.
CO2:	apply the classical methods to solve linear ordinary differential equations.
CO3:	apply the appropriate numerical methods to solve ordinary differential equations.
CO4:	apply the classical methods to solve partial differential equations.
CO5:	apply the appropriate finite difference schemes to solve partial differential equations.

Pre-requisites:

- Fundamentals of elementary algebra
- Fundamentals of calculus
- Fundamentals of trigonometry
- Fundamentals of geometry

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2		3	2						2	2	3	3
CO2	3	2		3	2						2	2	3	3
CO3	3	2		3	2						2	2	3	3
CO4	3	2		3	2						2	2	3	3
CO5	3	2		3	2						2	2	3	3

Course assessment methods [Theory with tutorial course]

Direct		Indirect
CIE test I (8) (Theory) CIE test II (8) (Theory) CIE test III (8) (Theory) Objectives Test (6)	Attendance (5) Assignment/Quiz/Seminar (5) Total CIE: 40 marks Semester End Examination: 60marks	Course end survey

Unit 01 VECTOR CALCULUS — **12 Hours**

Vector differentiation: Scalar and vector valued functions – Gradient of a scalar point function - Level surface, Unit normal vector, Angle between the two surfaces, directional derivatives – Divergence of a vector point function – Solenoidal vector – Curl of a vector point function – Irrotational vector – Problems based on vector identities – Scalar potential.

Vector integration: Line, surface and volume integrals – Statements of Green's, Stoke's and Gauss divergence theorems – Simple applications involving squares, rectangles, cubes and rectangular parallelopiped.

Unit 02 ORDINARY DIFFERENTIAL EQUATIONS — **12 Hours**

Higher order linear ordinary differential equations with constant coefficients – Cauchy's and Legendre's linear ordinary differential equations – Method of variation of parameters.

Unit 03	NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS	12 Hours
Single Step Methods: Numerical solution of first order ordinary differential equations by Taylor's series, Euler and Modified Euler and Fourth order Runge – Kutta method. **Multi Step Methods:** Numerical solution of first order ordinary differential equations by Milne's and Adam's predictor-corrector methods.		
Unit 04	**PARTIAL DIFFERENTIAL EQUATIONS**	**12 Hours**
Formation of partial differential equations – Lagrange's partial differential equation – Clairaut's form of partial differential equations – Second order linear partial differential equation with constant coefficients.		
Unit 05	**NUMERICAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS**	**12 Hours**
Classification of second order partial differential equations – Finite difference schemes for the solution of two dimensional Laplace's and Poisson's equations on rectangular domain – One dimensional heat flow equation by explicit (Bender-Schmidt's) and implicit (Crank Nicholson) methods.		

Theory: 45 Hrs	Tutorial: - 15	Practical: -	Project:--	Total Hours: 60 Hrs

TEXT BOOKS:

1. T. Veerarajan, "Linear Algebra and Partial Differential Equations", McGraw Hill Publishers, 1st Edition, 2018.
2. T. Veerarajan, "Engineering Mathematics for Semesters I & II", McGraw Hill Publishers, 1st Edition, 2019.
3. T. Veerarajan, "Numerical Methods", McGraw Hill Publishers, 1st Edition, 2018.

REFERENCE BOOKS:

1. J. Stewart, "Calculus", Cengage Publishers, 8th Edition, 2016.
2. C. Prasad and R. Garg, "Advanced Engineering Mathematics", Khanna Publishers, 1st Edition, 2018.
3. E. Kreyszig., "Advanced Engineering Mathematics", Wiley Publishers, 10th Edition, Reprint, 2017.
4. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, 2018.
5. B. V. Ramana, "Higher Engineering Mathematics", McGraw Hill Publishers, 29th Reprint, 2017.

Dr. S. JAYABHARATHI
ASSOCIATE PROFESSOR & HEAD
DEPARTMENT OF MATHEMATICS,
SONA COLLEGE OF TECHNOLOGY,
SALEM-636 005. Tamilnadu.
Ph: 0427 - 4099999.

BoS Date: 08. 07. 2023	HoD / Mathematics

U23PHY203F	PHYSICS FOR MECHANICAL ENGINEERING	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1:	Analyse the relation between arrangement of atoms and material properties.
CO2:	Discuss the dual nature of matter and radiation and the application of wave nature of particles.
CO3:	Describe the basic components of lasers.
CO4:	Distinguish the types of magnetic materials.
CO5:	Elucidate the different modes of heat transfer.

Pre-requisite:

Basic Knowledge in atomic physics, optics and modern physics

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	2	2	-	-	2	-	1	-	2
CO2	3	2	-	-	-	2	2	-	-	2	-	1	-	2
CO3	3	2	-	-	-	2	2	-	-	2	-	1	-	2
CO4	3	2	-	-	-	2	2	-	-	2	-	1	-	2
CO5	3	2	-	-	-	2	2	-	-	2	-	1	-	2

Course Assessment methods

Direct		Indirect
CIE test I (8) CIE test II (8) CIE test III (8) Assignment/seminar/Quiz (5)	Objectives Test (6) Attendance (5) Total CIE: 40 marks Semester End Examination (60)	Course end survey

Unit 01: CRYSTAL PHYSICS — **9 Hours**

Importance of crystals - Types of crystals - Basic definitions in crystallography (Lattice -space lattice - unit cell - lattice parameters - basis) - Bravais lattices - Lattice planes and Miller indices - Interplanar distance - d spacing in cubic lattice - Calculation of number of atoms per unit cell - Atomic radius - Coordination number - Atomic Packing Factor for SC, BCC, FCC and HCP structures - Polymorphism and allotropy - Crystal imperfections - Point, line and surface defects - Burger vector.

Unit 02: QUANTUM PHYSICS	9 Hours
Limitations of classical theory - Dual nature of matter and radiation - Compton effect - Expression for Compton shift (no derivation) - de Broglie waves - Heisenberg's Uncertainty Principle - Schrödinger's time independent and time dependent wave equations - Physical significance of wave function - Energy and wave function of an electron trapped in one dimensional box - Application of wave nature of particles - Electron microscope - Comparison of optical and electron microscope - Scanning electron microscope - Transmission electron microscope - Limitations of electron microscope.	
Unit 03: LASERS	**9 Hours**
Energy level - Stimulated absorption - Population inversion - Meta stable state - Spontaneous emission - Stimulated emission - Basic components of a laser - Einstein's theory of spontaneous and stimulated emission of radiation - Types of lasers - Solid state laser - Nd:YAG laser - Gas laser - CO_2 laser - Semiconductor laser - Homojunction and hetero junction laser - Holography - Construction and reconstruction of hologram - Application of laser in industry – Cutting, welding and drilling – Medical applications – Lasik - Laser in 3D printing - Operation and its applications.	
Unit 04: MAGNETIC MATERIALS	**9 Hours**
Basic definitions - Magnetic moment - Magnetic field - Magnetic field intensity - Magnetic permeability - Magnetization - Intensity of magnetization - Magnetic susceptibility - Types of magnetic materials - Dia , Para and Ferromagnetic materials - Domain theory of ferromagnetism - Origin of domains – Antiferromagnetic materials- Ferrites - Structure, properties and applications - Hysteresis - Hard and soft magnetic materials.	
Unit 05: THERMAL PHYSICS	**9 Hours**
Heat and temperature - Modes of heat transfer - Conduction, convection and radiation - Specific heat capacity - Thermal capacity and coefficient of linear thermal expansion - Thermal conductivity - Measurement of thermal conductivity of a good conductor - Forbe's method - Measurement of thermal conductivity of a bad conductor - Lee's disc method - Radial flow of heat - Cylindrical flow of heat - Practical applications of conduction of heat - Thermal radiations - Properties and applications of thermal radiations.	

Theory: 45 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 45 Hrs

TEXT BOOKS

1. M.N. Avadhanulu, P.G. Kshirsagar , "A Textbook of Engineering Physics", S.Chand & Company Ltd, New Delhi 2014.
2. B D. K. Bhattacharya, Poonam Tandon "Engineering Physics", Oxford University Press 2017.

REFERENCES

1. "Engineering Physics", Sonaversity, Sona College of Technology, Salem, Revised Edition 2018.
2. B. K. Pandey and S. Chaturvedi, "Engineering Physics", Cengage Learning India Pvt. Ltd., Delhi, 2021.
3. Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury, "Concepts of Modern Physics", McGraw-Hill (Indian Edition), 2017.

4.	R.Wolfson, "Essential University Physics", Volume 1 & 2. Pearson Education (Indian Edition), 2009.
5.	R. Murugeshan, Kiruthiga Sivaprasath, "Thermal Physics", S.Chand & Company Ltd, New Delhi 2018.

12.1.2024

Dr. C. SHANTHI, M.Sc.,M.E.,Ph.D.
Professor of Physics
Head, Department of Sciences
Sona College of Technology (Autonomous)
SALEM-636 005.

17/1/24.

Dr. M.RENUGA,
Professor & Head,
Department of Humanities & Languages,
Sona College of Technology,
SALEM - 636 00

U23ME201	Engineering Mechanics For Mechanical Engineering	L	T	P	J	C
		3	1	0	0	4

Course Outcomes

At the end of the course, the student will be able to

CO1:	Summarize the basic quantities and idealizations of mechanics and examine the standard procedures for performing numerical calculations.
CO2:	Apply the condition of equilibrium of the rigid body in 2D and compute the support reactions.
CO3:	Compute the centroid of plane surfaces and develop a method for determining the moment of inertia.
CO4:	Analyze the mechanics of friction.
CO5:	Apply critical thinking to analyze and solve dynamic problems, integrating principles of displacement, velocity, and acceleration.

Pre-requisite:

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3											2	
CO2	3	3											2	
CO3	3	3											2	
CO4	3	3											2	
CO5	3	3											2	

Course Assessment methods

Direct		Indirect
CIE test I (8) CIE test II (8) CIE test III (8) Assignment/seminar/Quiz (5)	Objectives Test (6) Attendance (5) Total CIE: 40 marks Semester End Examination (60)	Course end survey

Unit 01: FUNDAMENTAL CONCEPTS OF MECHANICS — **12 Hours**

Introduction to mechanics - Fundamental concepts, units, and dimensions - General procedure for analyses - unit conversion - Laws of Mechanics (parallelogram law, Lami's theorem, triangular law of forces), and Principle of transmissibility - Types of forces acting on a body - Equilibrium of a particle - Equivalent system of forces and computation of resultant forces.

Unit 02: EQUILIBRIUM OF RIGID BODIES IN 2 DIMENSIONS — **12 Hours**

Free-Body Diagrams – Types of supports and their reactions - Requirements of static equilibrium –Moments and Couples - Moment of a Force about a Point, Varignon's Theorem – Equilibrium of rigid bodies in two dimensions.

Unit 03: CENTRIODS AND AREA MOMENT OF INERTIA	12 Hours
Introduction - Centroids of simple Plane Areas and Curves (rectangle, triangle, circle, hollow circle, T-section & I-section) - Area moment of inertia for rectangle, circle, hollow circle, triangle, I-Section, C-Section, and T-Section.	
Unit 04: FRICTION	**12 Hours**
Types of friction - laws of sliding friction - Equilibrium analyses of simple systems with sliding friction - Angle of friction - cone of friction - Equilibrium of bodies on an inclined plane - Ladder friction- Applications of friction (Qualitative treatment only).	
Unit 05: KINETICS AND KINEMATICS OF PARTICLES	**12 Hours**
Displacement, velocity, acceleration, and their relationship - Rectilinear and Curvilinear motion- Newton's laws of motion (fundamentals) - Work-Energy principle - introduction to Impulse and momentum - analyses of the impact of elastic bodies.	

Theory: 45 Hrs	Tutorial: 15	Practical: --	Project: --	Total Hours: 60 Hrs

TEXT BOOKS

1. Bansal R K, "A Textbook of Engineering Mechanics"- 6th edition, 2022, Laxmi publications (P) LTD.
2. R. C. Hibbler, Engineering Mechanics: Statics & Dynamics, Person Prentice hall, 14th edition, 2017.
3. Kumar, K.L., "Engineering Mechanics", 4th Revised Edition, Tata McGraw-Hill Publishing Company, New Delhi (2017).

REFERENCES

1. S. Timoshenko, Engineering Mechanics (In SI Units) (SIE) ,5th Edition,2017, McGraw Hill Education.
2. Beer, F.P and Johnston Jr. E.R., "Vector Mechanics for Engineers (In SI Units): Statics and Dynamics", 12 th Edition, Tata McGraw-Hill Publishing company, New Delhi (2019).
3. Irving H. Shames and Krishna Mohana Rao. G., "Engineering Mechanics – Statics and Dynamics", 4th Edition, Pearson Education (2016)
4. Meriam J.L. and Kraige L.G., " Engineering Mechanics- Statics' - Volume 1, & 'Dynamics' , John Wiley & Sons,(2017 & 2018)
5. Rajasekaran S and Sankarasubramanian G., "Engineering Mechanics Statics and Dynamics", 3rd Edition, Vikas Publishing House Pvt. Ltd., (2005).
6. Bhavikatti, S.S "Engineering Mechanics", 8th New Age International (P) Limited Publishers, (2021).

Dr. D. SENTHIL KUMAR, M.E.,Ph.D
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5.

U23ME202	MANUFACTURING PROCESS	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO6:	Explain the major concepts of material removal process, cutting tool materials, tool wear and tool life calculations
CO7:	Describe the parts and working principle of centre lathe, and discriminate the special purpose lathes of capstan and turret lathe
CO8:	Analyze and select the suitable welding process based on the different applications and identify the causes of welding defects
CO9:	Explain the sand casting process, pattern materials, special casting processes and calculate the pattern allowances and casting pouring time
CO10:	Elaborate the various types of moulding processes in the manufacturing of plastic components

Pre-requisite: Nil

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3					3	3	3	3	3	
CO2	3	3	2	3					3	3	3	3	3	
CO3	3	3	2	3					3	3	3	3	3	
CO4	3	3	2	3					3	3	3	3	3	
CO5	3	3	2	2					3	3	3	3	3	

Course Assessment methods

Direct		Indirect
CIE test I (8) CIE test II (8) CIE test III (8) Assignment/seminar/Quiz (5)	Objectives Test (6) Attendance (5) Total CIE: 40 marks Semester End Examination (60)	Course end survey

Unit 01: THEORY OF METAL CUTTING — **9 Hours**

Introduction: material removal processes, nomenclature of single point cutting tool- chip formation, orthogonal cutting, oblique cutting- shear angle in orthogonal cutting- cutting tool materials, tool wear, Taylors tool life, factors affecting tool life – tool life calculations - surface finish, cutting fluids.

Unit 02: CENTRE LATHE AND SPECIAL PURPOSE LATHES — **9 Hours**

Centre lathe: constructional features- various operations, tool and work holding devices- taper turning methods, special attachments, lathe machining time calculations. Capstan and turret lathes – automats – Swiss type- Geneva mechanism, bar feeding mechanism.

Unit 03: METAL JOINING PROCESS	9 Hours
Gas welding: Types- oxy- acetylene, Flame characteristics- Arc welding: Types- Metal arc welding-TIG welding- MIG welding-Plasma arc welding- Submerged arc welding- Electro slag welding – Melting efficiency - Resistance welding: Butt- Spot- Seam welding, Heat generated calculations - Friction welding- Electron beam welding. Thermit Welding - Brazing- Soldering- Welding defects.	
Unit 04: METAL CASTING	**9 Hours**
Sand Casting- Moulding Tools- Types of Patterns- Pattern Materials- Pattern Allowances- Pattern Allowances Calculations- Types of Moulding Sand- Properties- Core Making- Methods of Sand Testing- Pouring time calculations- Moulding Machines: Types- Melting Furnaces: Cupola, Crucible and Electric arc furnace- Special Casting Process: Shell, Investment Casting - Lost Wax Process- Pressure Die Casting- Centrifugal Casting- CO2 Process- Sand Casting Defects- Inspection Methods.	
Unit 05: MANUFACTURING OF PLASTIC COMPONENTS	**9 Hours**
Types and characteristics of plastics – Moulding of thermoplastics – working principles and typical applications – injection moulding – Plunger and screw machines – Compression moulding, Transfer Moulding – Typical industrial applications – Introduction to blow moulding – Rotational moulding – Film blowing – Extrusion.	

Theory: 45 Hrs	Tutorial: --	Practical: --	Project: --	Total Hours: 45 Hrs

TEXT BOOKS

1. P.N. Rao, "Manufacturing Technology: Foundry, Forming, and Welding, Volume 1", McGraw-Hill Education (India) Private Limited, 5th Edition, 2018.
2. P.N. Rao, "Manufacturing Technology: Metal Cutting and Machine Tools, Volume 2", McGraw-Hill Education (India) Private Limited, 4th Edition, 2019.
3. J.P .Kaushish "Manufacturing Processes" PHI Learning Private limited, second edition 2010.

REFERENCES

1. B.S. Magendran parashar & R.K. Mittal, "Elements of Manufacturing Processes", Prentice Hall of India, 2003.
2. Hajra Choudhury, "Elements of Workshop Technology, Vol. I Media Promoters & Publishers pvt ltd, 2009.

Dr.D.SENTHIL KUMAR, M.E.,Ph.D
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5.

U23TAM201	தமிழரும் தொழில்நுட்பமும்	L	T	P	J	C
		1	0	0	0	1

Course Outcomes

At the end of the course, the student will be able to

CO1:	Describe the weaving and ceramic technology
CO2:	Explain the design and construction technology
CO3:	Analyse the manufacturing technology
CO4:	Describe the agriculture and irrigation technology
CO5:	Explain the Scientific Tamil and Tamil Computing

Course Assessment methods

Direct		Indirect
CIE test I (30) CIE test II (30) CIE test III (40)	Total CIE: 100 marks Semester End Examination: NIL	Course end survey

Unit 01: WEAVING AND CERAMIC TECHNOLOGY — **3 Hours**

அலகு I நெசவு மற்றும் பானைத் தொழில்நுட்பம்: 3

சங்க காலத்தில் நெசவுத் தொழில் - பானைத் தொழில்நுட்பம் – கருப்பு சிவப்பு பாண்டங்கள் பாண்டங்களில் கீறல் குறியீடுகள்.

Unit 02: DESIGN AND CONSTRUCTION TECHNOLOGY — **3 Hours**

அலகு II வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்: 3

சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு– சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் - சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் – மாமல்லபுரச் சிற்பங்களும், கோவில்களும் - சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் - நாயக்கர் காலக் கோயில்கள் – மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாட்டு வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ–சாரோசெனிக் கட்டிடக் கலை.

Unit 03: MANUFACTURING TECHNOLOGY — **3 Hours**

அலகு III உற்பத்தித் தொழில் நுட்பம்: 3

கப்பல் கட்டும் கலை - உலோகவியல் - இரும்புத் தொழிற்சாலை - இரும்பை உருக்குதல், எஃகு - வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் - நாணயங்கள் அச்சடித்தல் – மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள், கண்ணாடி மணிகள் - கடுமண் மணிகள் - சங்கு மணிகள் - எலும்புத்துண்டுகள் - தொல்லியல் சான்றுகள் – சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

Unit 04: AGRICULTURE AND IRRIGATION TECHNOLOGY — **3 Hours**

அலகு IV வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்: 3

அணை, ஏரி, குளங்கள், மதகு - சோழர்காலக் குமுழித் தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் - வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்துக்குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்.

Unit 05: SCIENTIFIC TAMIL & TAMIL COMPUTING — **3 Hours**

அலகு V அறிவியல் தமிழ் மற்றும் கணித்தமிழ்: 3

அறிவியல் தமிழின் வளர்ச்சி -கணித்தமிழ் வளர்ச்சி – தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக் கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம்.

Theory: 15 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 15 Hrs

TEXT BOOKS	
1.	தமிழக வரலாறு –மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2.	கணினித் தமிழ் –முனைவர் இல. சுந்தரம். (விகடன் பிரகரம்). கீழடி –வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு) பொருநை –ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
REFERENCES	
3.	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
4.	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
5.	Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
6.	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
7.	Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
8.	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
9.	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10	Journey of Civilization Indus to Vaigai (R.Ramakrishna) (Published by: RMRL) – Reference Book.

HOD

Dr. M.RENUGA,
Professor & Head,
Department of Humanities & Languages,
Sona College of Technology,
SALEM - 636 005.

U23TAM201	TAMILS AND TECHNOLOGY	L	T	P	J	C
		1	0	0	0	1

Course Outcomes

At the end of the course, the student will be able to

CO1:	Describe the weaving and ceramic technology
CO2:	Explain the design and construction technology
CO3:	Analyse the manufacturing technology
CO4:	Describe the agriculture and irrigation technology
CO5:	Explain the Scientific Tamil and Tamil Computing

Course Assessment methods

Direct		Indirect
CIE test I (30) CIE test II (30) CIE test III (40)	Total CIE: 100 marks Semester End Examination: NIL	Course end survey

Unit 01: WEAVING AND CERAMIC TECHNOLOGY — **3 Hours**

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries

Unit 02: DESIGN AND CONSTRUCTION TECHNOLOGY — **3 Hours**

Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.

Unit 03: MANUFACTURING TECHNOLOGY — **3 Hours**

Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold- Coins as source of history - Minting of Coins – Beads making-industries Stone beads -Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described inSilappathikaram.

Unit 04: AGRICULTURE AND IRRIGATION TECHNOLOGY — **3 Hours**

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society

Unit 05: SCIENTIFIC TAMIL & TAMIL COMPUTING — **3 Hours**

Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries –Sorkuvai Project

Theory: 15 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 15 Hrs

TEXT BOOKS

1. தமிழக வரலாறு –மக்களும் பண்பாடும் –
கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் –முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
கீழடி –வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
பொருநை –ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)

REFERENCES	
1.	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
2.	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
3.	Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
4.	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
5.	Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
6.	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
7.	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
8.	Journey of Civilization Indus to Vaigai (R.Ramakrishna) (Published by: RMRL) – Reference Book.

HOD

Dr. M.RENUGA,
Professor & Head,
Department of Humanities & Languages,
College of Technology,
SALEM - 600 005.

U23GE201	BASIC APTITUDE-II (Common to All Departments)	L	T	P	J	C
		2	0	0	0	0

Course Outcomes

At the end of the course, the student will be able to

CO1:	Solve the problems in Percentage, Conversion of Percentage to Ratio and Ratio into Percentage and work on verbal aptitude questions
CO2:	Elucidate the problems in Profit and loss and percentage of profit and loss. Choose appropriate sentence fillers and Idioms and phrase
CO3:	Crack the problems involving Geometry, Area, Perimeter/Circumference, Surface area and Volume. Comprehend the given passages for Reading Comprehension activity and answer the questions correctly.
CO4:	Deduce the problems involving Trigonometry and exhibit good expertise in detecting errors in the given sentences.
CO5:	Interpret the problems on Ages & logarithm and work on logical reasoning and demonstrate good vocabulary skill by spotting errors.

Pre-requisite:

- Basic English language and Grammar knowledge
- Knowledge in Basic Mathematics

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO 11	PO12
CO1	3	3	3	2	1	1	1	3	3	3	2	3
CO2	3	3	3	2	1	1	1	3	3	3	2	3
CO3	3	3	3	2	1	1	1	3	3	3	2	3
CO4	3	3	3	2	1	1	1	3	3	3	2	3
CO5	3	3	3	2	1	1	1	3	3	3	2	3

Course Assessment methods

Direct		Indirect
CIE test I (30) - Theory CIE test II (30) - Theory CIE test III (40) – Theory	Total CIE: 100 marks Semester End Examination – NIL	Course end survey

Unit 01	6 Hours
Percentage: Conversion of a Percentage into a Fraction – Conversion of a Percentage into a Ratio – Conversion of a Ratio into a Percentage - Percentage Change – Successive percentage – Problems **Verbal Aptitude:** Jumbled sentences & Reconstructions of sentences (PQRS)	
Unit 02	**6 Hours**
Profit Loss: Types of prices – Profit – Loss – Percentage of Profit and Loss - Common Gain or Loss – Selling Price and Cost Price Equality – Successive Profit and Loss – Problems **Verbal Aptitude:** Sentence fillers two words & Idioms and phrase	
Unit 03	**6 Hours**
Geometry: Angles – Complementary and Supplementary angles – Lines – Triangle – Types of triangles – Properties of Triangles – Problems **Area, Perimeter / Circumference:** Triangles - Rectangles and Squares – Parallelogram, Rhombus and Trapezium – Circles – Problems **Surface area, curved surface area & Volume:** Cuboid – Cube – Right circular cylinder – Right circular cone – Sphere – Hemisphere– Problems **Verbal Aptitude:** Reading comprehension.	
Unit 04	**6 Hours**
Trigonometry: Value of Trigonometry ratios for particular values – Sign of Trigonometrical ratios – Trigonometrical ratios for sum or difference of angles Problems **Verbal Aptitude:** Spotting errors	
Unit 05	**6 Hours**
Averages – Problems on ages – Logarithm - **Logical Reasoning:** Alpha Series – Venn diagram – Problems **Verbal Aptitude**: Writing captions for given pictures.	

Theory: 30 Hrs	Tutorial: 0	Practical: 0	Project: 0	Total Hours: 30 Hrs

TEXT BOOKS

1.	S.Chand and Dr.R.S.Aggarwal, "Quantitative Aptitude for competitive examinations", S Chand and Company Limited 2019.
2.	Nishit K.Sinha, "Logical Reasoning and Data Interpretation", Pearson 2021.

6/02/2024

Dr.S.Anita
Professor & Head
Department of Training

Dr. S. ANITA
Professor and Head
Department of Training,
SONA COLLEGE OF TECHNOLOGY,
SALEM-636 005.

U23PHL210A	PHYSICS LABORATORY (Common to I Year B.E/B.Tech. CIVIL, MECH & FT)	L	T	P	J	C
		0	0	2	0	1

Course Outcomes

At the end of the course, the student will be able to

CO1:	Determine the optical, thermal and magnetic properties of materials by various physics laboratory equipment.
CO2:	Access, process and analyse scientific information.
CO3:	Solve problems individually and collaboratively.

Pre-requisite: Capable of using Screw gauge, Vernier calliper, Travelling microscope, able to handle interferometer.

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2		1		1			1					2
CO2	3	2		1		1			1					2
CO3	3	2		1		1			1					2

Course Assessment methods

Direct		Indirect
CIE test I (15) Quiz 1 (5) CIE test II (15) Quiz 2 (5)	RTPS (10) Record (10) Total CIE:60 marks Semester End Examination (40 marks)	Course end survey

LIST OF EXPERIMENTS

1	Determination of the thickness of a thin wire by forming interference fringes using air wedge apparatus.
2	Determination of velocity of ultrasonic waves and compressibility of the given liquid using ultrasonic interferometer.
3	Determination of Rigidity Modulus of given wire using Torsion Pendulum.
4	Determination of coefficient of viscosity of liquid by Poiseuille's method.
5	Determination of Young's modulus of the material of the beam by Non-uniform bending method.
6	Determination of the wavelength of a diode laser.

7	Determination of particle size of lycopodium powder using diode laser.	
8	Determination of acceptance angle and numerical aperture of an optical fibre using diode laser.	
9	Determination of the thermal conductivity of a bad conductor using Lee's Disc apparatus.	
10	Determination of hysteresis using B-H curve method.	
		TOTAL : 30 HOURS

Dr. M.RENUGA,
Professor & Head,
Department of Humanities & La
Sona College of Techn
SALEM - 6

12-1-2024

Dr. C. SHANTHI, M.Sc.,M.E.,Ph.D.,
Professor of Physics
Head, Department of Sciences
Sona College of Technology (Autonomous)
SALEM-636 005.

U23ME203	WORKSHOP PRACTICES FOR MECHANICAL ENGINEERING	L	T	P	J	C
		0	0	2	0	1

Course Outcomes

At the end of the course, the student will be able to

CO1:	Develop a different shapes of joints in fitting, and dust pan in sheet metal
CO2:	Create a various joints in carpentry and integrate the metals by different Arc welding process
CO3:	Prepare a desired shapes of given work piece using Lathe machine

Pre-requisite: Nil

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3					3	3	3	3	1	3	
CO2	3	3	3	2				3	3	3	3	3	3	
CO3	3	3	3					3	3	3	3	3	3	

Course Assessment methods

Direct		Indirect
CIE test I (15) Quiz I- (5) CIE test II (15) Quiz II- (5)	RTPS (10) Record (10) Total CIE: 60 marks Semester End Examination (40 marks)	Course end survey

LIST OF EXPERIMENTS

SECTION A: FITTING

1. Making of Vee joint — 3 Hours

SECTION B: SHEET METAL

2. Making of Dust Pan — 3 Hours

SECTION C: CARPENTRY

3. Making of Half Lap Joint — 3 Hours

SECTION D: WELDING		
4.	Exercise on Arc welding of Butt Joint	2 Hours
5.	Exercise on Arc welding of Lap Joint	2 Hours
6.	Exercise on TIG Welding	3 Hours
7.	Exercise on MIG Welding	3 Hours
SECTION E: LATHE		
8.	Exercise on Simple Facing and Turning	2 Hours
9.	Exercise on Step and Taper Turning	3 Hours
10.	Exercise on Grooving and Thread Cutting Operation	3 Hours
11.	Exercise on Drilling and Boring	3 Hours
		Total Number of hours: 30

Theory: --	Tutorial: --	Practical: 30 Hrs	Project: --	Total Hours: 30 Hrs

Dr.D.SENTHIL KUMAR, M.E.,Ph.D
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5.

U23OL1201	French - II	L	T	P	J	C
		1	0	0	0	1

Course Outcomes

At the end of the course, the student will be able to

CO1:	Accept and refuse of an invitation, give some instruction of do's and don'ts, converse in commercial centres, write an invitation
CO2:	Describe a city, locate a place in a city, ask further details, describe one's hometown
CO3:	Talk about things around us, recite a past event, identify sign boards, express agree and disagree, express obligation and prohibition, sell an object in online
CO4:	Talk about one's goals, express one's feelings, write a list of things to do, express an opinion, talk about weather, draft a mail response
CO5:	Express one's interest and wish, describe a pet animal, express one's aversions, encourage others, write to ask for a help, narrate a past event, write a biography

Course Assessment methods

Direct		Indirect
CIE test I (30) CIE test II (30) CIE test III (40)	Total CIE: 100 marks Semester End Examination: NIL	Course end survey

Unit 01:	**3 Hours**
Hr 2: City shopping and services, conjugation: payer, manger and acheter, negative sentence Hr 4: Imperative sentence, food and beverages, utensils, cutleries, corckeries Hr 6: Quantitative articles, quantities, pronoun 'en', express appreciation, write an invitation	
Unit 02:	**3 Hours**
Hr 8: City and localities, Conjugation: prendre, adjectives of place, pronoun 'y' Hr 10: Transport, leisure activities, preposition of place, degrees of comparison Hr 12: Asking information about a new place, describe a city	
Unit 03:	**3 Hours**
Hr 14: Things in a store, conjugation : faire, imparfait 2, passé composé Hr 16: Things in a repairing shop, computer, relative pronouns: que and qui Hr 18: Imperative negative, express obligation and interdiction, online sale and response	
Unit 04:	**3 Hours**
Hr 20: Professions, conjugation: croire, voir, recent past tense Hr 22: Traveling formalities, expressing about health condition, future tense Hr 24: Pronoun COD, talk about weather condition, write about one's plans and projections	
Unit 05:	**3 Hours**
Hr 26: Citizenship and solidarity, conjugation: connaitre and savoir, depuis vs pendant Hr 28: Imparfait vs passé composé, nature and environment, indirect pronouns COI Hr 30: Animals, conditional, talk on supporting others, write a biography	

Theory: 15 Hrs	Tutorial: --	Practical: --	Project:-	Total Hours: 15 Hrs

TEXT BOOKS

1.	The course faculty will provide relevant audios, videos, handouts and notes.
2.	Books : Saison (Méthode de français, cachier d'activités)
3.	Reference books : La conjugaison, Dondon, Echo

13/2/24.

HOD

Dr. M.RENUGA,
Professor & Head,
Department of Humanities & Languages,
Sona College of Technology,
SALEM - 6.

U23OL1202	German - II	L	T	P	J	C
		1	0	0	0	1

Course Outcomes

At the end of the course, the student will be able to

CO1:	Use grammatical expressions appropriately in day-to-day conversation.
CO2:	Make them frame simple sentences /questions.
CO3:	Accentuate to start and sustain basic conversation
CO4:	Helps them articulate thoughts in German
CO5:	Identify the different forms of the verb

Course Assessment methods

Direct		Indirect
CIE test I (30) CIE test II (30) CIE test III (40)	Total CIE: 100 marks Semester End Examination: NIL	Course end survey

Unit 01:	3 Hours
Nominative/accusative case, adjectives	

Unit 02:	3 Hours
Modes of transportation, orientation, giving/understanding simple directions	

Unit 03:	3 Hours
• Food and beverages, Modal verbs, Separable verbs	

Unit 04:	3 Hours
• Simple sentences using modal / separable verbs	

Unit 05:	3 Hours
• Articles of clothing	

Theory: 15 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 15 Hrs

TEXT BOOKS

1.	Netzwerk A1

HOD 13/2/2024

Dr. M.RENUGA,
Professor & Head,
Department of Humanities & Languages
Sona College of Technology,
SALEM - 636

U23OL1203	Japanese - II	L	T	P	J	C
		1	0	0	0	1

Course Outcomes

At the end of the course, the student will be able to

CO1:	Use verbs in polite conversation or for dissuasion and describe two different activities
CO2:	Demonstrate the application of causative verbs and those that express ability or possibility, and describe experiences
CO3:	Use plain-style expressions, those that state opinions, and verbs and adjectives that go with nouns
CO4:	Express sentences that use 'when' and 'if' and those that describe how services are given and received
CO5:	Read 126 letters of Kanji, and demonstrate adequate knowledge of the lessons learnt in Levels I and II to pass the Japanese Language Proficiency Test (JLPT) for the N5 Level

Course Assessment methods

Direct		Indirect
CIE test I (30) CIE test II (30) CIE test III (40)	Total CIE: 100 marks Semester End Examination: NIL	Course end survey

Unit 01:	**3 Hours**
Hr 1-2: Words and verbs expressing requests / Kanji 1-10 Hr 3-4: Asking for permission; making statements to prohibit something / Kanji 11-20 Hr 5-6: Describing two activities / Kanji 21-30	
Unit 02:	**3 Hours**
Hr 7-8: Verbs that express 'I have to ...' / Kanji 31-40 Hr 9-10: Verbs which express ability or possibility / Kanji 41-50 Hr 11-12: Describing experience / Kanji 51-60	
Unit 03:	**3 Hours**
Hr 13-14: Plain-style expressions / Kanji 61-70 Hr 15-16: Expressions like 'I think that ...' / Kanji 71-80 Hr 17-18: Qualifying nouns with verbs and adjectives / Kanji 81-90	
Unit 04:	**3 Hours**
Hr 19-20: Expressions using 'When ...' / Kanji 91-100 Hr 21-22: Describing the giving and receiving of services / Kanji 101-110 Hr 23-24: Expressions using 'If ...' / Kanji 111-126	
Unit 05:	**3 Hours**
Hr 25-26: Preparing for JLPT N5 Hr 27-28: Preparing for JLPT N5 Hr 29-30: Preparing for JLPT N5	

Theory: 15 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 15 Hrs

TEXT BOOKS

1.	The course faculty will provide handouts / notes / course material.
2.	Books on Basic Japanese language available in the college library.

HOD

Dr. M.RENUGA,
Professor & Head,
Department of Humanities & Languages,
Sona College of Technology,
SALEM - 636 005.

U23OL1204	Korean - II	L	T	P	J	C
		1	0	0	0	1

Course Outcomes

At the end of the course, the student will be able to

CO1:	Identify time
CO2:	Identify the date and days of the week
CO3:	Explain location and places
CO4:	Explain destination
CO5:	Construct simple sentences / questions.

Course Assessment methods

Direct		Indirect
CIE test I (30) CIE test II (30) CIE test III (40)	Total CIE: 100 marks Semester End Examination: NIL	Course end survey

Unit 01: Time	3 Hours
Talking about time	
Unit 02: Date	3 Hours
Talking about dates and days of the week Talking about doing something in the past	
Unit 03: Location	**3 Hours**
Talking about location Talking about doing something at a location	
Unit 04: Direction	**3 Hours**
Talking about directions	
Unit 05: Future	**3 Hours**
Talking about doing something in the future Talking about plans for the future Talking about hope for the future	

Theory: 15 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 15 Hrs

REFERENCES

1	Vitamin Korean - 1

13/2/24.

HOD

Dr. M.RENUGA,
Professor & Head,
Department of Humanities & Languages,
Sona College of Technology,
SALEM - 635 005.

mech

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester III under Regulations 2023 (CBCS)
Branch: Mechanical Engineering

S.No	Course Code	Course Title	L	T	P	J	C	Category	Total Contact Hours	Course Type*
Theory courses										
1.	U23MAT301D	Probability and Statistics	3	1	0	0	4	BS	60	TT
2.	U23ME301	Engineering Thermodynamics	3	0	0	0	3	PC	45	T
3.	U23ME302	Fluid Mechanics and Machinery	3	0	2	0	4	PC	60	TL
4.	U23ME303	Conventional and Modern Manufacturing	3	0	2	0	4	PC	60	TL
5.	U23ME304	Instrumentation and Control Systems	3	0	0	0	3	ES	45	T
6.	U23ME305	Kinematics of Machines	3	0	0	0	3	PC	45	T
7.	noc24-mg72	**NPTEL**: Design Thinking- A Primer	1	0	0	0	1	ES	15	T
8.	U23GE302	**Audit Course**: Environment and Climate Science	2	0	0	0	0	AC	30	T
Practical courses										
9.	U23GE301	Soft Skills and Aptitude-I	0	0	2	0	1	EEC	30	L
							Total Credits	23		

*T- Theory, TT- Theory with Tutorial, TL- Theory with Laboratory, TP- Theory with Project, TLP- Theory with Laboratory and Project, L-Laboratory, LT- Laboratory with Theory, LP- Laboratory with Project, P- Project

Approved By

Chairperson, Mechanical Engineering BoS	**Member Secretary, Academic Council**	**Dean-Academics**	**Chairperson, Academic Council & Principal**
Dr.D.Senthilkumar	**Dr.R.Shivakumar**	**Dr.J.Akilandeswari**	**Dr.S.R.R.Senthil Kumar**

Copy to:-
HOD/ Mechanical Engineering, Third Semester B.E. Mechanical Students and Staff, COE

SEMESTER – III	PROBABILITY AND STATISTICS	L	T	P	J	C
U23MAT301D	(CSE / BME / MECH)	3	1	0	0	4

COURSE OUTCOMES

At the end of the course, the students will be able to

1.	apply the concepts of measures of central tendency, dispersion to the given data and analyze the results.
2.	compute simple and partial correlation coefficients and analyse regression equations for estimation and prediction purposes.
3.	apply the concepts of random variables and their properties to generate the moments.
4.	fit the suitable distribution and its properties to the real world problems and interpret the results.
5.	apply the concepts of joint probability distribution and its properties to find the covariance.

Pre-requisites:

- Fundamentals of elementary algebra
- Fundamentals of calculus
- Fundamentals of trigonometry
- Fundamentals of geometry

CO / PO, PSO Mapping

(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3 (CSE)
CO1	3	3	3	3	3							2	2		2
CO2	3	3	3	3	3							2	2		2
CO3	3	3	3	3	3							2	2		2
CO4	3	3	3	3	3							2	2		2
CO5	3	3	3	3	3							2	2		2

COURSE ASSESSMENT METHODS

DIRECT		INDIRECT
CIE test I (8)	Assignment/seminar/Quiz (5)	Course end survey
CIE test II (8)	Attendance (5)	
CIE test III (8)	Total CIE: 40 marks	
Objective Test (6)	Semester End Examination: 60 marks	

UNIT – I MEASURES OF CENTRAL TENDENCY AND DISPERSION **12**

Measures of central tendency (simple arithmetic mean, median, mode) – Quartiles – Measures of dispersion - Absolute and relative measures (range, inter-quartile range, quartile deviation, mean deviation about mean, standard deviation, coefficient of variation).

UNIT – II CORRELATION AND REGRESSION **12**

Simple and rank correlations – Multiple and partial correlations – Linear regression – Relation between simple correlation and regression - Curve fitting (straight line and parabola).

UNIT – III ONE DIMENSIONAL RANDOM VARIABLE **12**

One dimensional random variable – Discrete random variable – Distribution function of the discrete random variable – Probability mass function - Properties – Continuous random variable – Distribution function of the continuous random variable - Probability density function – Properties – Moments – Mathematical expectations – Moment generating function and its properties.

UNIT – IV	THEORETICAL DISTRIBUTIONS	12

Discrete distributions – Binomial distribution – Additive property, moment generating function, mean, variance and standard deviation of binomial distribution – Poisson distribution - Additive property, moment generating function, mean, variance and standard deviation of Poisson distribution – Poisson distribution as limiting form of binomial distribution (Statement only) – Geometric distribution - Memoryless property, moment generating function, mean, variance and standard deviation of Geometric distribution – Continuous distributions - Uniform distribution - Moment generating function, mean, variance and standard deviation of Uniform distribution - Exponential distribution - Memoryless property, moment generating function, mean, variance and standard deviation of exponential distribution - Normal distribution - Additive property, moment generating function, mean, variance and standard deviation of normal distribution (without derivation) – Normal distribution as limiting form of binomial distribution (Statement only) – Problems based on real time applications in discrete and continuous distributions.

UNIT – V	TWO DIMENSIONAL RANDOM VARIABLES	12

Two dimensional discrete random variables – Joint probability distribution of discrete random variables – Marginal and conditional probability distributions – Two dimensional continuous random variables – Joint probability density function – Joint probability distribution function for continuous two dimensional random variables - Marginal and conditional density functions – Covariance – Correlation.

Theory: **45 Hours**	Tutorial: **15 Hours**	Practical: --	Project: --	Total: **60 Hours**

TEXT BOOKS:

1. S. C. Gupta and V. K. Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Sons Publishers, 11th Edition, Reprint, 2019.
2. T. Veerarajan, "Probability, Statistics and Random Processes with Queueing Theory and Queueing Networks", McGraw Hill Publishers, 4th Edition, 7th Reprint, 2018.

REFERENCE BOOKS:

1. R. A. Johnson and C. B. Gupta, "Miller and Freund's, Probability and Statistics for Engineers", Pearson Publishers, 9th Edition, 2018.
2. S. Ross, "A First Course in Probability", Pearson Publishers, 9th Edition, 2019.
3. S. P. Gupta, "Statistical Methods", Sultan Chand and Sons Publishers, 46th Edition, 2023.

Dr. S. JAYABHARATHI
ASSOCIATE PROFESSOR & HEAD
DEPARTMENT OF MATHEMATICS,
SONA COLLEGE OF TECHNOLOGY,
SALEM-636 005. Tamilnadu.
Ph: 0427 - 4099999.

B. E / B. TECH REGULATIONS 2023	HEAD OF THE DEPARTMENT OF MATHEMATICS
S&H BoS DATE: 22 – 06 – 2024	

U23ME301	ENGINEERING THERMODYNAMICS	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1:	Discuss the thermodynamic properties of system and apply the first law of thermodynamics to solve engineering problems.
CO2:	Apply the Second law of thermodynamics and entropy principle to various processes.
CO3:	Determine the thermodynamic properties of pure substance in flow and non-flow processes.
CO4:	Compare the ideal and real gases and its appropriate thermodynamic relations.
CO5:	Compute the Psychrometric properties of air and analyze the Psychrometric processes in real time applications.

Pre-requisite: Engineering Mathematics, Engineering Physics

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2										2	
CO2	3	3	2	2									2	
CO3	3	3	2										2	
CO4	3	3	2										1	
CO5	3	3	2	2									2	

Course Assessment methods

Direct		Indirect
CIE test I (8) CIE test II (8) CIE test III (8) Assignment/seminar/Quiz (5)	Objectives Test (6) Attendance (5) Total CIE: 40 marks Semester End Examination: 60 marks	Course end survey

Unit 01: BASIC CONCEPTS AND FIRST LAW OF THERMODYNAMICS — **9 Hours**

Basic concepts - macroscopic and microscopic approach, Thermodynamic system - classification, Properties of system-, state, path, process and cycle, Concept of Quasi static process, thermodynamic equilibrium - Forms of Work and Heat interaction - Sign Convention, Zeroth law of thermodynamics- temperature scales, First Law of Thermodynamics, Constant Volume and Constant Pressure Specific Heats -- Internal Energy, Enthalpy, application of first law to non-flow processes and steady flow systems.

Unit 02: SECOND LAW OF THERMODYNAMICS AND CONCEPTS OF ENTROPY — **9 Hours**

Kelvin-Planck and Clausius Statements of the Second Law - Heat Engine, Heat pump and Refrigerator –

Equivalence of Kelvin-Planck and Clausius statement—Reversibility and irreversibility -- Causes of Irreversibility -- Carnot Cycle – Carnot theorem --Thermodynamic Temperature Scale.

Clausius Inequality -- Entropy -- A property -- Entropy change in reversible process -- Principle of Increase of Entropy -- availability (theory only). Third law of thermodynamics-statement.

Unit 03: PROPERTIES OF PURE SUBSTANCE	**9 Hours**

Properties of pure substance, thermodynamic properties of pure substance in solid, liquid and vapour phases, phase rule, p-v, p-T, T-v, T-s, h-s diagrams. p-v-T surface.

Formation of steam and its thermodynamic properties -- Use of Steam Table and Mollier Chart -- Calculations of work done and heat transfer in non flow and flow processes -- Determination of steam quality—Simple Rankine cycle.

Unit 04: IDEAL AND REAL GASES, THERMODYNAMIC RELATIONS	**9 Hours**

Ideal and real gases - Equations of state for ideal and real gases- van der Waal's relation-Reduced properties. Compressibility factor-Principle of Corresponding states, Generalized Compressibility Chart and its use.

Exact differential, Maxwell relations, Tds Equations, Difference and ratio of heat capacities, Joule-Thomson Coefficient, Clausius Clapeyron equation.

Unit 05: PSYCHROMETRY	**9 Hours**

Psychrometric properties, Psychrometric charts. Property calculations of air vapour mixtures by using chart and expressions. Psychrometric process – adiabatic saturation, sensible heating and cooling, humidification, dehumidification, evaporative cooling and adiabatic mixing.

Theory: 45 Hrs	**Tutorial: -**	**Practical: -**	**Project:-**	**Total Hours: 45 Hrs**

(Use of Steam tables, Mollier chart and Psychrometric charts are permitted)

TEXT BOOKS

1. Cengel, 'Thermodynamics – An Engineering Approach' 10th Edition, Tata McGraw Hill, New Delhi, 2023.
2. Domkundwar, Kothandaraman, A course in Thermal Engineering, 6th edition, Dhanpat Rai & Co (P) Ltd. 2016.
3. Chattopadhya,P. Engineering Thermodynamics, Oxford university press, New Delhi, 2016.

REFERENCES

1. Nag.P.K., "Engineering Thermodynamics", 6th Edition Tata McGraw-Hill, New Delhi, 2017.
2. Sonntag, R.E., Borgnakke, C., and Van Wylen, G.J., Fundamentals of Thermodynamics, 7th ed., John Wiley, 2015.
3. Michael J Moran, Howard N. Shapiro, Daisie D. Boettner, Margaret B. Baily, "Fundamentals of Engineering Thermodynamics" 8th Edition, John Wiley& sons, 2014
4. Holman.J.P., "Thermodynamics", 4th Ed. McGraw-Hill, 2008.
5. Arora C.P, "Thermodynamics", Tata McGraw-Hill, New Delhi, 2004.

Dr. D. SENTHIL KUMAR, M.E.,Ph.D
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5

U23ME302	FLUID MECHANICS AND MACHINERY	L	T	P	J	C
		3	0	2	0	4

Course Outcomes

At the end of the course, the student will be able to

CO1:	Understand the properties and concept of pressure measurement.
CO2:	Analyse the fluid flow problems using continuity equation and Bernoulli's equation with their applications.
CO3:	Distinguish laminar and turbulent flow through circular pipes and power transmission through pipes.
CO4:	Solve the real time problems with help of dimensional analysis by using Buckingham's ∏ theorem.
CO5:	Analyse the performance of hydraulic turbines and pumps.

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2									1		
CO2	3	3	3										2	2
CO3	3	3	3										2	2
CO4	3	3	3										2	2
CO5	3	3	3										2	2

Course Assessment methods- Theory with Laboratory Course

Direct		Indirect
CIE test I (10 marks) - Theory CIE test II (10 marks) - Theory CIE test III (10 marks) - Theory CIE test IV (10 marks) - Laboratory	Assignment/seminar/Quiz (5 marks) Attendance (5 marks) Total CIE: (50 marks) Semester End Examination (50 marks) [SEE- Theory (35 marks), Lab (15 marks)]	Course end survey

Unit 01: FLUID PROPERTIES AND PRESSURE MEASUREMENT — **T:9 Hours**

Theory: Definitions – Fluid - Properties of fluids- mass density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapor pressure, surface tension, cavitation and capillarity - Pressure measurement-manometry, buoyancy, stability of floating bodies, forces on submerged bodies.

Unit 02: FLUID KINEMATICS AND DYNAMICS — **T:9 Hours P: 5 Hours**

Types of fluid flow - application of continuity equation, Continuity equations in Cartesian coordinates. Momentum equation-linear and angular. Euler's equation of motion along streamline, Bernoulli's equation, and its applications-Orifice meter, Venturimeter, Pitot tube.

Practical (Only for practical examination): Determination of the Coefficient of discharge of given Orifice meter and Venturi meter; Determination of velocity of air using pitot tube.

Unit 03: FLOW THROUGH PIPES	**T: 9 Hours** **P: 5 Hours**

Laminar flow though circular pipes – Hagen Poiseuille equation - Boundary layer concept- Turbulent flow through circular pipes - Darcy Weisbach equation – friction factor - Moody diagram - Energy losses, pipes in series and parallel - Power transmission through pipes.

Practical (Only for practical examination): Determination of friction factor for a given set of pipes; Determination of minor losses for a given set of pipes.

Unit 04: DIMENSIONAL ANALYSIS	**T:9 Hours**

Need for dimensional analysis – methods of dimensional analysis – Buckingham's ∏-theorem, Dimensionless parameters - application of dimensionless parameters. Models and Similitude - Model laws

Unit 05: HYDRAULIC TURBINES AND PUMPS	**T: 9 Hours** **P: 5Hours**

Hydraulic turbines-classification and working principle. Pelton wheel turbine -Francis turbine-Kaplan turbine-Velocity triangle-work done- Efficiencies- Performance calculations. Centrifugal pumps– working principle – work done by the impeller – performance curves – Reciprocating pump- working principle – comparison.

Practical (Only for practical examination): Conducting experiments and drawing the characteristic curves of Pelton wheel, Francis turbine and Kaplan turbine; Conducting experiments and drawing the characteristic curves of centrifugal pump and reciprocating pump.

Theory: 45 Hrs	**Tutorial:**	**Practical: 15 Hrs**	**Project:**	**Total Hours: 60 Hrs**

TEXT BOOKS

1. Bansal, R.K., Fluid Mechanics and Hydraulics Machines, (9th edition), Laxmi publications (P) Ltd, New Delhi, 2017.
2. Sukumar Pati., "Fluid Mechanics and Hydraulics Machines", Tata McGraw Hill publications (P) Ltd, New Delhi, 2015.

REFERENCES

1. Modi P.N. and Seth, S.M. "Hydraulics and Fluid Mechanics", Standard Book House 20th edition, New Delhi 2015.
2. Ramamritham. S, Hydraulics, Fluid Mechanics and Fluid Machines, Dhanpat Rai & Sons, Delhi, edition 2012.
3. Streeter, V. L. and Wylie E. B., "Fluid Mechanics", McGraw Hill Publishing Co. 2010.9th edition.
4. C.S.P.Ojha, R.Berndtsson, P.N.Chandramouli., Fluid Mechanics and Machinery, Oxford UniversityPress, New Delhi, 2010
5. Kumar K. L., "Engineering Fluid Mechanics", Eurasia Publishing House(p) Ltd., New Delhi 2004.

LIST OF EQUIPMENTS			
1.	Orifice meter.	-	1 No.
2.	Venturi meter. .	-	1 No.
3.	Apparatus for finding friction factor for a given set of pipes.	-	1 No.
4.	Apparatus for finding minor losses for a given set of pipes.	-	1 No.
5.	Apparatus for finding velocity of air using pitot tube.	-	1 No.
6.	Pelton wheel.	-	1 No.
7.	Francis Turbine.	-	1 No.
8.	Kaplan Turbine.	-	1 No.
9.	Centrifugal pump.	-	1 No.
10.	Reciprocating pump.	-	1 No.

Dr. D. SENTHIL KUMAR, M.E.,Ph.D
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5

U23ME303	CONVENTIONAL AND MODERN MANUFACTURING	L	T	P	J	C
		3	0	2	0	4

Course Outcomes

At the end of the course, the student will be able to

CO1:	Acquire knowledge about principle of special machine tools and its operating mechanisms and produce various components from different machining methods.
CO2:	Demonstrate the working of various bulk deformation processes involving drawing, forging, rolling, and extrusion process.
CO3:	Acquire knowledge and analyse the various components of CNC machines and programming.
CO4:	Classify additive manufacturing process and identify suitable RP process for product manufacturing.
CO5:	Enhance and adopt advanced machining knowledge towards product development.

Pre-requisite: Manufacturing Process, Workshop Practices laboratory

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1		2					3	3		2	3	2
CO2	3	1										2	3	
CO3	3	1		2						3		2	3	3
CO4	3	3	3	3	3				3	3		2	3	3
CO5	3	2			3					3		2	3	3

Course Assessment methods- Theory with Laboratory Course

Direct		Indirect
CIE test I (10 marks) - Theory CIE test II (10 marks) - Theory CIE test III (10 marks) - Theory CIE test IV (10 marks) - Laboratory	Assignment/seminar/Quiz (5 marks) Attendance (5 marks) Total CIE: (50 marks) Semester End Examination: (50 marks) [SEE – Theory (35 marks), Lab (15 marks)]	Course end survey

Unit 01: SPECIAL MACHINE TOOLS — **T:9 Hours, P: 9 Hours**

Theory: Construction, Types, Operations and mechanisms of Shaper, Planner, Slotter and Broaching. Operations: drilling, Reaming, Boring- Tapping. Milling operations-types of milling cutter. Gear: cutting, forming, milling, hobbing. Grinding: cylindrical grinding, surface grinding, Centre less grinding – honing, lapping and buffing.

Practical (Only for practical examination): Exercises on Milling machine (Vertical and Horizontal), Shaper, Grinding (Surface, Cylindrical), Slotting and Capstan Lathe.

Unit 02: BULK DEFORMATION PROCESSES	**9 Hours**

Hot and Cold working Process- **Rolling**: Type of rolling mills- Process, **Drawing Process**: Wire drawing, Tube drawing, **Extrusion:** Direct and Indirect, Defects in rolling parts, **Forging Process**: Open and closed die forging, **Sheet metal:** Metal Spinning, Embossing, Coining, hydro forming, Rubber pad forming, and Explosive forming.

Unit 03: CNC MACHINE TOOLS	**T:9 Hours** **P:3 Hours**

Evolution of CNC Technology, CNC and DNC concept, CNC Machine building, Classification- Open loop and closed loop control, guide ways – Friction, Anti friction and other types of guide ways, Automatic Tool Changer, Coordinate system, G & M Codes, CNC part programming for turning and Milling- examples.

Practical (Only for practical examination): Simulation of CNC part programming for simple turning and milling.

Unit 04: DIGITAL MANUFACTURING	**T:9 Hours** **P: 3 Hours**

Introduction, Principle, Classification – process parameters – process details – machine details, Software's, Applications of Fusion Deposition Modelling, Stereo-lithography, Solid Ground Curing, Selective Laser Sintering, Laminated Object Manufacturing.

Practical (Only for practical examination): Simple CAD model preparation, Data interfacing: formats (STL, IGES), Model Slicing algorithms, Tool path generation, Production of simple 3D component.

Unit 05: ADVANCED MANUFACTURING	**9 Hours**

Principles- Process Parameters- Process Capabilities and applications of:
Electrical Discharge Machining, Wire Electrical Discharge Machining, Electro chemical Machining, Ultrasonic Machining, Laser beam machining, Electron beam machining, Abrasive Water jet machining and Plasma Arc cutting.

Theory: 45 Hrs	**Tutorial:**	**Practical: 15 Hrs**	**Project:**	**Total Hours: 60 Hrs**

TEXT BOOKS

1.	Pawan Negi, Mangey Ram, Om Prakash Yadav, "Basics of CNC Programming", River Publishers, 2022.
2.	Kaushik Kumar, Divya Zindani, J. Paulo Davim, " Rapid Prototyping, Rapid Tooling and Reverse Engineering", De Gruyter, 2020.
3.	P.N. Rao, "Manufacturing Technology: Metal Cutting and Machine Tools, Volume 2", McGraw-Hill Education (India) Private Limited, 4th Edition, 2019.
4.	J.P .Kaushish "Manufacturing Processes" PHI Learning Private limited, second edition 2019.
5.	Gary F. Benedict, "Nontraditional Manufacturing Processes", CRC Taylor and Francis, 2015.

REFERENCES			
1.	B.L. Juneja,G.S. Sekhon, Nitin Seth, "Fundamentals of Metal Cutting and Machine Tools", Published by New Age International (P) Limited. 2014		
2.	Mikell P Groover, "Principles of Modern Manufacturing", Wiley India Pvt Ltd, 2014.		
LIST OF EQUIPMENT'S			
1.	Horizontal Milling Machine	-	1 No
2.	Vertical Milling Machine	-	1 No
3.	Surface Grinding Machine	-	1 No
4.	Cylindrical Grinding Machine	-	1 No
5.	Shaper	-	2 Nos.
6.	Slotter	-	1 No
7.	Turret and Capstan Lathes	-	1 No
8.	3D Printer	-	1 No
9.	Computers- CNC & 3D print simulation	-	30 No's (per batch)

Dr. D. SENTHIL KUMAR, M.E.,Ph.D
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5

U23ME304	INSTRUMENTATION AND CONTROL SYSTEMS	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1:	Describe the basic components of instrumentation, measurement, and control systems.
CO2:	Assess the parameters and performance of transducers.
CO3:	Develop measurement techniques for mechanical systems.
CO4:	Implement control engineering methods in automatic control systems used in contemporary manufacturing, processing, and transportation settings.
CO5:	Design mechanical control systems for automation purposes.

Pre-requisite: Physics for Mechanical Engineering

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1								3						
CO2	3	3			3									3
CO3					3								3	3
CO4					3									3
CO5			3		3			3		3			3	3

Course Assessment methods

Direct		Indirect
CIE test I (8) CIE test II (8) CIE test III (8) Assignment/seminar/Quiz (5)	Objectives Test (6) Attendance (5) Total CIE: 40 marks Semester End Examination: 60 marks	Course end survey

Unit 01: MEASURING SYSTEM — **9 Hours**

Concepts of Mechanical measuring instruments – Elements of a measuring system – Requirements of measuring instruments – Static and dynamic characteristics of measuring instruments – Errors in measurements - Impedance matching - Least square method- Zero and first order system- step response and impulse response.

Unit 02: TRANSDUCER ENGINEERING — **9 Hours**

Classification and types of Transducers and Sensors – Transducer's Mathematical model - Electromechanical, Piezoelectric, Thermocouples and Optoelectronic transducers - principles of resistive,

inductive, and capacitive transducers - Transducer Troubleshooting- special transducers - Smart sensors- Nano sensors.	
Unit 03: INDUSTRIAL INSTRUMENTATION	**9 Hours**
Measurement of vibrations and speed – Accelerometer – Sensors to measure absolute, gauge, vacuum and atmospheric pressures - Measurement of temperature: pyrometer, Fiber optics sensor - Measurement of flow - hot wire anemometer – magnetic flow meter– ultrasonic meter. Measurement of displacement – Measurement of Force –Strain gauge, Load cells- Measurement of torque – Case study assignments.	
Unit 04: CONTROL SYSTEM	**9 Hours**
Introduction to Control systems – Open and Closed loop systems – stepper and servo mechanisms. Transfer function: Block diagram reduction algebra, signal flow graphs – Pollution Control system- Basics of Controllers and response analysis- Problems.	
Unit 05: DESIGN OF AUTOMATION AND CONTROLS SYSTEM	**9 Hours**
Automated systems- introduction to systems –design of hydraulic and pneumatic control system controls – Basics of Directional Control Valve (DCV) - sequence operations- Applications of relays/switches- design of – electro pneumatics - Programmable controllers - Cost considerations - programmable logic controllers - PLC languages (Basics of Ladder Diagram) - case studies.	

Theory: 45 Hrs	Tutorial:	Practical:	Project:	Total Hours: 45 Hrs

TEXT BOOKS

1. Ernest O. Doebelin, Dhanesh N. Manik, Doebelin's Measurement Systems: 7th Edition, McGraw-Hill; Seventh edition, ISBN-13: 978-9353168711, 2019.
2. Alan S. Morris, Reza Langari Measurement and Instrumentation: Theory and application, Academic Press, ISBN No. 978-0-12-3819604, 2016.
3. Norman S. Nise, "Control Systems Engineering", Wiley, 7th Edition, 2015.
4. Katsuhiko Ogata, "Modern Control Engineering", Prentice Hall, 5th Edition, 2009.

REFERENCES

1. Gene F. Franklin, J. Da Powell, and Abbas Emami-Naeini, "Feedback Control of Dynamic Systems", Pearson, 7th Edition, 2014.
2. Robert B. Northrop, "Introduction to Instrumentation and Measurements", CRC Press, 3rd Edition, 2014.

Dr.D.SENTHIL KUMAR, M.E.,Ph.D
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5

U23ME305	KINEMATICS OF MACHINES	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1:	Apply Kutzbach and Gruebler's criterion, Grashoff's law to solve problems in various mechanisms.
CO2:	Determine the displacement, velocity, and acceleration in simple mechanisms.
CO3:	Construct displacement diagrams and cam profile for radial cam.
CO4:	Design the simple, compound and epicyclic gear trains.
CO5:	Synthesize four-bar and slider Crank mechanisms and analyze the characteristics of robot arm kinematics.

Pre-requisite: Engineering Mechanics

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2									3	
CO2	3	3	2	2									3	
CO3	3	3	3										3	
CO4	3	3	3										3	
CO5	3	3	3	3									3	

Course Assessment methods

Direct		Indirect
CIE test I (8) CIE test II (8) CIE test III (8) Assignment/seminar/Quiz (5)	Objectives Test (6) Attendance (5) Total CIE: 40 marks Semester End Examination: 60 marks	Course end survey

Unit 01: BASICS OF MECHANISMS — **9 Hours**

Basic concepts of Link, Kinematic pair, Kinematic chain, Mechanism, Machine, Degree of Freedom, Kutzbach and Grubler's criterion and Grashoff's law- Degree of freedom - Kinematic Inversions of four bar chain and slider crank chain - Mechanical Advantage - Transmission angle. Description of common Mechanisms – Single, Double and Offset slider mechanism. Straight line Mechanisms (Exact & Approximate Straight line).

Unit 02: KINEMATICS OF LINKAGE MECHANISMS	9 Hours
Analysis of simple mechanisms (single slider crank mechanism, four bar mechanism) - Graphical methods for displacement, velocity and acceleration polygons; Coincident points – Coriolis acceleration. Velocity analysis using instantaneous centres of simple mechanisms (Single slider crank mechanism and four bar mechanism).	
Unit 03: KINEMATICS OF CAM MECHANISMS	**9 Hours**
Classifications of cam and follower – Displacement, Velocity & Acceleration diagram – Follower Motion (Uniform Velocity Motion, Simple Harmonic Motion, Uniform Acceleration and Retardation motion, Cycloidal motions) – Graphical construction of displacement, Velocity & Acceleration diagram and cam profile for a radial cam - Pressure angle and undercutting.	
Unit 04: GEARS AND GEAR TRAINS	**9 Hours**
Classification of gears – Gear tooth terminology –involute tooth profile. Fundamental Law of toothed gearing and involute gearing – Length of the path of contact and contact ratio - Interference and undercutting – Nonstandard gear teeth – helical, bevel, worm, rack and pinion gears (basics only). Gear trains – Simple, compound and Epicyclic gear trains.	
Unit 05: SYNTHESIS OF MECHANISMS AND ROBOT ARM KINEMATICS	**9 Hours**
Classification of synthesis – type, dimension, number, Synthesis of four bar mechanism and Slider crank Mechanism -Chebyshev and Freudenstein's method. Robot Arm kinematics – Denavit - Hartenberg Parameters - Forward and inverse kinematics of a two dimensional 2 degree of freedom manipulators (type RR).	

Theory: 45 Hrs	Tutorial: 0	Practical: 0	Project:0	Total Hours: 45 Hrs

TEXT BOOKS

1. K.S. Fu, R.C Gonzalez,"Robotics control, sensing, Vision, and Intelligence", Tata McGraw-Hill, 2016, ISBN-13: 978-0-07-026510-3
2. Robert L. Norton,"Kinematics and Dynamics of Machinery", Tata McGraw-Hill, 2010. ISBN: 9789351340201

REFERENCES

1. S.S.Rattan, "Theory of Machines & Mechanisms", Tata McGraw hill publishers, 4th Edition, 2019, ISBN-13: 9789353166335, 9353166330.
2. Uicker J.J.,Pennock G.R., Shigley J.E., "Theory of Machines and Mechanisms" (Indian Edition), Oxford University Press, 2017, ISBN : 9780190264482, 0190264489.
3. Sadhu Singh, "Theory of Machines", Pearson Education, New Delhi, 3rd Edition, 2012, ISBN : 978-8131760697.
4. Thomas Bevan, "Theory of Machines", CBS Publishers and Distributors, 3rd Edition, 2010, ISBN-13: 978-8131729656.
5. Ghosh A and A.K.Mallick, "Theory of Mechanisms and Machines", Affiliated East- West Pvt. Ltd., New Delhi, 2008, ISBN-13: 978-8185938936.
6. Rao J.S and Dukkipati R.V, "Mechanism and Machine Theory", Wiley-Eastern Ltd., New Delhi, 2nd Edition, 2007, ISBN-13: 978-8122404265.
7. Khurmi, R.S./"Theory of Machines", 14th Edition, S Chand Publications, 2007.

8.	Ambekar A. G., Mechanism and Machine Theory, Prentice Hall of India, NewDelhi, 2007, ISBN:9788120331341
9.	John Hannah and Stephens R.C, "Mechanics of Machines", Viva Books Private Limited, 4th Edition, 2005, ISBN:9788176496797, 8176496790.

Dr.D.SENTHIL KUMAR, M.E.,Ph.D
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5

noc24_mg72 **DESIGN THINKING - A PRIMER** 1 0 0 0 1

ABOUT THE COURSE:

Design thinking is a systematic method of solving problems. This method is unique that it starts and ends with humans. The design thinkers start by observing, interviewing or just plain experiencing a situation. Then, they proceed to improve the situation of the humans by solving problems for them.

COURSE LAYOUT

Week 1: Introduction to Design Thinking

Week 2: Empathize Phase: Customer Journey Mapping

Week 3: Analyze Phase: 5-Whys and How might we...

Week 4: Solve Phase: Ideation: Free Brainstorming & Make/Test Phase: Prototype

TOTAL: 15 HOURS

TEXTBOOK

1. Karmic Design Thinking by Prof. Bala Ramadurai, available at Amazon (paperback), Amazon (e-book), Flipkart, Pothi, bookspace.in.

REFERENCE BOOKS

1. Design: Creation of Artifacts in Society by Prof. Karl Ulrich, U. Penn.
2. Change by Design by Tim Brown.

J. Alland

Dr. J. AKILANDESWARI
PROFESSOR & HEAD
Department of Information Technology
SONA COLLEGE OF TECHNOLOGY
SALEM - 636 005

U23GE302	ENVIRONMENT AND CLIMATE SCIENCE	L	T	P	J	C
		2	0	0	0	0

Course Outcomes

At the end of the course, the student will be able to

CO1:	Describe the importance of the acute need for environmental awareness and discuss significant aspects of natural resources like forests, water and food resources.
CO2:	Illustrate the concepts of an ecosystem and provide an overview of biodiversity and its conservation.
CO3:	Analyze the causes, effects of various environmental pollution and their remedial measures.
CO4:	Provide solutions to combat environmental issues like global warming, acid rain, ozone Layer depletion.
CO5:	Analyze the effect of climate change in various sectors and their remedial measures.

Pre-requisite:

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2				2	2							-
CO2	2	-												-
CO3	3	2				2	2							2
CO4	3	2				2	2							2
CO5	3	2				2	2							2

Course Assessment methods

Direct		Indirect
CIE test I (30) - Theory CIE test II (30) - Theory CIE test III (40)- Theory	Total CIE: **100 marks** Semester End Examination – **NIL**	Course end survey

Unit 01: INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES	**6 Hours**

Definition, Scope and Importance Forest Resources: - Use and over - exploitation, deforestation, Case Studies; Water Resources: - Use and Over-Utilization of Surface and ground water, Floods, Drought, Food Resources-Effects of Modern Agriculture, Fertilizer- Pesticide Problems-Role of an Individual Conservation of Natural Resources.

Unit 02: ECOSYSTEMS AND BIODIVERSITY	**6 Hours**

Structure and Function of an Ecosystem-Energy Flow in the Ecosystem.-Food Chains, Food Webs and

cological Pyramids.

Introduction to Biodiversity-Value of Biodiversity: Consumptive Use, Productive Use, Social, Ethical, Aesthetic and Option Values-India as a Mega-Diversity Nation-Threats to Biodiversity: Habitat Loss, Poaching of Wildlife, Man-Wildlife Conflicts – Endangered and Endemic Species of India-Conservation of Biodiversity: In-Situ and Ex-Situ conservation of Biodiversity.

Unit 03: ENVIRONMENTAL POLLUTION	**6 Hours**

Definition – Causes, Effects and Control Measures of: - (A) Air Pollution (B) Water Pollution (C) Soil Pollution (D) Marine Pollution (E) Noise Pollution (F) Thermal Pollution, Solid Waste Management- Effects and Control Measures of Acid Rain – Role of an Individual in Prevention of Pollution.

Unit 04: FUNDAMENTALS OF CLIMATE CHANGE	**6 Hours**

Sustainable Development-Climate Change- Causes and effects of Global Warming-Effect of global warming in food supply, plants, sea, coral reef, forest, agriculture, economy-Kyoto Protocol in reduction of greenhouse gases-Ozone Layer Depletion-mechanism, effects and control measures- Montreal Protocol to prot ozone layer depletion-Rainwater Harvesting-Effect of climate change due to air pollution Case study - CNG vehicles in Delhi.

Unit 05: EFFECT OF CLIMATE CHANGE	**6 Hours**

Fungal diseases in forests and agricultural crops due to climatic fluctuations - Growing energy needs - effect of climate change due to non-renewable energy resources. Renewable energy resources in the prevention of climatic changes- Effect of climatic changes in ground water table, garments, monuments, buildings, consumption of energy, agriculture and in electric power sector - Carbon credit - carbon footprint - disaster management -Role of an individual to reduce climate change.

Theory: 30	**Tutorial: --**	**Practical: --**	**Project:--**	**Total Hours: 30 Hrs**

TEXT BOOKS

1.	Miller, T.G. Jr., "Environmental Science", Wadsworth Pub. Co. 2018.
2.	Anubha Kaushik and Kaushik, "Environmental Science and Engineering" New Age International Publication, 4th Multicolour Edition, New Delhi, 2014.

REFERENCES

1.	S. Radjarejesri et al., "Environmental Science" Sonaversity, Sona College of Technology, Salem, 2018.
2.	Masters, G.M., "Introduction to Environmental Engineering and Science", Pearson Education Pvt., Ltd., 2nd Edition, 2004.
3.	Erach, B., "The Biodiversity of India", Mapin Publishihg P.Ltd.,Ahmedabad, India.
4.	Erach Bharucha, "Textbook of Environmental Studies for Undergraduate Courses", 2005, University Grands Commission, Universities Press India Private Limited, Hyderguda, Hyderabad – 500029.

Dr. C. SHANTHI, M.Sc.,M.E.,Ph.D.,
Professor of Physics
Head, Department of Sciences
Sona College of Technology (Autonomous)
SALEM-636 005.

Dr. M.RENUGA,
Professor & Head,
Department of Humanities & Languages,
Sona College of Technology
SALEM - 636 0[illegible]

U23GE301	SOFT SKILLS AND APTITUDE - I	L	T	P	J	C
		0	0	2	0	1

Course Outcomes

At the end of the course, the student will be able to

CO1:	Demonstrate capabilities in specific soft-skill areas using hands-on and/or case-study approaches
CO2:	Solve problems of greater intricacy than those in BA-I and II in stated areas of quantitative aptitude and logical reasoning
CO3:	Demonstrate higher than BA-I and II levels of verbal aptitude skills in English regarding specific topics.

Pre-requisite: Basic Aptitude I & II

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	1	1	2	2	3	3	3	1	3	1	1
CO2	3	3	3	2	2	2	1	3	3	2	1	3	2	2
CO3	1	1	1	1	1	1	1	3	3	3	1	3	1	1

Course Assessment methods

Direct		Indirect
CIE test I (15) Quiz - I (5) CIE test II (15) Quiz – II (5)	RTPS (10) Record (10) Total CIE marks : **60 marks** Semester End Examination : **40 marks**	Course end survey

1.Soft Skills	**Demonstrating soft-skill capabilities with reference to the following topics**: a. Attitude building b. Self-awareness and self -acceptance c. Dealing with criticism d. Innovation and creativity e. Problem solving and decision making f. Public speaking g. Group discussions.

2. Quantitative Aptitude and Logical Reasoning		**Solving problems with reference to the following topics:** a. Vedic Mathematics b. Simplification c. Number Properties d. Averages e. Percentage f. Profit Loss and Discount g. Ratio & Mixtures h. Equation i. Problem on Ages j. Data interpretation		
3. Verbal Aptitude		**Demonstrating English language skills with reference to the following topics:** a. Verbal analogy b. Tenses c. Prepositions d. Reading comprehension e. Choosing correct / incorrect sentences f. Describing pictures		
Theory : ---	**Tutorial : ----**	**Practical : 30hrs**	**Project : ---**	**Total hours : 30hrs**

10/7/2024

Dr.S.Anita
Professor & Head
Department of Training

Dr. S. ANITA
Professor and Head
Department of Training,
SONA COLLEGE OF TECHNOLOGY,
SALEM-636 005.

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester IV under Regulations 2023 (CBCS)
Branch: Mechanical Engineering

S.No	Course Code	Course Title	L	T	P	J	C	Category	Total Contact Hours	Course Type*
Theory courses										
1.	U23ME401	Thermal Engineering	3	0	0	0	3	PC	45	T
2.	U23ME402	Strength of Materials	3	0	0	0	3	PC	45	T
3.	U23ME403	Engineering Materials and Metallurgy	3	0	0	0	3	PC	45	T
4.	U23ME404	Machine Learning	3	0	0	0	3	ES	45	T
5.	U23ME405	Dynamics of Machinery	3	0	2	0	4	PC	75	TL
6.	U23ME406	Metrology, Inspection and Quality Control	3	0	2	0	4	ES	75	TL
7.	U23GE402	**Audit Course**: Essence of Indian Traditional Knowledge	2	0	0	0	0	AC	30	T
Practical courses										
8.	U23ME407	Thermal Engineering Laboratory	0	0	3	0	1.5	PC	45	L
9.	U23ME408	Strength of Materials Laboratory	0	0	3	0	1.5	PC	45	L
10.	U23ME409	Machine Learning Laboratory	0	0	2	0	1	ES	30	L
11.	U23GE401	Soft Skills and Aptitude-II	0	0	2	0	1	EEC	30	L
Total Credits							25			

*T- Theory, TT- Theory with Tutorial, TL- Theory with Laboratory, TP- Theory with Project, TLP- Theory with Laboratory and Project, L-Laboratory, LT- Laboratory with Theory, LP- Laboratory with Project, P-Project

Approved By

Chairperson, Mechanical Engineering BoS	Member Secretary, Academic Council	Dean-Academics	Chairperson, Academic Council & Principal
Dr.D.Senthilkumar	Dr.R.Shivakumar	Dr.J.Akilandeswari	Dr.S.R.R.Senthil Kumar

Copy to:-

HOD/ Mechanical Engineering, Fourth Semester B.E. Mechanical Students and Staff, COE

Prof. Dr. S. R. R. SENTHILKUMAR,
M.E.(Struct), Ph.D., MISTE,FIE, C. ENG(I), MICI,
PRINCIPAL,
SONA COLLEGE OF TECHNOLOGY,
JUNCTION MAIN ROAD, SALEM-636 005.

U23ME401	THERMAL ENGINEERING	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1:	Analyse the air standard efficiency and mean effective pressure of the various gas power cycles.
CO2:	Demonstrate the working of Internal Combustion engines and test the performance of Internal Combustion engines under different load conditions.
CO3:	Estimate steam flow rate through nozzle and analyze steam power cycle.
CO4:	Determine various performance characteristics of air compressors.
CO5:	Determine the COP of vapour compression refrigeration systems and solve cooling load estimation problems with python programming.

Pre-requisite: Engineering Thermodynamics

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO 2
CO1	3	3	2	2			2					1	2	
CO2	3	2	2	2		2	2	1				1	2	
CO3	3	3	3	3			2					1	2	
CO4	3	2	2	2			2					1	1	
CO5	3	3	3	2	3		2			2		2	3	

Course Assessment methods

Direct		Indirect
CIE test I (9) CIE test II (9) CIE test III (10) Objectives Test (7)	Assignment/seminar/Quiz (5) Total CIE: **40 marks** Semester End Examination: **60 marks**	Course end survey

Unit 01: GAS POWER CYCLES — 9 Hours

Otto, Diesel, Dual, Stirling, Brayton cycles. Actual and theoretical P-V diagram, Calculation of air standard efficiency and mean effective pressure, comparison of Otto, diesel and dual cycles.

Unit 02: INTERNAL COMBUSTION ENGINES — 9 Hours

Classification of I.C engines, four stroke and two stroke cycle engines, combustion phenomenon and

knocking in SI and CI engine, Valve and port timing diagrams – Super-charging and Turbo charging- Ignition system and fuel injection system. Introduction to Direct injection (DI) engine, HCCI engine, CRDI engine. Cooling and lubrication system. Engine tests - performance, heat balance, and retardation - Morse test.

Unit 03: NOZZLES AND STEAM POWER CYCLES	**9 Hours**

Steam nozzles- flow through steam nozzles, effect of friction, critical pressure ratio and super saturated flow. Introduction to steam turbines – Compounding of steam turbines (theory only). Steam power cycle- Rankine, Reheat and regeneration cycle.

Unit 04: AIR COMPRESSORS	**9 Hours**

Classifications of compressors - Reciprocating air compressor - performance characteristics, effect of clearance volume, free air delivery and displacement, Multistage Compressor - intercooler – Description of Rotary compressor, vane, centrifugal and axial compressors.

Unit 05: REFRIGERATION AND AIR CONDITIONING	**9 Hours**

Fundamentals of refrigeration – COP - properties of refrigerants, Vapour compression refrigeration system - cycle, p-h chart, Vapour absorption system- comparison, Fundamentals of air conditioning system, types and working principles. Python programming for solving cooling load estimation in air conditioning design (simple problems).

Theory: 45 Hrs	**Tutorial: -**	**Practical: -**	**Project:-**	**Total Hours: 45 Hrs**

TEXT BOOKS

1. R.K.Rajput, "Thermal Engineering" , Laxmi Publications, New Delhi, Eleventh edition, 2020.
2. Kothandaraman C.P, Domkundwar and A.V. Domkundwar, "A course in Thermal Engineering", Dhanpat Rai & Sons, Sixth Edition, 2016.
3. Ashok Namdev Kamthane, Amit Ashok Kamthane, "Programming and Problem Solving with Python", Mc-Graw Hill Education, 2018.

REFERENCES

1. Sarkar B.K., "Thermal Engineering", Tata McGraw-Hill, New Delhi, 2022
2. Arora C.P., "Refrigeration and Air conditioning", Tata McGraw-Hill, New Delhi, 2017.
3. Holman J.P. "Thermodynamics", McGraw-Hill, 1987.
4. V.Ganesan, "Internal Combustion Engines", Tata McGraw-Hill, New Delhi, 2012.
5. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach", Pearson India Education Services Pvt. Ltd., 2016.

Dr.D.SENTHIL KUMAR, M.E.,Ph.D
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5

U23ME402	STRENGTH OF MATERIALS	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1:	Analyze axial deformation, stresses, and strains in materials under axial loads (tension, compression).
CO2:	Evaluate the material's response to complex loading conditions using theories of failure and material strength.
CO3:	Calculate shear and bending stresses in structural members subjected to shear forces and bending moments.
CO4:	Apply the concepts of torsion, axial twist in shafts and Analyze the buckling load for columns, stability under various boundary conditions.
CO5:	Determine the deflections and deformations of beams under different loading conditions.

Pre-requisite: Engineering Mechanics, Statics, Dynamics

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3										3	3	
CO2	3	3	3		3					3		3	3	3
CO3	3	3	3		3					3		3	3	
CO4	3	3	3	3	3					3	3	3	3	3
CO5	3	3	3	3	3		3			3	3	3	3	3

Course Assessment methods

Direct		Indirect
CIE test I (9) CIE test II (9) CIE test III (10) Objectives Test (7)	Assignment/seminar/Quiz (5) Total CIE: 40 marks Semester End Examination: 60 marks	Course end survey

Unit 01: Introduction to Strength of Materials — 9 Hours

Stress and Strain: Concepts of stress and strain, types of stress and strain, Hooke's Law, Poisson's ratio, volumetric strain & Thermal strain

Axial Force: Deformation of bars under axial loads, axial deformation of materials.

Stress-Strain Relationship: Stress-strain curves for ductile and brittle materials, Young's Modulus, Yield Stress,

Ultimate Stress & Proof stress, allowable stress and its significance.				
Unit 02: **Complex Loading**				**9 Hours**
Combined Stresses: Stresses due to combined axial, bending, and torsional loads **Principal Stresses**: Mohr's Circle of Stress, principal planes and maximum shear stress, Relationship between Elastic constants, Factor of Safety.				
Unit 03: **Shear and Bending Stresses**				**9 Hours**
Shear Stress: Shear force and shear stress distribution across a beam section. **Bending Stress**: Derivation of bending equation, neutral axis, moment-curvature relationship, stresses in simple bending. **Shear Force and Bending Moment Diagrams**: Drawing shear force and bending moment diagrams for cantilever, simply supported and overhanging beams.				
Unit 04: **Torsion of Shafts, Columns and Buckling**				**9 Hours**
Torsional Deformation: Torsion in circular shafts, derivation of the torsion equation, angle of twist, shear stresses due to torsion. **Solid and Hollow Shafts**: Power transmission, applications of torsion in mechanical design **Buckling of Columns**: Types of buckling, critical load, Euler's theory of buckling for columns with different boundary conditions.				
Unit 05: **Deflection of Beams**				**9 Hours**
Deflection due to Bending: Equation for bending deflection, integration method, Macaulay's method. **Deflection due to Shear**: Differential equation for shear deflection. **Methods for Deflection Analysis**: Superposition principle, Moment-area method, Conjugate Beam method.				
Theory: 45 Hrs	**Tutorial: - 0**	**Practical: - 0**	**Project:- 0**	**Total Hours: 45 Hrs**

TEXT BOOKS

1.	S. Timoshenko, Strength of Materials, CBS Publishers, 3rd Edition (2019)
2.	J. M. Gere, Mechanics of Materials, Cengage Learning, 9th Edition (2018)
3.	R.K. Bansal, Strength of Materials, Laxmi Publications, 6th Edition (2020)

REFERENCES

1.	R. C. Hibbeler, Mechanics of Materials, Pearson Education, 11th Edition (2019)
2.	F.P. Beer, E.R. Johnston, Mechanics of Materials, McGraw-Hill Education, 8th Edition (2021)

Dr.D.SENTHIL KUMAR, ME PhD
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5

U23ME403	ENGINEERING MATERIALS AND METALLURGY	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1:	Analyze the constitution of alloys, solid solutions, and phase diagrams, including various reactions and imperfections in solids.
CO2:	Investigate heat treatment processes such as annealing, hardening, and case hardening and their effects on material properties.
CO3:	Examine the effects of alloying elements on ferrous and non-ferrous metals and evaluate their applications in engineering.
CO4:	Evaluate the properties and applications of non-metallic materials, including polymers, ceramics and composites.
CO5:	Critique the material testing methods to assess mechanical properties and select suitable materials based on engineering requirements.

Pre-requisite: Chemistry for mechanical Engineering, Physics for mechanical Engineering

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2										3	3	
CO2	3	2				3						3	3	3
CO3	3	2	2									3	3	3
CO4	3	2				3						3	3	3
CO5	3	2	2	3								3	3	3

Course Assessment methods

Direct		Indirect
CIE test I (9) CIE test II (9) CIE test III (10) Objectives Test (7)	Assignment/seminar/Quiz (5) Total CIE: **40 marks** Semester End Examination: **60 marks**	Course end survey

Unit 01: CONSTITUTION OF ALLOYS AND PHASE DIAGRAMS — **9 Hours**

Constitution of alloys - Solid solutions, substitutional and interstitial - phase diagrams, Isomorphous, eutectoid, eutectic, peritectoid, and peritectoid reactions, imperfections in solids: vacancies, interstitials, linear defects, edge and screw dislocations, interfacial defects, equilibrium diagram- Iron - Iron carbon.

Unit 02: HEAT TREATMENT — **9 Hours**

Diffusion-steady-state and non-steady-state, Isothermal transformation diagrams - cooling curves

superimpose on I.T diagram- CCII Full annealing, recrystallization and spheroidising -normalizing, hardening, Jominy end quench test -Austempering, martempering - case hardening - carburizing, nitriding, cyaniding, carbonitriding, flame and induction hardening- Case studies of heat treatment in automobile engines.

Unit 03: FERROUS AND NONFERROUS METALS	9 Hours
Effect of alloying elements on steel (Mn, Si, Cr, Ni, V, Ti & W) - stainless and tool steels- HSLA - maraging steels — Cast Irons - Grey, White, malleable, spheroidal graphite, alloy cast irons, Copper and Copper alloys - Brass, Bronze and Cupronickel – Aluminum, Al alloys and its applications in automobile industry- Bearing alloys. Joining of Dissimilar metals.	

Unit 04: NON-METALLIC MATERIALS	9 Hours
Polymers - types of polymers, commodity and engineering polymers - Properties and applications of PE, PP, PS, PVC, PMMA, PET, PC, PA, ABS, PI, PAI, PPO, PPS, PEEK, PTFE, , Polymer Composites - Fiber reinforced polymer (FRP), Carbon reinforcement fiber polymer (CRFP)- Case studies- Ceramics, Cermets.	

Unit 05: TESTING AND THE METHODOLOGY OF MATERIAL SELECTION	9 Hours
Mechanism of plastic deformation, slip and twinning, Types of fracture, Corrosion and Degradation of materials -Testing of materials under tension, compression and shear loads, Hardness tests (Brinell, Vickers and Rockwell), Impact test - Izod and Charpy, Fatigue and creep tests. Surface treatment, characterization, and selection of Materials: part and material requirements- material system- list candidate materials- properties of requirements-select best match and specify it- case studies on surface treatment in different industries.	

Theory: 45 Hrs	Tutorial: -	Practical: -	Project:-	Total Hours: 45 Hrs

TEXTBOOKS

1. "Materials Science and Engineering: An Introduction" by William D. Callister and David G. Rethwisch, Wiley Publication, 10th Edition (2020).
2. "Engineering Materials and Metallurgy" by R.K. Rajput, S. Chand Publishing, 4th Edition (2020).
3. "Material Science and Metallurgy" by O.P. Khanna, Dhanpat Rai Publications, Edition (2021).
4. "Mechanical Metallurgy" by George E. Dieter, McGraw-Hill Education Publication, 3rd Edition (2017).
5. "Physical Metallurgy" by V. Raghavan, PHI Learning Publications, 3rd Edition (2021).

REFERENCES

1. "Engineering Materials: Properties and Applications of Metals and Alloys" by Kenneth G. Budinski and Michael K. Budinski, Pearson Publication, 9th Edition 2009.
2. "Elements of Materials Science and Engineering" by Lawrence H. Van Vlack, Pearson Education India publication; 6th edition 2002, ISBN: 8131706001.
3. "The Science and Engineering of Materials" by Donald R. Askeland and Wendelin J. Wright, Cl-Engineering publication; 6th edition 2010, ISBN: 978-0495296027.
4. "Introduction to Physical Metallurgy" by Sidney H. Avner, McGraw Hill Education publication; 2nd edition 2017, ISBN: 978-0074630068.
5. "Innovations in Everyday Engineering Materials" by T. DebRoy and H.K.D.H. Bhadeshia Published by Springer International Publishing, 2021 edition.

Dr.D.SENTHIL KUMAR, M.E.,Ph.D
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5

U23ME404	MACHINE LEARNING	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1:	Cognize the basic concepts and techniques of Machine Learning.
CO2:	Analyze data based on analytics, metrics and visualize it for developing machine learning algorithms.
CO3:	Apply regression algorithms and compute the metrics.
CO4:	Understand and apply classification algorithms and compute its metrics.
CO5:	Apply clustering algorithms and perform cross validation.

Pre-requisite: NIL.

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2												
CO2	3	3	3	2	3					3		2		3
CO3	3	3	3	3	3							2	3	3
CO4	3	3	3	3	3							2	3	3
CO5	3	3	3	3	3							2	3	3

Course Assessment methods

Direct		Indirect
CIE test I (9) CIE test II (9) CIE test III (10) Objectives Test (7)	Assignment/seminar/Quiz (5) **Total CIE: 40 marks** Semester End Examination: **60 marks**	Course end survey

Unit 01: INTRODUCTION — **9 Hours**

History of Artificial Intelligence – overview of machine learning – Linear algebra – scalars, vectors and tensors –Matrix operations – special matrices –Matrix decomposition – labeled data – un- labeled data – supervised learning – unsupervised learning – semi-supervised learning – reinforced learning – data & its types – Artificial Intelligence and deep learning in Engineering applications.

Unit 02: DATA ANALYTICS & VISUALIZATION	9 Hours
Introduction to Data Analytics - Descriptive Analytics, Diagnostic Analytics, Predictive Analytics and Prescriptive Analytics. Data exploration (histograms, bar chart, box plot, line graph, scatter plot) - Qualitative and Quantitative Data - Measure of Central Tendency (Mean, Median and Mode) - Measure of Positions (Quartiles, Deciles, Percentiles and Quantiles) - Measure of Dispersion (Range, Median, Absolute deviation about median, Variance and Standard deviation) - Measure of Distribution (Skewness and Kurtosis), Box and Whisker Plot.	
Unit 03: MACHINE LEARNING ALGORITHMS – I	**9 Hours**
Regression – Linear regression – Polynomial regression - regression metrics – computation of Mean Absolute Error (MAE), Mean Squared Error (MSE), Root Mean Squared Error (RMSE), R^2 (R-Squared) & Adjusted R^2 - goodness of fit – bias-variance tradeoff – Applications in new product design & optimization.	
Unit 04: MACHINE LEARNING ALGORITHMS – II	**9 Hours**
Classification – Logistic regression - k nearest neighbor (kNN) algorithm – Support vector machine - Naïve Bayes Classifier – Decision trees (entropy calculation, root node selection & construction of tree) - Classification metrics – Accuracy, Precision and Recall, F1-score & AU-ROC - Confusion Matrix – Application - Predictive Maintenance with Machine Learning	
Unit 05: MACHINE LEARNING ALGORITHMS – III	**9 Hours**
Clustering – Hierarchical – divisive, agglomerative, dendrograms, K-means – identification of centroids and location near centroids – Density based spatial clustering of applications with noise (DBSCAN) – Apriori Algorithm Cross-Validation in Machine Learning- K-Fold Cross-Validation – Applications in CAE simulation.	

Theory: 45 Hrs	Tutorial: -	Practical: -	Project:-	Total Hours: 45 Hrs

TEXT BOOKS

1. Alpaydin, E., 2020. Introduction to machine learning. MIT press.
2. Rogel-Salazar, J., 2020. Advanced data science and analytics with Python. Chapman and Hall/CRC.
3. Embarak, D.O., Embarak and Karkal, 2018. Data analysis and visualization using python. Berkeley, CA, USA: Apress.

REFERENCES

1. Witten, Ian H., et al. Data Mining: Practical machine learning tools and techniques. Morgan Kaufmann, 2016.
2. Xanthidis, D., Wang, H.I. and Manolas, C., 2022. Data Analytics and Data Visualization with Python. In Handbook of Computer Programming with Python (pp. 319-371). Chapman and Hall/CRC.
3. Hackeling, Gavin. Mastering Machine Learning with scikit-learn. Packt Publish.
4. Kelleher, John D., Brian Mac Namee, and Aoife D'arcy. Fundamentals of machine learning for predictive data analytics: algorithms, worked examples, and case studies. MIT press, 2020.
5. Chandra, S.S. and Hareendran, S., 2021. *Machine learning: a practitioner's approach*. PHI Learning Pvt. Ltd..

Dr.D.SENTHIL KUMAR, M.E.,Ph.D
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5

U23ME405	DYNAMICS OF MACHINERY	L	T	P	J	C
		3	0	2	0	4

Course Outcomes

At the end of the course, the student will be able to

CO1:	Analyze and apply static and dynamic force analysis, including turning moment diagrams and flywheel analysis.
CO2:	Apply the principles of static and dynamic balancing to rotating and reciprocating masses, including partial balancing of locomotive engines.
CO3:	Analyze the principles in mechanisms used for governing of machines and gyroscopes.
CO4:	Analyze the concepts in free and for vibrations for single-degree freedom systems.
CO5:	Determine the natural frequencies of transverse and torsional vibrations in mechanical systems.

Pre-requisite: Engineering Mechanics for Mechanical Engineering, Kinematics of Machines

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3						3		2	3	
CO2	3	3	3	3						3		2	3	
CO3	3	3	3	3						3		2	3	
CO4	3	3		3								2	3	
CO5	3	3		3						3		2	3	

Course Assessment Methods- Theory with Laboratory Course

Direct		Indirect
CIE test I (10) - Theory CIE test II (10) - Theory CIE test III (10) - Theory CIE test IV(15) - Laboratory	Assignment / Quiz/ Seminar (5) Total CIE: **50 marks** Semester End Examination: **50 marks** [SEE- Theory (35 marks),Lab (15 marks)]	Course end survey

Unit 01: FORCE ANALYSIS — **T:9 Hours, P: 9 Hours**

Theory:

D Alembert's principle -Applied and constraint forces – Free body diagrams – Static equilibrium conditions – Two, three & four members – Static force analysis of simple mechanisms – Dynamic equivalent system-correction couple – Inertia force and Inertia torque -Dynamic Analysis in reciprocating engines – Bearing loads – Crankshaft torque- Equivalent masses. Turning moment diagrams – Single and multi-cylinder engines &double acting engines – Maximum fluctuation of energy and its determination- Coefficient of

fluctuation of speed – Fly Wheel Analysis.

Practical (Only for practical examination): Kinematics of 4 bar mechanisms – Slider crank and Crank Rocker Mechanism - Determination of velocity and acceleration; Determination of moment of inertia by oscillating method for connecting rod and Flywheel.

Unit 02: BALANCING	**T: 9 Hours** **P: 3 Hours**

Static and dynamic balancing of rotating masses – Balancing of reciprocating masses Balancing of locomotives - Balancing of Multi-cylinder engines – Partial balancing of locomotive engines.

Practical (Only for practical examination): Balancing of rotating masses – Determination of Magnitude and Direction of unbalanced forces.

Unit 03: MECHANISM FOR CONTROL	**T: 9 Hours** **P: 9 Hours**

Theory:

Necessity of governor- Types of governors- Working principle of centrifugal governors- Gravity-controlled and spring-controlled governors - Effect of friction – Hunting and Isochronism-calculation of equilibrium speed and ranges of speed of governors-controlling force diagram for spring-controlled governors.

Gyroscopic couple – Gyroscopic effects on the movement of aeroplanes and ships – Stability of two-wheel drive and four-wheel drive – Gyroscope stabilization.

Practical (Only for practical examination): Governors - Determination of sensitivity, effort, etc. for Watt, Porter, Proell, and spring-controlled Governors; Motorized Gyroscope-Verification of laws -Determination of gyroscopic couple.

Unit 04: LONGITUDINAL VIBRATIONS	**T: 9 Hours**

Introduction to vibration – Terminology – Classification of vibrations – Undamped and Dampedfree vibration of single degree of freedom systems-springs in series springs in parallel and combinations-Viscous damping-types of damped system. Forced vibration of single degree of freedom system- harmonic excitation- Logarithmic decrement- magnification factor, vibration isolation and transmissibility.

Unit 05: TRANSVERSE AND TORSIONAL VIBRATIONS	**T: 9 Hours** **P: 9 Hours**

Theory:

Transverse vibrations of shafts and beams-natural frequency- Rayleigh's method - Dunkerley's method-whirling of shafts. Torsional vibrations -equivalent shafts- natural frequencies- single rotor, two rotor and three rotor systems.

Practical (Only for practical examination): Whirling of shaft- Determination of critical speed of shaft with concentrated loads; Transverse vibration – free beam. Determination of natural frequency and deflection of the beam.

Theory: 45 Hrs	**Tutorial:**	**Practical: 30 Hrs**	**Project:**	**Total Hours: 75 Hrs**

TEXT BOOKS

1.	Rattan .S.S, "Theory of Machines", Fifth Edition, Tata McGraw-Hill Publishing Company Ltd, 2019.
2.	Sadhu Singh "Theory of Machines", Pearson Education, 3rd edition, 2019.

REFERENCES	
1.	Shigley J.E. and Uicker J.J., "Theory of Machines and Mechanisms", 4th edition, oxford university press, 2018.
2.	Rao J.S and Dukkipati R.V, "Mechanism and Machine Theory", New Age International, New Delhi, 2018.
3.	Thomas Bevan, "Theory of Machines" CBS Publishers and Distributers, 3rd edition, 2018.
4.	P.L.Ballaney, "Theory of Machines", Khanna publishers, 23rd Edition, 2003, ISBN 817409122X, 9788174091222.
5.	Dr.V.P.Singh, Mechanical Vibrations, PHI, 2018.
LIST OF EQUIPMENT'S	
1.	Four bar Mechanism
2.	Slider Crank Mechanism
3.	Compound Pendulum
4.	Universal Governor
5.	Motorized Gyroscope
6.	Whirling of shafts
7.	Transverse Vibration Apparatus
8.	Balancing of Rotating masses Apparatus

Dr. D. SENTHIL KUMAR, M.E.,Ph.D
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5

U23ME406	METROLOGY, INSPECTION AND QUALITY CONTROL	L	T	P	J	C
		3	0	2	0	4

Course Outcomes

At the end of the course, the student will be able to

CO1:	Apply fundamental principles of metrology to demonstrate linear measuring instruments, comparators.
CO2:	Analyze various angular measuring instruments to perform precise angular and surface measurements.
CO3:	Analyze the principles and applications of various metrology techniques, including laser interferometry, autocollimation, and CMM, to critically evaluate the accuracy and precision
CO4:	Apply statistical quality control methods (control charts, process capability studies) to analyze and improve manufacturing processes.
CO5:	Determine the most suitable NDT technique for inspecting a given component by evaluating the component's characteristics.

Pre-requisite: Manufacturing Process

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2			2								2	
CO2	2	2		2	1								2	2
CO3	2			2	2								2	2
CO4	3	3	3			2		1					2	1
CO5	3			3					2	2				2

Course Assessment methods- Theory with Laboratory Course

Direct		Indirect
CIE test I (10) - Theory CIE test II (10) - Theory CIE test III (10) - Theory CIE test IV(15) - Laboratory	Assignment / Quiz/ Seminar (5) Total CIE: **50 marks** Semester End Examination: **50 marks** [SEE- Theory (35 marks),Lab (15 marks)]	Course end survey

Unit 01: BASICS OF METROLOGY AND LINEAR MEASUREMENTS	**T:9 Hours P: 10 hours**

Introduction to Metrology- Precision and accuracy. Limits, fits, and tolerances, GO and NO GO gauges-design Taylor's principle, Feeler gauges, plug gauges, and snap gauges. Linear Measuring Instruments –

Vernier caliper, Micrometer, Vernier height gauge, Depth Micrometer; Slip gauges. Comparators: Dial Indicator, Johnsson Mikrokator, Sigma Comparator, Mechanical - Optical comparator, Electronic Comparators, Pneumatic Comparators.

Practical (Only for practical examination): Exercises on Calibration of linear measuring instruments – Vernier caliper, micrometer, Vernier height gauge, and vernier Depth gauge. Calibration of Dial gauge, Checking the limits of dimensional tolerances using Pneumatic comparators.

Unit 02: ANGULAR AND SURFACE MEASUREMENTS	**T: 9 Hours** **P: 12 Hours**

Theory: Angular measuring instruments – Protractors, Universal Bevel Protractors, Sine bar, Sine Center, Measurement of Inclines, Spirit Level, and Clinometer. Two-wire and three-wire methods, floating carriage micrometer. Gear Measurement - Gear tooth comparator, and Parkinson's Tester. Surface Texture Measurement - importance of surface conditions, roughness and waviness, surface roughness standards specifying surface roughness parameters- Ra, Ry, Rz, RMS value.

Practical (Only for practical examination): Measurement of Taper Angle using sine bar/bevel protractor, , Measurement of thread parameters using Floating carriage micrometer. Surface roughness tester.

Unit 03: ADVANCES IN METROLOGY	**T: 9 Hours** **P: 8 Hours**

Lasers in metrology - Laser interferometers – Tool Maker's microscope, profile projector. Principles and Methods of Straightness and Flatness Measurement - Autocollimators. Coordinate measuring machine (CMM). Importance of nanometrology- Transmission Electron Microscopy, scanning electron microscope, scanning tunneling microscope, Energy-dispersive X-ray spectroscopy, and X-ray powder diffraction (XRD).

Practical (Only for practical examination): Measurement of cutting tool parameters using tool maker's microscope and profile projector, Measurement of straightness and flatness using autocollimator.

Unit 04: QUALITY CONTROL	**T:9 Hours**

Introduction, definition, and concept of quality & quality control, statistical methods – Quality Tools – Histogram, Check sheets, Ishikawa diagrams, Pareto, Scatter diagrams, control charts for non-confirming – p chart, np chart, C and U charts, control charts for variables- X chart and R chart with process capability studies.

Unit 05: QUALITY INSPECTION	**T: 9 Hours**

Introduction to Nondestructive quality inspection – Principles, equipment, procedures, limitations, and applications of: Visual inspection – Magnifying Mirror, Fiber optic borescope – Liquid Penetrant Testing- Magnetic Particle Testing – Ultrasonic Testing – Eddy current Testing. Applications in inspection of castings, forgings, Extruded steel parts, bars, pipes, and rails.

Theory: 45 Hrs	**Tutorial:**	**Practical: 30 Hrs**	**Project:**	**Total Hours: 75 Hrs**

TEXT BOOKS	
1.	Gupta, I.C., A Textbook of Engineering Metrology, Dhanpat Rai Publications, 2019.
2.	J. Prasad, C G K Nair, "Non Destructive Testing and Evaluation of Materials", Tata McGraw Hill Education Private Limited, 2011.
3.	Imalka Munaweera, M.L. Chamalki Madhusha, "Characterization Techniques for Nanomaterials", CRC Press, 2023.
4.	Douglas C. Montgomery, Introduction to Statistical Quality Control, John Wiley & Sons, 2020.
REFERENCES	
1.	Doeblin E.O., Measurement Systems, Mc Graw-Hill, 2017.
2.	Jain. R. K , Engineering Metrology, Khanna Publishers, 2022.
3.	Grant, E.L., Statistical Quality Control, McGraw-Hill, 2017
4.	Raghavendra N.V. and Krishnamurthy, L., Engineering Metrology and Measurements, Oxford University Press, 2013
LIST OF EQUIPMENT'S	
1.	Vernier Caliper, Vernier Height Gauge, Vernier Depth Gauge
2.	Micrometer and Dial Gauge
3.	Sine Bar and Slip Gauge Set
4.	Bevel Protractor
5.	Tool Makers Microscope
6.	Autocollimator
7.	Profile Projector
8.	Floating Carriage Micrometer
9.	Mechanical and Pneumatic Comparator
10.	Surface Roughness Tester

Dr. D. SENTHIL KUMAR, M.E.,Ph.D
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5

U23ME407	THERMAL ENGINEERING LABORATORY	L	T	P	J	C
		0	0	3	0	1.5

Course Outcomes

At the end of the course, the student will be able to

CO1:	Analyse the performance of an IC engine in different operational conditions and sketch valve and port-timing diagrams.
CO2:	Evaluate the performance to improve efficiency of air compressor, refrigerator and air conditioning system.
CO3:	Troubleshoot engine performance issues in real-time scenarios to ensure optimal functionality systematically

Pre-requisite: Nil

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1				2			2				2
CO2	3	2	1				2			2				2
CO3	3	2	1				2			2				2

Course Assessment methods

Direct		Indirect
CIE test I (15) Quiz 1 (5) CIE test II (15) Quiz 2 (5)	RTPS (10) Record (10) Total CIE: **60 marks** Semester End Examination: **40 marks**	Course end survey

LIST OF EXPERIMENTS

1. Valve Timing and Port Timing Diagrams.
2. Performance Test on 4-stroke Diesel Engine.
3. Heat Balance Test on 4-stroke Diesel Engine.
4. Retardation Test to find Frictional Power of a Diesel Engine.
5. Determination of Calorific value of Fuel using Bomb Calorimeter.
6. Determination of Viscosity using Red Wood Viscometer.
7. Determination of Flash Point and Fire Point.
8. Performance test on reciprocating air compressor.
9. Determination of COP of a Refrigeration system.
10. Determination of COP of an air conditioning system.
11. Demo on Morse Test on Multi cylinder Petrol Engine.

Total Number of hours: 45

Theory: 0	Tutorial: 0	Practical: 45 Hrs	Project: 0	Total Hours: 45 Hrs

Dr.D.SENTHIL KUMAR, M.E.,Ph.D
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5

U23ME408	STRENGTH OF MATERIALS LABORATORY	L	T	P	J	C
		0	0	3	0	1.5

Course Outcomes

At the end of the course, the student will be able to

CO1:	Analyse the compressive strength, tensile strength and shear strength of various engineering structures.
CO2:	Evaluate the mechanical properties and behaviour of materials under various loads and conditions, including hardness, elasticity, and fatigue.
CO3:	Investigate and characterize the mechanical properties and surface characteristics of materials using various testing and evaluation techniques.

Pre-requisite: Nil

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3					2		2	2			3	2
CO2	3	3					2		2	2			3	2
CO3	3	3					2		2	2			3	2

Course Assessment methods

Direct		Indirect
CIE test I (15) Quiz 1 (5) CIE test II (15) Quiz 2 (5)	RTPS (10) Record (10) Total CIE: **60 marks** Semester End Examination: **40 marks**	Course end survey

LIST OF EXPERIMENTS

1. Tension test on Mild Steel (MS) rod.
2. Compression test - Bricks & Concrete cubes.
3. Double shear test.
4. Deflection test - Cantilever & Simply supported beam.
5. Impact test Charpy & Izod.
6. Hardness test on various materials (Vickers, Rockwell & Brinell).
7. Tests on spring Tension & Compression.
8. Study of Fatigue test of metallic materials.
9. Torsion test of metallic materials.
10. Study of Non-destructive testing (NDT) on materials.
11. Micro hardness test on coated and hardened samples.

List of Equipment's (for a batch of 30 students)

1. Universal testing machine.
2. Compression testing machine.
3. Shear testing machine.
4. Deflection testing machine.
5. Rockwell hardness tester.
6. Brinell hardness tester.
7. Vickers hardness tester.
8. Fatigue testing machine.
9. Impact testing machine.
10. Ultrasonic pulse velocity.
11. Vickers micro hardness tester

Total Number of hours:45

Theory: 0	Tutorial: 0	Practical: 45 Hrs	Project: 0	Total Hours: 45 Hrs

Dr. D. SENTHIL KUMAR, M.E.,Ph.D
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5

U23ME409	MACHINE LEARNING LABORATORY	L	T	P	J	C
		0	0	2	0	1

Course Outcomes

At the end of the course, the student will be able to

CO1:	Apply data analytics and visualization skills using python in-built library functions.
CO2:	Design and evaluate prediction-based machine learning algorithms through python in-built library functions.
CO3:	Design and evaluate classification & clustering-based machine learning algorithms through python in-built library functions.

Pre-requisite: Nil

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3				3	3		3		3
CO2	3	3	3	3	3				3			3		3
CO3	3	3	3	3	3				3			3		3

Course Assessment methods

Direct		Indirect
CIE test I (15) Quiz 1 (5) CIE test II (15) Quiz 2 (5)	RTPS (10) Record (10) Total CIE: **60 marks** Semester End Examination: **40 marks**	Course end survey

LIST OF EXPERIMENTS

1. Compute the mean, median, mode, percentile, quartile, decile, Standard deviation and variance of a given dataset.
2. Construction of scatter plots, line plots, bar plots & histograms for given dataset and summarize the salient conclusions by inference of the constructed plot.
3. Construct a box & whisker plot for a given dataset and summarize the salient conclusions by inference of the constructed plot.
4. Implement Linear regression algorithm for a given dataset and predict the outcome for a new data.
5. Compute the regression metrics (MAE, MSE, RMSE, R^2 & Adjusted R^2) for a given dataset.
6. Implement polynomial regression algorithm for a given dataset and infer the goodness of fit by varying the degree of polynomial.
7. Implement kNN algorithm for a given dataset and predict the outcome for a new data.
8. Compute the classification metrics (Accuracy, Precision and Recall, F1-score & AU-ROC) and develop the Confusion Matrix for a given dataset.
9. Implement k-Means algorithm for a given data set by computing centroids. Also determine the optimal value of 'k'.

(Note: Use of standard in-built library functions in Python tool should be utilized for all the experiments)

Total Number of hours: 30

Theory: 0	Tutorial: 0	Practical: 30 Hrs	Project: 0	Total Hours: 30 Hrs

Dr.D.SENTHIL KUMAR, M.E.,Ph.D
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5

U23GE402	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	L	T	P	J	C
		2	0	0	0	0

	Course Outcomes
	At the end of the course, the student will be able to
CO1:	Analyze the basics of Indian Traditional knowledge in modern scientific perspectives.
CO2:	Explain the basics of Vedic science and its applications in modern days.
CO3:	Discuss the introduction and objectives of modern science.
CO4:	Describe the contribution of Noble laureates for India's achievements in Science and Technology.
CO5:	Analyze the various traditional practices for holistic health care of human beings.
	Pre-requisite:

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2			2	-							2	2
CO2	2	2	2			2	-							2	2
CO3	2	2	2			2	-							2	2
CO4	2	2	2			2	-							2	2
CO5	2	2	2			2	-							2	2

Course Assessment methods

Direct			Indirect
CIE test I (30) - Theory CIE test II (30) - Theory CIE test III (40)- Theory	Total CIE: **100 marks** Semester End Examination – **NIL**		Course end survey

Unit 01: BASIC STRUCTURE OF INDIAN KNOWLEDGE SYSTEM		6 Hours
Indian Traditional Scriptures, Exposure to 4 – Vedas (the Rigveda, the Yajurveda, the Samaveda and the Atharvanaveda), 4 – Upavedas (Ayurveda, Dhanurveda, Gandharvaveda, Sthapatya, etc.), 6 – Vedangas (Shiksha, Kalp, Nirukta, Vyakaran, Jyotish).		

Unit 02: INDIAN KNOWLEDGE SYSTEM AND MODERN SCIENCE		6 Hours
Relevance of Science and Spirituality, Science and Technology in ancient India, Superior intelligence of Indian sages and scientists.		

Unit 03: INDIAN TRADITION AND CULTURE	**6 Hours**
The Indian way of life, Introduction to Indian tradition, The Scientific Outlook and Human Values – Basics of Applied Vedic Science – modern day application of Vedas and procedure – Ancient Indian Scientific thoughts.	
Unit 04: INDIAN ARTISTIC TRADITION	**6 Hours**
Introduction and overview of significant art forms in ancient India such as painting, sculpture, Civil Engineering, Architecture, Music, Dance, Literature, etc.	
Unit 05: YOGA AND HOLISTIC HEALTH CARE	**6 Hours**
Fundamentals of yoga and holistic health – Human biology – Importance and Practice of Yoga, Pranayama and other prevailing health care techniques – Diet and nutrition – Life management – Contemporary yogic models – case study.	

Theory: 30	Tutorial: --	Practical: --	Project:--	Total Hours: 30 Hrs

REFERENCES

1. Sivaramakrishnan, V., Cultural Heritage of India- Course Material, Bharatiya Vidya Bhavan, Mumbai, 5 th Edition, 2014.
2. Capra F., Tao of Physics, Shambhala, 2010
3. Chatterjee S.C. and Datta D.M., An Introduction to Indian Philosophy, University of Calcutta, 1984.
4. RN Jha, Science of Consciousness Psychotherapy and Yoga Practices, Vidyanidhi Prakasham, Delhi, 2016.
5. Raja Ram Mohan Roy, Vedic Physics, Mount Meru Publication ISBN: 9781988207049.
6. Swami Jitatmanand, Modern Physics and Vedant, Bharatiya Vidya Bhavan.

20-12-2024

Dr. C. SHANTHI, M.Sc.,M.E.,Ph.D.,
Professor of Physics
Head, Department of Sciences
Sona College of Technology (Autonomous)
SALEM-636 005.

30/12/24.

Dr. M.RENUGA,
Professor & Head,
Department of Humanities & Languages,
Sona College of Technology,
SALEM - 63

U23GE401	SOFT SKILLS AND APTITUDE – II	L	T	P	J	C
		0	0	2	0	1

Course Outcomes

At the end of the course, the student will be able to

CO1:	Demonstrate capabilities in additional soft-skill areas using hands-on and/or case-study approaches
CO2:	Solve problems of increasing difficulty than those in SSA-I in given areas of quantitative aptitude and logical reasoning and score 65-70% marks in company-specific internal tests
CO3:	Demonstrate greater than SSA-I level of verbal aptitude skills in English regarding the given topics and score 65-70% marks in company-specific internal tests

Pre-requisite: Basic Aptitude I & II

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

CO-PO Mapping	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12
CO-1	1	1	1	1	1	2	2	3	3	3	1	3
CO-2	3	3	3	2	2	2	1	3	3	2	1	3
CO-3	1	1	1	1	1	1	1	3	3	3	1	3

Course Assessment methods

Direct		Indirect
CIE test I (15) Quiz - I (5) CIE test II (15) Quiz – II (5)	RTPS (10) Record (10) Total CIE marks : **60 marks** Semester End Examination : **40 marks**	Course end survey

1. Soft Skills	**Demonstrating soft-skill capabilities with reference to the following topics:** a. SWOT b. Goal setting c. Time management d. Stress management. e. Mindfulness f. Interpersonal skills and Intrapersonal skills g. Presentation skills h. Group discussions
2. Quantitative Aptitude and Logical Reasoning	**Solving problems with reference to the following topics:** a. Logarithm b. Progression

		c. Time & Work d. Simple Interest e. Compound Interest f. Time Speed & Distance g. Plane Geometry h. Mensuration for 2D i. Mensuration for 3D j. Syllogism		
3. Verbal Aptitude		**Demonstrating English language skills with reference to the following topics:** a. Critical reasoning b. Theme detection c. Verbal analogy d. Prepositions e. Articles f. Cloze test g. Company specific aptitude questions		
Theory : —	**Tutorial : —**	**Practical : 30hrs**	**Project : —**	**Total hours : 30hrs**

12/12/2024

Dr.S.Anita
Professor & Head
Department of Training

Dr. S. ANITA
Professor and Head
Department of Training,
SONA COLLEGE OF TECHNOLOGY,
SALEM-636 005.

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester V under Regulations 2023 (CBCS)
Branch: Mechanical Engineering

S.No	Course Code	Course Title	L	T	P	J	C	Category	Total Contact Hours	Course Type*
Theory courses										
1.	U23ME501	Heat and Mass Transfer	3	0	0	0	3	PC	45	T
2.	U23ME502	Design of Machine Elements	3	0	0	0	3	PC	45	T
3.	U23ME503	Computer Aided Design and Analysis	3	0	0	0	3	PC	45	T
4.	U23ME504	Computer Integrated Manufacturing	3	0	0	0	3	PC	45	T
5.	noc25- cs147	**NPTEL:** Introduction to Internet of Things	3	0	0	0	3	PE	45	T
6.	U23ME940	**Professional Elective-** Fundamentals of Automotive Systems	3	0	0	0	3	PE	45	T
	U23ME908	Additive Manufacturing	3	0	0	0				
Practical courses										
7.	U23ME505	Heat and Mass Transfer Laboratory	0	0	4	0	2	PC	60	L
8.	U23ME506	Computer Aided Design Laboratory	0	0	4	0	2	PC	60	L
9.	U23GE501	Soft Skills and Aptitude-III	0	0	2	0	1	EEC	30	L
Total Credits							23			

*T- Theory, TT- Theory with Tutorial, TL- Theory with Laboratory, TP- Theory with Project, TLP- Theory with Laboratory and Project, L-Laboratory, LT- Laboratory with Theory, LP- Laboratory with Project, P-Project.

Approved By

Chairperson, Mechanical Engineering BoS	Member Secretary, Academic Council	Dean-Academics	Chairperson, Academic Council & Principal
Dr.D.Senthilkumar	Dr.R.Shivakumar	Dr.J.Akilandeswari	Dr.S.R.R.Senthil Kumar

Copy to:- HOD/ Mechanical Engineering, Fifth Semester B.E. Mechanical Students and Staff, COE

mech

U23ME501	HEAT AND MASS TRANSFER	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1:	Evaluate the heat conduction through plane walls, cylinder and composite walls and with internal heat generation.
CO2:	Analyse the various fin efficiencies and effectiveness and unsteady heat conduction with lumped heat system.
CO3:	Apply the convective heat transfer concepts in forced convection and free convection systems.
CO4:	Determine the heat transfer in heat exchangers by LMTD and NTU methods and describe the concept of boiling and condensation.
CO5:	Evaluate the radiation heat exchange between surfaces and thermal shields.

Pre-requisite: Engineering Thermodynamics, Thermal Engineering.

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3			2							1		3
CO2	3	3			2							1		3
CO3	3	3			2							1		3
CO4	3	3			2							1		3
CO5	3	3			2							1		3

Course Assessment methods

Direct		Indirect
CIE test I (9) CIE test II (9) CIE test III (10) Assignment/seminar/Quiz (5)	Objectives Test (7) Total CIE: 40 marks Semester End Examination (60)	Course end survey

Unit 01: CONDUCTION — **9 Hours**

Introduction - modes of heat transfer - conduction - steady state heat conduction - Fourier Law of Conduction - thermal conductivity - General Differential equation of Heat Conduction - Cartesian - One Dimensional Steady State Heat Conduction through Plane Wall, Cylinders and Spherical systems - Composite Systems - Conduction with Internal Heat Generation - Critical radius of insulation.

Unit 02: EXTENDED SURFACES & UNSTEADY STATE HEAT CONDUCTION	9 Hours
Types of Fins - Circumferential and longitudinal fins- Heat Flow Calculations - Evaluation of fin performance: Fin efficiency, Fin effectiveness. Introduction to unsteady state heat conduction – transient heat conduction - Lumped systems.	
Unit 03: CONVECTION	**9 Hours**
Boundary Layer Concept - Types of Convection - Forced Convection - External Flow - Flow over Plates, Cylinders and Spheres. Internal Flow - Laminar and Turbulent Flow - Combined laminar and turbulent. Free Convection - Flow over Vertical Plate, Horizontal Plate, Cylinders and Spheres.	
Unit 04: HEAT EXCHANGERS, BOILING AND CONDENSATION.	**9 Hours**
Heat Exchangers types - Overall Heat Transfer Coefficient - Fouling Factors - LMTD Method of heat Exchanger Analysis - Effectiveness - NTU Method of Heat Exchanger Analysis - Physical significance of NTU - Introduction to compact heat exchangers. Introduction to Boiling and condensation – Pool Boiling, Flow Boiling, Boiling Curve - film wise and drop wise condensation (elementary treatment only).	
Unit 05: RADIATION & MASS TRANSFER	**9 Hours**
Fundamental Concepts - Stefan Boltzmann Law – Kirchhoff's law - Relation to Irradiation and Radiosity – Absorptivity, Reflectivity and Transmissivity. Radiation exchange between surfaces - Shape Factor relations – Electrical Analogy - Radiation Shields. Introduction to mass transfer -Fick's Law of Diffusion - Diffusion Mass Transfer – Convective mass transfer.	

Theory: 45 Hrs	Tutorial: -	Practical: -	Project:-	Total Hours: 45 Hrs

TEXT BOOKS

1.	Kothandaraman C.P "Fundamentals of Heat and Mass Transfer" New Age International,New Delhi, 2015.
2.	Sachdeva R C, "Fundamentals of Engineering Heat and Mass Transfer" New Age International, 2016.
3.	Nag P.K, "Heat Transfer", Tata McGraw-Hill, New Delhi, 2002.
4.	Cengel, Y.A. "Heat Transfer: A Practical Approach", Tata McGraw, Hill. Second edition2008.

REFERENCES

1.	Incropera, Frank; Dewitt,David. P "Fundamentals of Heat and Mass Transfer", John Wiley& Sons Pvt. Ltd., 2010.
2.	Holman J.P "Heat and Mass Transfer" Tata McGraw-Hill, 2012.
3.	R.K. Rajput, "A text book of Heat and Mass Transfer", S. Chand Publications. 2018.

Dr.D.SENTHIL KUMAR, M.E.,Ph.D
PROFESSOR & HEAD,
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5.

U23ME502	DESIGN OF MACHINE ELEMENTS	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1:	Select the materials based on Mechanical properties, different types of loading and introduction about simple, steady and variable stresses.
CO2:	Illustrate the design procedure for various types of shafts, keys and couplings.
CO3:	Design the threaded fasteners, bolted joints, including eccentric loading & welded joints for pressure vessels and structures.
CO4:	Design the various types of springs, such as helical and leaf springs, under constant and varying loads and flywheels consider stresses in rims and arms for engines.
CO5:	Develop the design procedure for various types of bearings like sliding contact and rolling contact bearings.

Pre-requisite: Engineering Mechanics, Kinematics of Machinery, Dynamics of Machinery and Strength of Materials.

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3			3						3	2	
CO2	3	3	3			2						3	2	
CO3	3	3	3			2						3	2	
CO4	3	3	3			2						3	2	
CO5	3	3	3			2						3	2	

Course Assessment methods

Direct		Indirect
CIE test I (9) CIE test II (9) CIE test III (10) Assignment/seminar/Quiz (5)	Objectives Test (7) Total CIE: 40 marks Semester End Examination (60)	Course end survey

Unit 01: STEADY AND VARIABLE STRESSES IN MACHINE MEMBERS — **9 Hours**

Fundamentals of machine design - Introduction to the design process - Factors influencing machine design, selection of materials based on mechanical properties, limits, fits and tolerances -Direct, bending and torsional stress equations – Role of factor of safety - Theories of failure – Design for variable loading – Soderberg, Goodman and Gerber relations - Design of curved beams.

Unit 02: DESIGN OF SHAFTS AND COUPLINGS	9 Hours
Design of solid and hollow shafts based on strength and rigidity - Design of rigid couplings – Flange, Box and clamp - Introduction of flexible couplings - Bushed pin type Coupling and Oldham's Coupling.	
Unit 03: DESIGN OF TEMPORARY AND PERMANENT JOINTS	**9 Hours**
Thread fasteners -Stresses in thread fasteners - Design of bolted cylinder covers – Bolted joints under eccentric loading - Welded joints – Strength of Butt joints, Parallel fillet and Transverse fillet weld joints - welded joints subjected to eccentric loaded joints.	
Unit 04: DESIGN OF SPRINGS AND ENGINE COMPONENTS	**9 Hours**
Design of helical and leaf springs under constant loads and varying loads – Introduction of concentric springs – Design of flywheels involving stresses in rim and arms for engines and punching machines.	
Unit 05: DESIGN OF BEARINGS	**9 Hours**
Design and Selection of sliding and rolling contact bearings - Cubic mean load - Design of journal bearings - Mckees equation -Lubrication in journal bearings – Bearing materials for various applications.	

Theory: 45 Hrs	Tutorial: -	Practical: -	Project:-	Total Hours: 45 Hrs

Note: Use of PSG Design Data Book is permitted

TEXT BOOKS

1. Joseph Shigley, Charles Mischke, Richard Budynas and Keith Nisbett "Mechanical Engineering Design", 9th Edition, Tata McGraw-Hill, 2020
2. R.S.Khurmi, "Machine Design", 25th edition, S Chand Publisher, 2020.
3. Bhandari V, "Design of Machine Elements", 3rd Edition, Tata McGraw-Hill Book Co, 2021.

REFERENCES

1. Ansel Ugural, "Mechanical Design – An Integral Approach", First Edition, Tata McGraw-Hill Book Co, 2010.
2. Merhyle F. Spotts, Terry E. Shoup and Lee E. Hornberger, "Design of Machine Elements" Eight Edition, Printice Hall, 2012.
3. Orthwein W, "Machine Component Design", Jaico Publishing Co, 2015.
4. Robert C. Juvinall and Kurt M. Marshek, "Fundamentals of Machine Design", Fourth Edition, Wiley, 2020.
5. Alfred Hall, Halowenko, A and Laughlin, H., "Machine Design", Tata McGraw-Hill Book Co. (Schaum's Outline), 2018.
6. Sundararajamoorthy T. V. Shanmugam .N, "Machine Design", Anuradha Publications, Chennai, 2019.

Dr. D. SENTHIL KUMAR, M.E.,Ph.D
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5

U23ME503	COMPUTER AIDED DESIGN AND ANALYSIS	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1:	Determine 2D and 3D transformation matrices, and construct 2D and 3D models of products using geometric modeling techniques.
CO2:	Solve structural problems using the potential energy method and weighted residual method.
CO3:	Analyze structures using one-dimensional bar elements and heat transfer elements.
CO4:	Solve scalar and vector variable problems using two-dimensional elements.
CO5:	Formulate the Jacobian matrix and perform integration using Gauss quadrature.

Pre-requisite: Engineering graphics, Strength of material

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	2				2								3	
CO2	3	3		3	2								3	
CO3	3	3		3	2								3	2
CO4	3	3		2	2					2			3	
CO5	3	3		3	2					2			3	3

Course Assessment methods

Direct		Indirect
CIE test I (9) CIE test II (9) CIE test III (10) Assignment/seminar/Quiz (5)	Objectives Test (7) Total CIE: 40 marks Semester End Examination (60)	Course end survey

Unit 01: INTRODUCTION TO COMPUTER AIDED DESIGN — **9 Hours**

Introduction and overview. Need and Scope of Computer Aided Machine Design, CAD design process, Graphic standards, 2D and 3D geometric Transformation- Scaling, Translation and Rotation. Geometric modelling- Synthetic curves –Cubic spline, Bezier and B-spline curves, Wire Frame modeling, surface modeling and Solid Modeling-Constructive solid geometry (CSG), Boundary Representation (B-Rep).

Unit 02: INTRODUCTION TO FINITE ELEMENT METHOD	9 Hours
Finite element modeling procedure - mathematical modeling- Application to the continuum- Discretization - Matrix algebra - Gaussian elimination - Governing equations for continuum- Classical Techniques in FEM –Potential energy methods -Ritz method , Weighted residual methods, engineering applications of FEA.	
Unit 03:ONE DIMENSIONAL PROBLEMS	**9 Hours**
One dimensional element Coordinates and shapes functions- Potential energy approach -Galarkin's approach- Assembly of stiffness matrix and load vector- linear 1D bar element - nodal approximation - development of shape functions- quadratic shape functions - element matrices and vectors-. One dimensional heat transfer element – Assembly of stiffness matrix and load vector, one-dimensional heat transfer problems.	
Unit 04: TWO DIMENSIONAL PROBLEMS	**9 Hours**
Scalar Variable Problems- Finite element modeling- CST element- Element equations, Load vectors and boundary conditions – Assembly - Vector Variable problems- Elasticity equations, Plane Stress, Plane Strain, Axisymmetric problems- Formulation- element matrices- Assembly - boundary conditions and solutions.	
Unit 05: ISOPARAMETRIC ELEMENT AND NUMERICAL INTEGRATION	**9 Hours**
Natural coordinates, Iso parametric elements, four nodded quadrilateral element–Shape functions- Element Jacobian matrix -stiffness matrix and force vector – Numerical integration – Gauss quadrature-Gauss points- problems using gauss quadrature.	

Theory: 45 Hrs	Tutorial: -	Practical: -	Project:-	Total Hours: 45 Hrs

TEXT BOOKS

1. Ibrahim Zeid. & R. Sivasubramanian" CAD-CAM Theory and Practice", Tata McGraw- Hill Publishing Co. Ltd. 2nd edition, 2016. ISBN-13:978-0070151345
2. Chandrupatla & Belagundu, "Introduction to Finite Elements in Engineering", Prentice-Hall of India, Eastern Economy Editions, 4th Edition, 2015, ISBN-13: 978-9332551824.

REFERENCES

1. Mikell P. Groover and Emory W. Zimmers, Jr, "CAD/CAM Computer Aided and Manufacturing". Eastern Economy Edition, PHI publishers 2008.ISBN 13: 978- 8120304024.
2. Rao S.S., "The Finite Element Method in Engineering", Fourth Edition, Published

	by\Elsevier, 5th Edition, 2010, Hardcover ISBN: 9781856176613.
3.	P.Seshu, "Text Book of Finite Element Analysis", Prentice-Hall of India Pvt. Ltd., NewDelhi, 2007. ISBN-978-203-2315-5
4.	J.N.Reddy, "An Introduction to the Finite Element Method", McGraw-Hill International Editions, 2006, 3rd Edition, ISBN: 9780070607415.
5.	David V.Hutton,"Fundamentals of Finite Element Analysis", Tata McGraw-Hill Edition, 2005, ISBN: 9780070601222.

Dr. D. SENTHIL KUMAR, M.E.,Ph.D
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5

U23ME504	COMPUTER INTEGRATED MANUFACTURING	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO 1	Explain the evolution and structure of Computer Integrated Manufacturing (CIM) and its subsystems.
CO 2	Design a Group Technology-based cellular manufacturing system to enhance workflow and reduce manufacturing lead time.
CO 3	Develop integrated production planning solutions in capacity planning, scheduling, and inventory control to meet dynamic market demands.
CO 4	Evaluate Flexible Manufacturing Systems (FMS) through quantitative modeling techniques to enhance productivity.
CO 5	Create intelligent robotic solutions to solve complex industrial tasks with high precision and repeatability.

Pre-requisite: Manufacturing Process, Conventional and Modern Manufacturing

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2							1	2	2
CO2	3	3	3	3	2							1	2	2
CO3	3	3	3	3	2							1	2	2
CO4	3	3	3	3	2							1	2	2
CO5	3	3	3	3	2							1	2	2

Course Assessment methods

Direct				Indirect
CIE test I	(9)	Objective Tests	(7)	Course end survey
CIE test II	(9)	Total CIE:	(40)	
CIE test III	(10)	Semester End Examination	(60)	
Assignment/seminar/Quiz	(5)			

Unit 01: INTRODUCTION TO COMPUTER INTEGRATED MANUFACTURING — **9 Hours**

Introduction to CAD and CAM – Manufacturing Planning, Evolution of CIM – CIM wheel and cycle- Types of production - Manufacturing models and Metrics -Manufacturing Control – Mathematical models of Production Performance –Simple Problems – Lean Production and Just-In-Time Production: History-Toyota Production system-Kanban.

Unit 02: CELLULAR MANUFACTURING	**9 Hours**
Group Technology (GT)- Part Families – Parts Classification and coding – Simple Problems in Opitz Part Coding system – Production flow Analysis – Cellular Manufacturing – Composite part concept – Machine cell design and layout – Quantitative analysis in Cellular Manufacturing – Rank Order Clustering Method - Arranging Machines in a GT cell – Hollier Method – Simple Problems.	
Unit 03: PRODUCTION PLANNING & CONTROL AND COMPUTER AIDED PROCESS PLANNING	**9 Hours**
Production planning and Control System - Aggregate Production Planning and Master Production Schedule – Material Requirement Planning (MRP I) – Simple Problems – Capacity Planning – Shop Floor Control – Inventory Control – EOQ. - Simple Problems. Introduction to Manufacturing Resource Planning (MRP II) & Enterprise Resource Planning (ERP). **Process planning-** Manual Process Planning and Computer Aided Process Planning (CAPP)- Variant process planning – Generative process planning.	
Unit 04: FLEXIBLE MANUFACTURING SYSTEM (FMS) AND AUTOMATED GUIDED VEHICLE SYSTEM (AGVS)	**9 Hours**
Introduction to FMS- Types of Flexibility - FMS Components – FMS Application & Benefits – FMS Planning and Control– Quantitative analysis in FMS – Bottleneck Model in FMS- Simple Problems. Automated Guided Vehicle System (AGVS) – AGVS Application – Vehicle Guidance technology – Vehicle Management & Safety- Petrinet models.	
Unit 05: INDUSTRIAL ROBOTICS	**9 Hours**
Robot Anatomy and Related Attributes – Classification of Robots- Robot Control systems – End Effectors – Sensors in Robotics – Robot Accuracy and Repeatability - Industrial Robot Applications – Robot Part Programming — Simple Problems.	

Theory: 45 Hrs	Tutorial:	Practical:	Project:	Total Hours: 45 Hrs

TEXT BOOKS

1.	Mikell P. Groover, "Automation, Production system and Computer integrated Manufacturing", Prentice Hall of India Pvt. Ltd., 4thEdition, 2014.
2.	Alavudeen and Venkateshwaran, "Computer Integrated Manufacturing", PHI Learning Pvt. Ltd., New Delhi, 2013
3.	Kant Vajpayee S, "Principles of Computer Integrated Manufacturing", Prentice Hall, India, 2003

REFERENCES

1.	Radhakrishnan P., Subramanyan S. and Raju V., "CAD/CAM/CIM", New Age International (P) Ltd, New Delhi, 2018
2.	James A. Retrg, Herry W. Kraebber, "Computer Integrated Manufacturing", Pearson Education, Asia,3rd Edition,2004.
3.	Rao. P. N., Tewari. N. and Kundra. T.K., "Computer Aided Manufacturing", Tata McGraw Hill Publishing Company, 2000.

Dr.D.SENTHIL KUMAR, M.E.,Ph.D
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-6

noc25-cs147 INTRODUCTION TO INTERNET OF THINGS 3 0 0 3

ABOUT THE COURSE

Internet of Things (IoT) is presently a hot technology worldwide. Government, academia, and industry are involved in different aspects of research, implementation, and business with IoT. IoT cuts across different application domain verticals ranging from civilian to defence sectors. These domains include agriculture, space, healthcare, manufacturing, construction, water, and mining, which are presently transitioning their legacy infrastructure to support IoT. Today it is possible to envision pervasive connectivity, storage, and computation, which, in turn, gives rise to building different IoT solutions. IoT-based applications such as innovative shopping system, infrastructure management in both urban and rural areas, remote health monitoring and emergency notification systems, and transportation systems, are gradually relying on IoT based systems. Therefore, it is very important to learn the fundamentals of this emerging technology.

COURSE LAYOUT

Week 1: Introduction to IoT: Part I, Part II, Sensing, Actuation, Basics of Networking: Part-I
Week 2: Basics of Networking: Part-II, Part III, Part IV, Communication Protocols: Part I, Part II
Week 3: Communication Protocols: Part III, Part IV, Part V, Sensor Networks: Part I, Part II
Week 4: Sensor Networks: Part III, Part IV, Part V, Part VI, Machine-to-Machine Communications
Week 5: Interoperability in IoT, Introduction to Arduino Programming: Part I, Part II, Integration of Sensors and Actuators with Arduino: Part I, Part II
Week 6: Introduction to Python programming, Introduction to Raspberry Pi, Implementation of IoT with Raspberry Pi
Week 7: Implementation of IoT with Raspberry Pi (contd), Introduction to SDN, SDN for IoT
Week 8: SDN for IoT (contd), Data Handling and Analytics, Cloud Computing
Week 9: Cloud Computing(contd), Sensor-Cloud
Week 10: Fog Computing, Smart Cities and Smart Homes
Week 11: Connected Vehicles, Smart Grid, Industrial IoT
Week 12: Industrial IoT (contd), Case Study: Agriculture, Healthcare, Activity Monitoring

TOTAL HOURS : 45

Dr. D. SENTHIL KUMAR, M.E.,Ph.D
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
SALEM-5

BOOKS AND REFERENCES

Prescribed Textbook for the course:

1. S. Misra, A. Mukherjee, and A. Roy, 2020. *Introduction to IoT*. Cambridge University Press. Availability: https://www.amazon.in/Introduction-IoT- SudipMisra/dp/1108959741/ref=sr_1_1?dchild=1&keywords=sudip+misra&qid=1627359928&sr=8-1
2. S. Misra, C. Roy, and A. Mukherjee, 2020. *Introduction to Industrial Internet of Things and Industry 4.0*. CRC Press. Available: http://www.amazon.in/dp/1032146753/ref=sr_1_3?dchild=1&keywords=sudip+misra&qid=1627359928&sr=8-3

U23ME908	ADDITIVE MANUFACTURING	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1:	Recognize the development of AM technology and how AM technology propagated into various businesses and developing opportunities.
CO2:	Acquire knowledge on process of transforming a concept into the final product in AM technology.
CO3:	Elaborate the vat polymerization and direct energy deposition processes and its applications.
CO4:	Acquire knowledge on process and applications of powder bed fusion and material extrusion
CO5:	Evaluate the advantages, limitations, applications of binder jetting, material jetting and sheet lamination processes.

Pre-requisite: Conventional and Modern Manufacturing

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO 1	3				2	3	3	2		2		2	3	2
CO 2	3	3		3	2						2	2	3	2
CO 3	3	2		2	3						2		3	
CO 4	3	2		3	3	2					3		3	
CO 5	3	2		2	2	3						2	3	2

Course Assessment methods

Direct		Indirect
CIE test I (9) CIE test II (9) CIE test III (10) Assignment/seminar/Quiz (5)	Objectives Test (7) Total CIE: 40 marks Semester End Examination (60)	Course end survey

Unit 01: INTRODUCTION — **9 Hours**

Overview - Need - Development of Additive Manufacturing (AM) Technology: Rapid Prototyping- Rapid Tooling - Rapid Manufacturing - Additive Manufacturing. AM Process Chain- ASTM/ISO 52900 Classification - Benefits. Applications: Building Printing - Bio Printing - Food Printing- Electronics Printing. Business Opportunities and Future Directions – Case studies: Automobile, Aerospace, Healthcare.

Unit 02: DESIGN FOR ADDITIVE MANUFACTURING (DfAM)	9 Hours
Concepts and Objectives - AM Unique Capabilities - Part Consolidation – Topology Optimization- Generative design - Lattice Structures - Multi-Material Parts and Graded Materials - Data Processing: CAD Model Preparation - AM File formats: STL-Problems with STL- AMF Design for Part Quality Improvement: Part Orientation - Support Structure - Slicing - Tool Path Generation – Design rules for Extrusion based AM.	
Unit 03: VAT POLYMERIZATION AND DIRECTED ENERGY DEPOSITION	**9 Hours**
Photo polymerization: Stereolithography Apparatus (SLA)- Materials -Process - top down and bottom up approach - Advantages - Limitations - Applications. Digital Light Processing (DLP) - Process - Advantages - Applications. Continuous Liquid Interface Production (CLIP)Technology. Directed Energy Deposition: Laser Engineered Net Shaping (LENS)- Process - Material Delivery - Materials -Benefits -Applications.	
Unit 04: POWDER BED FUSION AND MATERIAL EXTRUSION	**9 Hours**
Powder Bed Fusion: Selective Laser Sintering (SLS): Process - Powder Fusion Mechanism - Materials and Application. Selective Laser Melting (SLM), Electron Beam Melting (EBM): Materials - Process - Advantages and Applications. Material Extrusion: Fused Deposition Modelling (FDM)- Process- Materials -Applications and Limitations.	
Unit 05: OTHER ADDITIVE MANUFACTURING PROCESSES	**9 Hours**
Binder Jetting: Three-Dimensional Printing - Materials - Process - Benefits- Limitations - Applications.Material Jetting: Multijet Modeling- Materials - Process - Benefits - Applications. Sheet Lamination: Laminated Object Manufacturing (LOM)- Basic Principle- Mechanism: Gluing or Adhesive Bonding - Thermal Bonding- Materials-Application and Limitation	

Theory: 45 Hrs	Tutorial: -0	Practical: -0	Project:-0	Total Hours: 45 Hrs

TEXT BOOKS

1. Ian Gibson, David Rosen, Brent Stacker, Mahyar Khorasani "Additive manufacturing technologies", 3rd edition Springer Cham, Switzerland, 2021, ISBN 9783030561260.
2. Andreas Gebhardt and Jan-Steffen Hotter "Additive Manufacturing: 3D Printing for Prototyping and Manufacturing", Hanser publications, United States, 2015, ISBN 9781569905821.

REFERENCES

1. Andreas Gebhardt, "Understanding Additive Manufacturing: Rapid Prototyping, Rapid Manufacturing", Hanser Gardner Publication, Cincinnati., Ohio, 2011, ISBN 9783446425521.
2. Milan Brandt, "Laser Additive Manufacturing: Materials, Design, Technologies, and Applications", Woodhead Publishing., United Kingdom, 2016, ISBN 9780081004333.
3. Amit Bandyopadhyay and Susmita Bose, "Additive Manufacturing", 3rd Edition, CRC Press., United States, 2025, ISBN 9781032381824.
4. Liou, L.W. and Liou, F.W., "Rapid Prototyping and Engineering Applications: A Tool Box for Prototype Development", 2nd Edition, CRC Press., United States, 2019, ISBN 9781498798921.

Dr. D. SENTHIL KUMAR, M.E.,Ph.D
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5

U23ME940	FUNDAMENTALS OF AUTOMOTIVE SYSTEMS	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1:	Explain engine emissions, control technologies, and solve emission analysis problems.
CO2:	Analyze automotive powertrain configurations (FWD/RWD/AWD), clutch / transmission systems, and evaluate efficiency in drivetrain matching.
CO3:	Evaluate braking systems (hydraulic/air brakes, ABS, ESC) and compute braking dynamics.
CO4:	Design steering /suspension systems and solve suspension analysis problems.
CO5:	Compare advanced technologies (BEV, HEV, PHEV) and assess autonomous systems through case studies.

Pre-requisite: Thermal Engineering.

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2			2	2						3	
CO2	3	3	2										3	
CO3	3	3	2										3	
CO4	3	3	2										3	
CO5	3	3				2	2						2	

Course Assessment methods

Direct		Indirect
CIE test I (9) CIE test II (9) CIE test III (10) Assignment/seminar/Quiz (5)	Objectives Test (7) Total CIE: 40 marks Semester End Examination (60)	Course end survey

Unit 01: ENGINE EMISSIONS & CONTROL — **9 Hours**

Types of engine emissions (CO, NOx, PM), Emission norms (BSVI, Euro VI), Thermal Converters, Catalytic Converters, Particulate Traps, Exhaust Gas Recirculation (EGR), Selective Catalytic Reduction (SCR), Emission Analysis – simple problems.

Unit 02: AUTOMOTIVE TRANSMISSION & POWERTRAIN — **9 Hours**

Transmission- Clutch Construction, principles, types- Manual/Automatic/CVT. Gear Box- Sliding Mesh Gearbox, Constant Mesh Gearbox and Synchromesh Gearbox.

Powertrain- Driveline, Drive train configurations (FWD, RWD, AWD), Ideal Powertrain Characteristics,

Powertrain matching & efficiency analysis- Simple Problems.	
Unit 03: BRAKING SYSTEMS	**9 Hours**
Introduction to Brake System, Components and types- Hydraulic brake system, Air brake systems (pneumatics), Antilock Brake System (ABS), Electromagnetic Braking System, Parking Brake. Principle of Electronic Stability Control (ESC). Braking dynamics - Forces Acting on the Vehicle During Braking, Ideal Brake Force Distribution, Wheel Lock Analysis – Simple Problems	
Unit 04: STEERING & SUSPENSION SYSTEMS	**9 Hours**
Functions of Steering System, Steering Geometry, Ackerman Steering Condition, Trapezoidal Steering Mechanism, Components of a Steering System. Steering Types -Pitman Arm Type Steering, Rack and Pinion Steering. Power Steering - Hydraulic Power Steering, Electro Hydraulic Power Steering, Electric Power Steering. Wheel alignment (Camber, Caster, Toe), Suspension components (Springs, Dampers), Shock Absorber, Independent Suspension, Dependent Suspension, Suspension analysis- simple problems.	
Unit 05: ADVANCED TECHNOLOGIES	**9 Hours**
Classification of Electrified Powertrain - Electric & hybrid powertrains - Battery Electric Vehicles (BEV), Hybrid Electric Vehicles (HEV), Plug-in Hybrid Electric Vehicles (PHEV), Performance Analysis – Simple Problems. Case studies on autonomous vehicle systems.	

Theory: 45 Hrs	Tutorial: 0	Practical: 0	Project:0	Total Hours: 45 Hrs

TEXT BOOKS

1. R. Stone and J. K. Ball, Automotive Engineering Fundamentals, SAE International, 2004.
2. D. B. Astow, G. Howard and J. P. Whitehead, Car Suspension and Handling, 4th Edition, SAE International, 2004.
3. Ronald K Jurgen, "Navigation and Intelligent Transportation Systems – Progress in Technology", Automotive Electronics Series. SAE, USA, 2001.

REFERENCES

1. D. Crolla, D. E. Foster, T. Kobayashi and N. Vaughan (Editors-in-Chief), Encyclopedia of Automotive Engineering, Parts 1-6, Wiley, 2015.
2. T. K. Garrett, K. Newton, and W. Steeds, The Motor Vehicle, 13th Edition, SAE International, 2001
3. M. Ehsani, Y. Gao and A. Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, 2nd Edition, CRC Press, 2010.
4. V. Ganesan, Internal Combustion Engines, 3rd Edition, Tata McGraw Hill, 2007.
5. LjuboVlacic, Michel Parent and Fumio Harashima, "Intelligent Vehicle Technologies", Butterworth-Heinemann Publications, Oxford, 2001.

Dr. D. SENTHIL KUMAR, M.E.,Ph.D
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5

U23ME506	COMPUTER AIDED DESIGN LABORATORY	L	T	P	J	C
		0	0	4	0	2

Course Outcomes

At the end of the course, the student will be able to

CO1:	Understand BIS standards, engineering drawing practices, and use of drafting software for dimensioning and tolerancing.
CO2:	Create 2D orthographic views of standard machine components using CAD tools.
CO3:	Develop 3D models and prepare assembly drawings of mechanical components and sub-assemblies using modelling software.

Pre-requisite: Nil

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3				3					3				
CO2	3	2	2		3					3			3	
CO3	3	3	3	2	3					3			3	3

Course Assessment methods

Direct		Indirect
CIE test I (15) Quiz I- (5) CIE test II (15) Quiz II- (5)	RTPS (10) Record (10) Total CIE: 60 marks Semester End Examination (40 marks)	Course end survey

LIST OF EXPERIMENTS

Introduction

1. Introduction to Code of practice for Engineering Drawing, BIS specifications - Welding symbols, Riveted joints, keys, Fasteners - Reference to hand book for the selection of standard components like bolts, nuts, screws, keys etc. Introduction to Drafting Software, Editing, Dimensioning and Plotting Commands-Layering concepts -Limits, Fits and Tolerances.

2. **Preparation of 2-D Drawings**

   Orthographic views of standard machine components: Brackets, V-Blocks, Stop Block, Screw threads and Threaded fasteners.

3. Assembly Drawing (Preparation of assembled view)

i. Modeling & Assemble of flange coupling
ii. Modeling & Assemble of oldhams coupling
iii. Modeling & Assemble of Universal Coupling
iv. Modeling & assemble of Split muff Coupling
v. Modeling & Assemble of Screw Jack
vi. Modeling & Assemble of Knuckle Joint
vii. Modeling & Assemble of Plummer block bearing
viii. Modeling & Assemble of Machine vice
ix. Modeling & Assemble Simple Eccentric
x. Modeling & Assemble Pipe vice

List of Equipment's:

1. Computer systems configuration: i7 - 7th GEN-8GB RAM-1TB HDD 22" LED DISPY
2. 3D printer

List of Equipment's: (for a batch of 30 students)

1. Solid Works 2019 -100 users.

Dr. D. SENTHIL KUMAR, M.E.,Ph.D
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5

Total Number of hours:60

Theory: 0	Tutorial: 0	Practical: 60 Hrs	Project: 0	Total Hours:60 Hrs

U23ME505	HEAT AND MASS TRANSFER LABORATORY	L	T	P	J	C
		0	0	4	0	2

Course Outcomes

At the end of the course, the student will be able to

CO1:	Determine heat transfer characteristics through various experimental methods for practical application.
CO2:	Evaluate thermal conductivity of materials to optimize insulation and heat transfer systems.
CO3:	Apply problem-solving skills to analyze and improve real-world heat transfer processes for efficiency

Pre-requisite: Thermal engineering and Heat and mass transfer.

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3			2							1		3
CO2	3	3			2							1		3
CO3	3	3			2							1		3

Course Assessment methods

Direct		Indirect
CIE test I (15) Quiz I- (5) CIE test II (15) Quiz II- (5)	RTPS (10) Record (10) Total CIE: 60 marks Semester End Examination (40 marks)	Course end survey

List of experiments: (for a batch of 30 students)

1. Thermal conductivity measurements by guarded plate method.
2. Thermal conductivity of metal bar.
3. Thermal conductivity of insulating powder.
4. Thermal conductivity of composite wall material.
5. Natural convection heat transfer from a vertical cylinder.
6. Forced convection inside tube.
7. Heat Transfer from Pin-fin (Natural & Forced convection modes).
8. Effectiveness of parallel/ Counter flow heat Exchanger.
9. Determination of Stefan- Boltzman constant.
10. Determination of Emissivity of a grey surface.

Total Number of hours:60

Theory: 0	Tutorial: 0	Practical: 60 Hrs	Project: 0	Total Hours:60 Hrs

Dr.D.SEN... R, M.E.,Ph.D
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5

U23GE501	SOFT SKILLS AND APTITUDE – III	L	T	P	J	C
		0	0	2	0	1

Course Outcomes

After successful completion of this course, the students should be able to

CO1:	Demonstrate soft skills effectively using practical exercises and case studies
CO2:	Solve problems of greater intricacy than those in SSA -I and II in stated areas of quantitative aptitude and logical reasoning and score 65-70% marks in company-specific internal tests
CO3:	Demonstrate higher than SSA -I and II levels of verbal aptitude skills in English regarding specific topics and score 65-70% marks in company-specific internal tests

Pre-requisite: Softskills and Aptitude I & II

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	1	1	2	2	3	3	3	1	3	1	1
CO2	3	3	3	2	2	2	1	3	3	2	1	3	2	2
CO3	1	1	1	1	1	1	1	3	3	3	1	3	1	1

Course Assessment methods

Direct				Indirect
CIE test I	(15)	RTPS	(10)	Course end survey
Quiz 1	(5)	Record	(10)	
CIE test II	(15)	Total CIE	: **60 marks**	
Quiz 2	(5)	Semester End Examination: **40 marks**		

1. Soft Skills

Demonstrating soft-skill capabilities with reference to the following topics:

a. Career planning
b. Resume writing
c. Group discussion
d. Teamwork
e. Leadership skills
f. Interview skills
g. Mock interviews
h. Mock GDs
i. LinkedIn Profile Optimization

2. Quantitative Aptitude and Logical Reasoning	**Solving problems with reference to the following topics:** a. Permutation and Combination b. Probability c. Clock & Calendar d. Numerical and Abstract Reasoning e. Analytical Reasoning f. Deductive Reasoning g. Non-Verbal Reasoning h. Prompt Engineering
3. Verbal Aptitude	**Demonstrating English language skills with reference to the following topics:** a. Subject verb agreement. b. Selecting the best alternative for the stated parts of given sentences. c. Reading comprehension. d. Contextual synonyms. e. Sentence fillers. f. Narrating a story on given prompts or given picture. g. Company specific aptitude questions.

Theory: -	**Tutorial: -**	**Practical: 30 hrs**	**Project: -**	**Total Hours: 30 hrs**

6/06/25

Dr.S.Anita
Professor & Head
Department of Training

Dr. S. ANITA
Professor and Head
Department of Training.
SONA COLLEGE OF TECHNOLOGY
SALEM-636 005.

Syllabi for

B.E/B.Tech Honours (Specialization in the same Discipline)

B.E/B.Tech Honours

B.E/B.Tech Minor

courses

U23ME2018	GREEN SUPPLY CHAIN MANAGEMENT	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1:	Get concise awareness of standards and legislation of modern electronic manufacturing for green environment.
CO2:	Explain the conventional electronic processing and lead free electronic manufacturing
CO3:	Realize the assembly process and the need of recycle of electronics
CO4:	Use reliability and product life cycle estimation tools for electronic manufacturing.
CO5:	Validate the green electronic manufacturing procedures in applications.

Pre-requisite:

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	1	3						1			1	1	2
CO 2	2	1	3						1			1	1	2
CO 3	2	1	3						1			1	1	2
CO 4	2	1	3						1			1	1	2
CO 5	2	1	3						1			1	1	2

Course Assessment methods

Direct		Indirect
CIE test I (9) CIE test II (9) CIE test III (10) Objectives Test (7)	Assignment/seminar/Quiz (5) Total CIE: **40 marks** Semester End Examination: **60 marks**	Course end survey

Unit 01: INTRODUCTION TO GREEN ELECTRONICS — **9 Hours**

Environmental concerns of the modern society- Overview of electronics industry and their relevant regulations in China, European Union and other key countries- global and regional strategy and policy on green electronics industry. Restriction of Hazardous substances (RoHS) - Waste Electrical and electronic equipment (WEEE - Energy using Product (EuP) and Registration- Evaluation, Authorization and Restriction of Chemical substances (REACH).

Unit 02: GREEN ELECTRONICS MATERIALS AND PRODUCTS — **9 Hours**

Basics of IC manufacturing and its process - Electronics with Lead (Pb) -free solder pastes, conductive adhesives, Introduction to green electronic materials and products - halogen-free substrates and components. Substitution of non-recyclable thermosetting polymer based composites with recyclable materials X-Ray Fluorescence (XRF) for identifying hazardous substances in electronic products	
Unit 03: GREEN ELECTRONICS ASSEMBLY AND RECYCLING	**9 Hours**
Various processes in assembling electronics components - the life-cycle environmental impacts of the materials used in the processes - substrate interconnects. Components and process equipments- Technology and management on e-waste recycle system construction, global collaboration, and product disassembles technology.	
Unit 04: PRODUCT DESIGN AND SUSTAINABLE ECO-DESIGN	**9 Hours**
Stages of product development process in green design: Materials- Manufacturing - Packaging and use - End of Life and disposal - Design for recycling - Life Cycle Assessment (LCA), and Eco- design tools - Environmental management systems, and International standards - Eco-design in electronics industry	
Unit 05: CASE STUDIES	**9 Hours**
Reliability of green electronics systems , Reuse and recycle of End-of-Life(EOL) electrical and electronic equipment for effective waste management - Introduction of Green Supply Chain, and Modeling green products from Supply Chain point of view - A life-cycle assessment for eco- design of Cathode Ray Tube Recycling.	

Theory: 45 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 45 Hrs

TEXT BOOKS

1.	Green Supply Chain Management, by Charisios Achillas , Dionysis D. Bochtis Dimitrios Aidonis, Routledge; 1st edition (16 November 2018), ISBN-10 : 38644617
2.	Sammy G. Shina, Green Electronics Design and Manufacturing, McGraw Hill., 2008.

REFERENCES

1.	David Simchi-Levi, PhilpKamintry and Edith Simchy Levy, Designing and Managing the Supply Chain - Concepts Strategies and Case Studies, 2nd Edition, Tata-McGraw Hill, 2012.
2.	Sudalaimuthu and Anthony Raj, Logistics Management for International Business- Text and cases, PHI, 2009 Edition.
3.	Ayers.J.B, "Hand book of supply chain management", The St. Lencie press,2000.
4.	Joel D. Wisner, Principles of Supply chain management, Cengage Learning, 2007.

Dr.D.SENTHIL KUMAR, ME.,Ph.D
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5

U23ME2014	LEAN MANUFACTURING	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1:	Discuss the basics of 6 SIGMA
CO2:	Elaborate the lean manufacturing tools.
CO3:	Illustrate about the deeper understanding methodologies of Lean manufacturing.
CO4:	Discuss lean concepts and its elements.
CO5:	Describe the implementation and challenges of lean manufacturing.

Pre-requisite:

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	1	1	2	1	1				1		3	1	1	2
CO 2	1	1	2	1	1				1		3	1	1	2
CO 3	1	1	2	1	1				1		3	1	1	2
CO 4	1	1	2	1	1				1		3	1	1	2
CO 5	1	1	2	1	1				1		3	1	1	2

Course Assessment methods

Direct		Indirect
CIE test I (9) CIE test II (9) CIE test III (10) Objectives Test (7)	Assignment/seminar/Quiz (5) Total CIE: **40 marks** Semester End Examination: **60 marks**	Course end survey

Unit 01: BASICS OF 6 SIGMA — **9 Hours**

Introduction to 6 Sigma, basic tools of six sigma like problem solving approach, standard deviation, normal distribution, various sigma levels with some examples, value for the enterprise, Variation, and sources of variation, Mean and moving the mean, Various quality costs, cost of poor quality.

Unit 02: INTRODUCTION TO LEAN MANUFACTURING TOOLS — **9 Hours**

Process Capability Indices, Cause and Effect diagram, Control Charts, Introduction to FMEA, APQP, PPAP. 3 foundational 6 Sigma methodologies: DMAIC, DMEDI, and Process Management DMEDI for process creation, DMAIC for process improvement and PDCA for sustaining improvements.

Unit 03: DEEPER UNDERSTADING METHODOLOGIES	9 Hours
What is a process, Why Process management, Keys to process management, Difference between process management and 6 Sigma, Introduction to Deming cycle, PDCA, DMAIC and continuous improvement, DMEDI for creation process, DMAIC Vs DMEDI with examples, Introduction to Toyota Production System, Six Sigma and Production System integration.	
Unit 04: LEAN ELEMENTS	**9 Hours**
Introduction to Lean Concepts like In-Built Quality, Concept of Right Part at the Right Time, Lead Time reduction, Optimum utilization of Capital, Optimum utilization of People. Understanding the Zero-defect concept and Metrics, Focus on Human Resources, Quality, Delivery, Cost. Building Zero defect capabilities, Cultural and Organizational aspects.	
Unit 05: IMPLEMENTATION AND CHALLENGES	**9 Hours**
Implementing Checks and Balances in the process, Robust Information Systems, Dashboard, follow up and robust corrective and preventive mechanism. Concept of Audits, and continuous improvement from gap analysis, risk assessments etc.	

Theory: 45 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 45 Hrs

TEXT BOOKS

1.	S. R. Devadasan,V. Sivakumar, R. Murugesh, P. R. Shalij , Lean and Agile Manufacturing Theoretical, Practical and Research Futurities ,PHI learning ,2012.
2.	Jeffrey K. Liker, The Toyota Way: 14 Management Principles, Mc Graw Hill, 2004
3.	Gemba Kaizen: A Commonsense Approach to a Continuous Improvement Strategy, Second Edition Masaki Imai, 2012.

REFERENCES

1.	Lean Manufacturing: Tools, Techniques, and How to Use Them By William M Feld, CRC press ,2000.
2.	Lean Manufacturing in the Developing World: Methodology, Jorge Luis García-Alcaraz, Aidé Aracely Maldonado-Macías, Guillermo Cortes-Robles ·, Springer International Publishing ,2014
3.	Francisco J. G. Silva, Luis Carlos Pinto Ferreira, Lean Manufacturing Implementation, Opportunities and Challenges, Nova Science Publishers, Incorporated, 2019.
4.	J. Temple Black, Steve L. Hunte, Lean Manufacturing Systems and Cell Design, Society of Manufacturing Engineers, 2003.
5.	N. Gopalakrishnan, Simplified Lean Manufacture By Prentice-Hall Of India Pvt. Limited,2010

Dr.D.SENTHIL KUMAR, M.E.,Ph.D
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester VI under Regulations 2023 (CBCS)
Branch: Mechanical Engineering

S.No	Course Code	Course Title	L	T	P	J	C	Category	Total Contact Hours	Course Type*
Theory courses										
1	U23ME601	Operations Research	3	0	0	0	3	PC	45	T
2	U23ME602	Design of Transmission Systems	3	0	0	0	3	PC	45	T
3	U23ME603	Industrial Automation	3	0	0	0	3	PC	45	T
4	U23ME941	**Professional Elective:** Energy Conservation In Industries	3	0	0	0	3	PE	45	T
	U23ME926	Data Analytics								
	U23ME939	Production Planning and Control								
5	U23ME942	**Professional Elective:** Surface Engineering and coating Technologies	3	0	0	0	3	PE	45	T
	U23ME943	Hydraulics and Pneumatics								
	U23ME936	Industrial Engineering and Management								
6		**Open Elective:**	3	0	0	0	3	OE	45	T
	U23ADS1003	Software engineering								
	U23BM1002	Basic Life Support								
	U23BM1004	Hospital Management								
	U23CE1008	Municipal Solid Waste Management								
	U23CE1009	Energy Efficiency and Green Building								
	U23CS1010	Cloud Computing								
	U23EC1009	Sensors And Smart Structures Technologies								
	U23EE1013	Energy Conservation and auditing								
	U23EE1021	Innovation, IPR And Entrepreneurship Development								
	U23FT1001	Fundamentals of Fashion Design								
	U23IT1002	Introduction To Database Technology								
	U23MC1008	Fundamentals of Robotics								
	U23MC1009	Smart Automation								
7	U23GE602B	Comprehension	1	0	0	0	1	AC	15	T
Practical courses										
8	U23ME604	Automation and Simulation Laboratory	0	0	4	0	2	PC	60	L
9	U23ME605	Computer Aided Analysis Laboratory	0	0	4	0	2	PC	60	L
10	U23ME606	Mini Project	0	0	0	2	1	PC	30	P
11	U23GE601	Soft Skills and Aptitude-IV	0	0	2	0	1	EEC	30	L
Total Credits							**25**			

*T- Theory, TT- Theory with Tutorial, TL- Theory with Laboratory, TP- Theory with Project, TLP- Theory with Laboratory and Project, L-Laboratory, LT- Laboratory with Theory, LP- Laboratory with Project, P-Project.

Approved By

Chairperson, Mechanical Engineering BoS	**Member Secretary, Academic Council**	**Dean-Academics**	**Chairperson, Academic Council & Principal**
Dr.D.Senthilkumar	**Dr.R.Shivakumar**	**Dr.J.Akilandeswari**	**Dr.S.R.R.Senthil Kumar**

Copy to:-

HOD/ Mechanical Engineering, Sixth Semester B.E. Mechanical Students and Staff, COE

U23ME601	OPERATIONS RESEARCH	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1:	Formulate real life situations into linear programming models and interpret the solution.
CO2:	Construct mathematical models for transportation and assignment problems and obtain optimal solutions using standard optimization techniques
CO3:	Analyse project networks using PERT/CPM and apply network optimization algorithms such as shortest route, minimal spanning tree, and maximum flow for effective operational planning
CO4:	Schedule jobs using Johnson's algorithm and apply deterministic and probabilistic inventory control models, and selective techniques for efficient inventory management.
CO5:	Formulate and analyse queuing systems, apply Monte-Carlo simulation techniques to simulate queuing problems efficiently.

Pre-requisite: NIL

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	1	0	0	0	0	1	0	2	3	2
CO2	3	3	2	2	2	0	0	0	0	1	0	2	3	2
CO3	2	3	3	3	2	0	0	0	1	1	1	2	3	2
CO4	2	3	3	2	2	0	0	0	1	1	1	2	3	2
CO5	3	3	2	3	2	0	0	0	0	1	0	3	3	3

Course Assessment methods- Theory with Laboratory Course

Direct		Indirect
CIE test I (8) CIE test II (8) CIE test III (8) Assignment/seminar/Quiz (5)	Objectives Test (6) Attendance(5) Total CIE: **40 marks** Semester End Examination: **60 marks**	Course end survey

Unit 1 - **Introduction to Operations Research and Linear Programming** — 9 Hours

The History of Operations Research - Operations Research Approach to Problem Solving - Models in Operations Research – Linear Programming problems (LPP), General Structure of an LP Model, Assumptions & limitations of an LP Model, Mathematical Model of a Linear Programming Problem. Graphical Method of solving a LPP, Optimal solution, Alternative (or Multiple) Optimal Solutions, Unbounded Solution, Infeasible Solution, Redundancy. Simplex Algorithm, Standard formulation of an LP Problem using simplex method, Simplex Algorithm (Only Maximization Case)

Unit 02: Transportation and Assignment models — **9 Hours**

Transportation problems - Introduction – Problem formulation, balancing the transportation problem – Solution for Initial basic feasible solution using North West Corner method, Least cost method, Vogel's method.
Assignment problems, Mathematical Models of Assignment Problem – Hungarian Method for Solving Assignment Problem, Travelling salesman problem.

Unit 03: Project Management using PERT and CPM, NETWORK MODELS	**9 Hours**

Differences Between PERT and CPM - PERT/CPM Network Components and Precedence Relationships - Critical Path Analysis - Forward Pass Method (For Earliest Event Time) - Backward Pass Method (For Latest Allowable Event Time) - Float (Slack) of an Activity and Event - Critical Path.
Network models, network components, construction of network diagram - Shortest route algorithm - Minimal spanning tree - Maximum flow algorithm. Optimization problems using network models.

Unit 04: Sequencing Problems & Decision Tree Algorithm	**9 Hours**

Sequencing Problems, Notations, Terminology and Assumptions, Processing n Jobs Through Two Machines, Johnson Algorithm.
Steps of Decision-Making Process - Types of Decision-Making Environments - Decision-Making Under Uncertainty - Optimism (Maximax or Minimin) Criterion - Pessimism (Maximin or Minimax) Criterion - Equal Probabilities (Laplace) Criterion - Coefficient of Optimism (Hurwicz) Criterion - Regret (Savage) Criterion.
Decision Trees Analysis – Creation of simple Decision trees under given probability conditions.

Unit 05: Queuing Theory and Monte-Carlo Simulation	**9 Hours**

Structure of Queuing System - Elements of Queuing models - Queue Discipline - Classification of Queuing Models - behaviour of the arrivals & service - Single-Server Queuing Models – Estimation of performance measures of a single server queuing system.
Introduction to Simulation - Types of Simulation - Advantages and Disadvantages of Simulation - Stochastic Simulation and Random Numbers - Random Number Generation - Simulation of Queuing Problems using Monte-Carlo Algorithm.

Theory: 45 Hrs	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total Hours: 45 Hrs**

TEXT BOOKS

1. H. A. Taha, "Operations Research ", Prentice Hall of India, 2013, Ninth Edition.
2. Panneerselvam. R , "Operations Research ", Prentice Hall of India, 2012, 2nd edition.
3. Hira and Gupta, "Introduction to Operations Research", S.Chand and Co., 2012.

REFERENCES

1. Shenoy, G.V; Srivastava,U.K; Sharma,S.C, "Operation Research for Management ", New Age International (P) Ltd, 2005.
2. Sherali, Hanif.D ; Jarvis,John.J ; Bazaraa,Mokhtar.S, "Linear Programming and Network Flows ", Wiley-Interscience, 2005.
3. Ravindran. A; Phillips, Dow.T; Solberg,James, "Operations Research Principles & Practice ", John Wiley, 2004.

Content beyond the Syllabus: (**Not to be included in the Semester End Examinations**) Use of ***MATLAB / Microsoft Excel / Python Programming*** Libraries for solving the following

problems:*Linear Programming; Assignment Problems; PERT / CPM; Transportation problems; Monte-Carlo simulation for Queuing.*

Dr.D.SENTHIL KUMAR, M.E.,Ph.D
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5

U23ME602	DESIGN OF TRANSMISSION SYSTEMS	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the students will be able to

CO1:	Analyze different flexible transmission elements and design suitable belt, rope, and chain drives for given power-transmission requirements.
CO2:	Evaluate gear forces, stresses, and dynamic effects and design spur and helical gears based on strength and wear criteria.
CO3:	Analyze bevel and worm gear systems and estimate gear dimensions and performance, considering stresses, efficiency, and thermal limits.
CO4:	Develop gearbox layouts using ray diagrams and design suitable speed-reduction or variable-speed gearbox systems for engineering applications.
CO5:	Design clutch and brake systems by evaluating torque transmission requirements and selecting appropriate configurations for performance and safety.

Pre-requisite:

Strength of Materials, Kinematics of Machines, Dynamics of Machinery

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	-	2	-	-	-	-	-	-	2	3	2
CO2	3	3	3	2	2	-	-	-	-	-	-	2	3	2
CO3	3	3	3	2	2	-	-	-	-	-	-	2	3	2
CO4	3	3	3	2	3	-	-	-	-	-	-	2	3	3
CO5	3	3	3	2	2	-	-	-	-	-	-	2	3	2

Course Assessment methods

Direct		Indirect
CIE test I (8) CIE test II (8) CIE test III (8)	Objectives Test (6) Attendance (5) Total CIE: **40 marks**	Course end survey

Assignment/seminar/Quiz (5)	Semester End Examination :**60 marks**	

Unit 01: FLEXIBLE TRANSMISSION ELEMENTS	**9 Hours**
Flexible transmission elements- design of flat belts & pulleys, selection of V-belts and pulleys, selection of hoisting wire ropes and pulleys, design of chains and sprockets	
Unit 02: SPUR GEARS AND HELICAL GEARS	**9 Hours**
Gear transmission- speed ratios and number of teeth, force analysis, tooth stresses, dynamic effects, fatigue strength, factor of safety, gear materials; Design of straight tooth spur gear and parallel axis helical gears based on strength and wear considerations, pressure angle in the normal and transverse plane; equivalent number of teeth and forces for helical gears.	
UNIT 03: BEVEL GEARS AND WORM GEARS	**9 HOURS**
Straight bevel gear- tooth terminology, tooth forces and stresses, equivalent number of teeth. Estimating the dimensions of a pair of straight bevel gears; Worm gear, merits & demerits, terminology, thermal capacity, materials, forces & stresses, efficiency, estimating the size of worm gear pair.	
Unit 04: GEAR BOXES	**9 Hours**
Gear box- geometric progression, standard step ratio; Ray diagram, kinematics layout; Design of sliding mesh gear box- Design of multi-seed gear box for machine tool applications; constant mesh gear box, speed reducer unit; Variable speed gear box; Fluid couplings, Torque converters for automotive applications.	
Unit 05: CLUTCHES AND BRAKES	**9 Hours**
Design of plate clutches, axial clutches, cone clutches, internal expanding rim clutches; Band and Block brakes, external shoe brakes, internal expanding shoe brake.	
(Note: Use of Data Book with Supplementary material is permitted for the University Examinations)	

Theory: 45 Hrs	**Tutorial: --**	**Practical: --**	**Project:--**	**Total Hours: 45 Hrs**

TEXT BOOKS

1.	Shigley, J. E., Mechanical Engineering Design, 10th ed., McGraw-Hill, 2014.
2.	Bhandari, V. B., —Design of Machine Element, 5th ed.,Tata McGraw-Hill, 2020

REFERENCES

1.	U.C.Jindal : Machine Design, "Design of Transmission System", Dorling Kindersley, 2010
2.	Alfred Hall, Halowenko, A and Laughlin, H., "Machine Design", Tata McGrawHill BookCo.(Schaum"s Outline), 2010
3.	Robert C. Juvinall and Kurt M. Marshek, "Fundamentals of Machine Design", 4th Edition, Wiley, 2005

4.	Gitin Maitra, L. Prasad "Hand book of Mechanical Design", 2nd Edition, Tata McGrawHill, 2001.
5.	Prabhu. T.J., "Design of Transmission Elements", Mani Offset, Chennai, 2000.

27/1/26

Dr.D.SENTHIL KUMAR, M.E.,Ph.D.
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5

U23ME603	INDUSTRIAL AUTOMATION	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the students will be able to

CO1:	Explain the fundamentals of industrial automation, control systems, hardware components, and sensors used in automated systems.
CO2:	Apply the latch principle and sensor-based control to design basic automation circuits.
CO3:	Develop electro-pneumatic circuits and apply automation design concepts for industrial applications.
CO4:	Apply PLC architecture and ladder logic programming to develop automation solutions.
CO5:	Analyze different network topologies and Design automation solutions for industrial applications.

Pre-requisite: Instrumentation and Control System, Computer Integrated Manufacturing.

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	1					1			2	1
CO2	2	2	3	2	2					1		1	3	2
CO3	2	1	3	2	2				1	1	1	1	3	3
CO4	2	2	3	2	3					1		1	3	3
CO5	2	2	2	3	3					2	1	2	2	3

Course Assessment methods

Direct		Indirect
CIE test I (8) CIE test II (8) CIE test III (8) Assignment/seminar/Quiz (5)	Objectives Test (6) Attendance (5) Total CIE: **40 marks** Semester End Examination:**60 marks**	Course end survey

Unit 01: INTRODUCTION TO AUTOMATION	9 Hours

The Industrial Control System: Automation and Process Control, Purpose of Industrial Automation, Industrial Automation Circuits: Power circuits-Automation circuits-Wiring diagrams, Computer-Based Industrial Control and Automation. **Hardware Components:** Relays-Principle-Power relay- Latching relay, Reed relay, Solenoid, Sensors: Thermal overload-Proximity-Photoelectric-Limit switch-Level switch, Timers-ON delay-OFF delay.

Unit 02: AUTOMATION CIRCUITS PRINCIPLES	9 Hours

Designing Automation Circuits: The Latch Principle, The Principle of "Command", Automation Circuit Design Regulations, Implementation of Automation Circuits, Machine Operation with Starting delay and stopping delay, **Automation Circuits with Sensors:** Starting a Machine with Cancelling Ability- Pump Operation Based on Level Control- Operation of Two Pumps According to Demand- Automation of a Garage Door, and Problems on circuit design.

Unit 03: DESIGN OF AUTOMATION CIRCUITS	9 Hours

Electro-Pneumatic Components and Symbols: Pneumatic Devices- Single and double acting cylinders, Calculations in Pneumatic Cylinders, Pressurized Air Flow Control Valves- DCVs, Cascade method Circuits, **Electro-Pneumatic Automation:** Applications- Automatic actuation of cylinders, Object Stamping Machine, Conveyor Arrangement for Objects Shorting and simple problems on automation design.

Unit 04: PROGRAMMABLE LOGIC CONTROLLERS	9 Hours

Introduction to PLCs: Modular Construction of a PLC, PLC I/O Components, Digital I/O Modules, Analog I/O Modules, Central Processing Unit. Basic Programming Principles of PLC: The generic form of Ladder logic. **PLC Programming:** Basic Programming Instructions, Boolean Logic and Activation Instructions, Programming with Timers and Counters, Simple PLC programming problems.

Unit 05: AUTOMATION NETWORKING AND APPLICATIONS	9 Hours

Networking: Topology of a Network- Star, Ring and Bus topology, Communication Protocols, The Actuator-Sensor Interface (AS-I) Network, The Profibus Network, SCADA Systems. **Automation application:** Conveyor System with Weight Control, A Simple Robotic Arm for Pickup and Placement of Light Objects, The Shearing Machine of an Unfolded Sheet, Rolling Mill Machine and Control of sheet thickness.

Theory: 45 Hrs	Tutorial: -	Practical: --	Project:--	Total Hours: 45 Hrs

TEXT BOOKS

1.	Stamatios Manesis, George Nikolakopoulos, "Introduction to Industrial Automation", CRC Press, 2018.
2.	Mikell P. Groover, "Automation, production systems, and computer-integrated manufacturing", Prentice Hall, 2008.

REFERENCES	
1.	Shimon Y. N (Editor), "Springer Handbook of Automation", Springer Berlin Heidelberg, 2009.
2.	Frank Lamb, "Industrial Automation-Hands-On", McGraw-Hill Education, 2013.
3.	B.R. Mehta, Y. Jaganmohan Reddy, "Industrial Process Automation Systems-Design and Implementation", Butterworth-Heinemann, 2014.
4.	K.L.S. Sharma, "Overview of Industrial Process Automation", Elsevier Science, 2011.

Dr.D.SENTHIL KUMAR, M.E.,Ph.D
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-

U23ME941	ENERGY CONSERVATION IN INDUSTRIES	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1:	Determine the energy consumption, utilization, and energy audit in industries.
CO2:	Measure the enhancement of energy efficiency in industrial electrical utilities.
CO3:	Diagnose the cause for under performance of thermal utilities and suggest suitable remedial measures thereof.
CO4:	Analyse the energy consumption in industries major utilities.
CO5:	Apply the concepts of energy economics and financial analysis techniques in industries.

Pre-requisite:

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	2	2	3					2	1	2
CO2	3	3	3	2	3		3					3		3
CO3	3	3	3	2	3		3					3	3	
CO4	3	3	3	2	3		3					3	3	
CO5	2	3	3	2	3		3					3		3

Course Assessment methods

Direct		Indirect
CIE test I (8) CIE test II (8) CIE test III (8) Objectives Test (6)	Assignment/seminar/Quiz (5) Attendance (5) Total CIE: **40 marks** Semester End Examination: **60 marks**	Course end survey

Unit 01: GENERAL CONCEPTS AND ENGINEERING CONSIDERATIONS — **9 Hours**

Energy - Power – Past & Present scenario of World; National Energy consumption, Act 2001 - Industrial energy conservation – Energy efficiency technologies - Energy Auditing: Need, Types, Methodology and Barriers - Energy efficiency in boilers (simple problems) - Industrial waste heat recovery.

Unit 02: ENERGY CONSERVATION IN ELECTRICAL INDUSTRIES — **9 Hours**

Introduction - Energy conservation in electrical systems - Energy conservation techniques: Diesel generator

(DG), Thermal power plants, Combined cycle gas turbine (CCGT), Motors, Compressors, Fans and Refrigeration systems - Solar panels installation for partial plant load – Energy Storage Solutions. (Simple problems)

Unit 03: ENERGY CONSERVATION IN MECHANICAL INDUSTRIES	**9 Hours**
Introduction - Optimized automation in machine operations (simple calculations) - Cutting power analysis in machining operations - Concepts of energy efficiency: Machine tools, Gears, and Hydraulic presses - Energy conservation in forging industry - Induction heaters for forging industry.	
Unit 04: ENERGY CONSERVATION IN CEMENT, CERAMIC AND GLASS INDUSTRIES	**9 Hours**
Introduction - Major process equipment - Energy efficiency opportunities - Energy conservation techniques: Cement industry, Ceramic industry and Glass industry - Energy consumption - Energy conservation measures (simple problems).	
Unit 05: ENERGY CONSERVATION IN METALLURGICAL AND MINING INDUSTRIES	**9 Hours**
Introduction - iron and steel making processes - Energy conservation technologies - Energy saving in aluminium, copper and nickel industries (simple problems) - Energy conservation in cupola furnaces - Induction furnaces - Electric arc furnaces - Case study: HINDALCO industries ltd.	

Theory: 45 Hrs	**Tutorial: --**	**Practical: --**	**Project:--**	**Total Hours: 45 Hrs**

TEXT BOOKS

1. Bhatia. S.C, and Puneet Mangla "Industrial Energy Conservation", Woodhead Publication, New Delhi, 2018.
2. White. L.C., P.S. Schmidt, D.R. Brown, "Industrial Energy Management and Utilisation" Hemisphere Publication, Washington, 2002.

REFERENCES

1. Energy Manager Training Manual (4 Volumes) available at www.energymanagertraining.com. a website administered by Bureau of Energy Efficiency (BEE), a statutory body under Ministry of Power, Government of India, 2004.
2. Turner. W.C., "Energy Management Hand book", Wiley, New York, 2018.
3. Dryden. I.G.C., "The Efficient Use of Energy" Butterworths, London, 2013
4. Soteris A. Kalogirou, "Solar Energy Engineering : Processes and Systems", Academic Press, New Delhi, 2023.
5. Ibrahim Dinçer, Marc A. Rosen, "Thermal Energy Storage Systems and Applications", John Wiley & Sons, 2021.

Dr.D.SENTHIL KUMAR, ME.PhD
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5

U23ME926	DATA ANALYTICS	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the students will be able to

CO1:	Explain the fundamentals of data analytics and its applications.
CO2:	Apply appropriate statistical analytical tools to interpret real-world engineering data.
CO3:	Analyze raw engineering datasets for quality issues and perform necessary pre-processing and exploratory analysis techniques.
CO4:	Analyze engineering data using appropriate models and justify the best model using performance.
CO5:	Apply Python tools to pre-process, analyze, and visualize data, and validate the results.

Pre-requisite: Machine Learning

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	3	-	-	-	3	3	3	3	2	2
CO2	3	3	3	2	3	-	-	-	3	2	2	3	2	2
CO3	3	2	2	3	3	-	-	-	3	3	2	3	2	2
CO4	3	3	3	3	3	-	-	-	3	3	2	3	3	3
CO5	3	3	3	3	3	-	-	-	3	3	2	2	3	3

Course Assessment methods

Direct		Indirect
CIE test I (8) CIE test II (8) CIE test III (8) Assignment/seminar/Quiz (5)	Objectives Test (6) Attendance (5) Total CIE: **40 marks** Semester End Examination: **60 marks**	Course end survey

Unit 01: INTRODUCTION TO DATA ANALYTICS	9 Hours

Introduction- Applications of Data analytics in various fields- Types of data – Descriptive, predictive, and prescriptive analytics- Data processing chain – Business intelligence concept and applications-Data warehousing.

Unit 02: STATISTICAL ANALYTICS	**9 Hours**
Measures of central tendency: Mean, Median, Mode - Standard Deviation – Variance - Interquartile range - Normal distribution - Skewness and Kurtosis –Hypothesis testing: z-test - Confident interval - t-test for one sample - chi-square test – ANOVA.	

Unit 03: DATA PRE-PROCESSING & EXPLORATION	**9 Hours**
Data collection from sensors, machines, experiments- Data mining-Data cleaning: missing values, noise removal, outliers- Feature extraction and feature scaling- Data transformation, encoding of categorical data-Exploratory Data Analysis (EDA): Histograms, box plots, scatter plots, Correlation and covariance-Data mining best practices-Data mining mistakes.	

Unit 04: DATA ANALYSIS	**9 Hours**
Introduction - Importance of data analysis – Decision trees-Decision tree construction-Criteria for decision tree algorithm-Regression models-Artificial Neural Networks-Design principles of ANN- Cluster analysis-K-means clustering- Model evaluation metrics- Association rule mining- Association rules exercise.	

Unit 05: PYTHON FOR DATA ANALYTICS	**9 Hours**
Python libraries – Jupiter & Spider module – NumPy- pandas -Scikit-Learn - data handling, slicing & repair – plotting – variables and data types – operators - sequence data – exploratory data analysis – dealing with missing data – data visualization-Case studies.	

Theory: 45 Hrs	**Tutorial: --**	**Practical: --**	**Project:--**	**Total Hours: 45 Hrs**

TEXT BOOKS

1.	Anil Maheshwari, "Data Analytics", McGraw Hill Education Pvt ltd., 2018.
2.	Jake VanderPlas, "Python Data Science Handbook, O'Reilly Media, Inc.,2017.

REFERENCES

1.	Robert S Witte, John Witte, "Statistics", John Wiley & Sons, Inc., 2017.
2.	Radha Sankarmani, S.Vijaya Lakshmi. Data Analytics, Willey India Pvt ltd., 2012
3.	Davy Cielen, Arno D.B, Mohamed Ali, "Introducing Data Science", Manning Publications Co, 2016.
4.	Gaoyan Ou, Zhanxing Zhu, Bing Dong, Weinan, "Introduction to Data Science", World Scientific Publishing Co. Pte. Ltd., 2024.

Dr.D.SENTHIL KUMAR, M.E.,Ph.D.
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5

U23ME939	PRODUCTION PLANNING AND CONTROL	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the students will be able to

CO1:	Analyze various production systems and evaluate product design factors by comparing their impact on productivity.
CO2:	Develop and justify an efficient process plan by assessing routing alternatives and machine capacity constraints.
CO3:	Apply suitable scheduling rules to solve loading, sequencing, and Gantt chart–based scheduling problems.
CO4:	Perform value engineering using FAS, evaluate replacement alternatives for deteriorating assets, and justify decisions using economic criteria.
CO5:	Design appropriate inventory control policies by calculating EOQ and ABC classification.

Pre-requisite:

Manufacturing process

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	2								3	2
CO2	3	2	3	2	2								3	2
CO3	3	2	3	2	2								3	2
CO4	3	2	3	2	2								3	2
CO5	3	2	3	2	2								3	2

Course Assessment methods

Direct		Indirect
CIE test I (8)	Objectives Test (6)	Course end survey

CIE test II (8) CIE test III (8) Assignment/seminar/Quiz (5)	Attendance (5) Total CIE: **40 marks** Semester End Examination:**60marks**	

Unit 01: CONCEPTS OF PRODUCTION PLANNING AND ECONOMICS	**9 Hours**
Objectives and benefits of planning and control - Functions of production control - Types of production - job, batch, and continuous - Product development and design - Marketing aspect - Functional aspects - Operational aspect - Durability and dependability aspect - Aesthetic aspect. Profit consideration - Standardization, Simplification & specialization – Break - even analysis - Economics of a new design.	
Unit 02: PRODUCT PLANNING AND PROCESS PLANNING	**9 Hours**
Product planning - Extending the original product information - Value analysis - Problems in lack of product planning - Process planning and routing - Prerequisite information needed for process planning - Steps in process planning - Quantity determination in batch production - Machine capacity, balancing - Analysis of process capabilities in a multi-product system.	
Unit 03: PRODUCTION SCHEDULING	**9 Hours**
Production Control Systems - Loading and scheduling - Master Scheduling - Scheduling rules-Gantt charts - Perpetual loading - Basic scheduling problems - Line of balance – Flow production scheduling - Batch production scheduling - Product sequencing – Production Control systems- Periodic batch control - Material requirement planning kanban – Dispatching-Progress reporting and expediting- Manufacturing lead time - Techniques for aligning completion times and due dates.	
Unit 04: VALUE ENGINEERING & REPLACEMENT ANALYSIS	**9 Hours**
Introduction– Types of Value– Seven Phases of Value Analysis– Application and Advantages of Value Analysis– Value Analysis of a Graphite Pencil by Matrix Method – Function Analysis System Technique – Replacement of Items that Fail Completely– Replacement of Items that Deteriorate– Replacement of the Defender. Simple problems.	
Unit 05: INVENTORY CONTROL AND RECENT TRENDS IN PPC	**9 Hours**
Inventory control-Purpose of holding stock - Effect of demand on inventories-Ordering procedures. Two bin system - Ordering cycle system - Determination of Economic order quantity and economic lot size - ABC analysis - Recorder procedure-Introduction to computer integrated production planning systems- elements of JIT Systems. Simple problems.	

Theory: 45 Hrs	**Tutorial:--**	**Practical: --**	**Project:--**	**Total Hours: 45 Hrs**

TEXT BOOKS

1.	Martand Telsang, "Industrial Engineering and Production Management", Fourth edition, S. Chand and Company, 2022.

2.	Pravin Kumar, Industrial Engineering and Management, Pearson Publications, 2017.

REFERENCES

1.	Rohit Manglik, "Production Planning and Control", EduGorilla Publication, 2023.
2.	Jain. K.C. & Aggarwal. L.N., "Production Planning, Control and Industrial Management", 8th Edition, Khanna Publishers, 2019.
3.	Samuel Eilon, "Elements of Production Planning and Control", Pearson, 2015.
4.	Elwood S.Buffa, and Rakesh K.Sarin, "Modern Production / Operations Management", 8th Edition, John Wiley and Sons, 2007.
5.	Upendra Kachru, "Production and operations management – Text and cases", Excel Books, 1st edition 2007.
6.	Chary. S.N., "Theory and Problems in Production & Operations Management", Tata McGraw-Hill, 1995.

Dr.D.SENTHIL KUMAR, M.E.,Ph.D
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5

U23ME943	HYDRAULICS AND PNEUMATICS	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1:	Explain the working principles of fluid power systems and hydraulic pumps.
CO2:	Describe the working principles of hydraulic actuators and control components.
CO3:	Design the Advanced Hydraulic Systems, Circuits, and Control Applications.
CO4:	Apply the working principles of Pneumatic Components, Circuit Design, and Fluidic Logic.
CO5:	Evaluate the operating condition of fluid power systems and diagnose faults or malfunctions effectively.

Pre-requisite:

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3		3									2	2	2
CO2	3		3		2							2	2	2
CO3	3		3		3							2	2	3
CO4	3		3		3							2	2	3
CO5	2	3	3		2							3	2	2

Course Assessment methods- Theory Course

Direct		Indirect
CIE test I (8) CIE test II (8) CIE test III (8) Assignment/seminar/Quiz (5)	Objectives Test (6) Attendance (5) Total CIE: **40 marks** Semester End Examination **:60 marks**	Course end survey

Unit 01: FLUID POWER PRINICIPLES AND HYDRAULIC PUMPS — **9 Hours**

Fluid power systems – Types of fluids – Properties of fluids - Basics of Hydraulics – Pascal's Law - Sources of Hydraulic power : Pumping Theory – Vane, Gear and Piston Pump – Construction, Working, Design, Advantages, Disadvantages, Performance, Selection criteria of pumps – Fixed displacement pumps – Work, Power and Torque-Problems.

Unit 02: HYDRAULIC ACTUATORS AND CONTROL COMPONENTS — **9 Hours**

Hydraulic Actuators: Cylinders – Types and construction – Rotary actuators-Hydraulic

motors – Applications. Control Components : Direction Control and pressure control valves – Types, Construction and Operation – Accessories : Reservoirs, Pressure Switches – Filters – types and selection - Applications	
Unit 03: HYDRAULIC SYSTEMS AND CIRCUITS Hydraulic cushioning, Accumulators, Intensifiers, Servo and Proportional valves – Applications. Fluid Power ANSI Symbols - Industrial hydraulic circuits – Regenerative, Double Pump, Air-over oil, Sequence, Reciprocation, Synchronization, Fail-Safe, Speed Control, Deceleration circuits – Electro Hydraulics - Problems	**9 Hours**
Unit 04: PNEUMATIC AND ELECTRO PNEUMATIC SYSTEMS Properties of air –Air preparation and distribution – Filters, Regulator, Lubricator, Muffler, Air control Valves, Quick Exhaust Valves, Pneumatic actuators, Design of Pneumatic circuit – classification - single cylinder and multi cylinder circuits, Ladder diagram – timer circuits - Problems	**9 Hours**
Unit 05: TROUBLE SHOOTING AND APPLICATIONS Selection, Installation, Conditioning, Trouble Shooting and Remedies in Hydraulic and Pneumatic systems, Press and Forklift applications – Low cost Automation – Hydraulic and Pneumatic power packs.	**9 Hours**

Theory: 45 Hrs	**Tutorial: -**	**Practical: -**	**Project: -**	**Total Hours: 45 Hrs**

TEXT BOOKS

1.	Anthony Esposito, "Fluid Power with Applications", seventh edition, Pearson's, 2025.
2.	M. Galal Rabie, "Fluid Power Engineering", 2nd Edition, McGraw Hill, 2023.

REFERENCES

1.	Jagadeesha. T., "Pneumatics Concepts, Design and Applications ", Universities Press, 2015.
2.	Joshi.P., Pneumatic Control", Wiley India, 2008.
3.	Majumdar, S.R., "Oil Hydraulics Systems – Principles and Maintenance",TataMcGraw Hill, 2001.
4.	Shanmugasundaram.K., "Hydraulic and Pneumatic Controls". Chand & Co, 2006.
5.	Srinivasan.R., "Hydraulic and Pneumatic Controls", Vijay Nicole Imprints, 2008.

Dr.D.SENTHIL KUMAR, M.E.,Ph.D
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5

27/11/25

U23ME936	INDUSTRIAL ENGINEERING AND MANAGEMENT	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the students will be able to

CO1:	Describe the fundamentals, functions, and evolution of Industrial Engineering and explain basic concepts of facility location, plant layout, and line balancing.
CO2:	Examine existing work methods and propose measurable improvements using work-study and time-study techniques.
CO3:	Develop forecasting models using qualitative and quantitative methods to support effective production planning and control.
CO4:	Analyze advanced manufacturing systems and evaluate material-handling solutions using system principles and equipment classifications.
CO5:	Apply TQM methodology to improve product and process quality, and use decision-tree analysis to select optimal decisions under uncertainty.

Pre-requisite: Nil

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2		2							2	3	2
CO2	3	2	3	2	2								3	3
CO3	3	3	2	2	2							2	3	2
CO4	3	2	2		3							2	3	3
CO5	2	2	3	2	2					2		3	3	2

Course Assessment methods

Direct		Indirect
CIE test I (8) CIE test II (8) CIE test III (8)	Assignment/seminar/Quiz (5) Attendance (5) Total CIE: **40marks**	Course end survey

Objectives Test (6)	Semester End Examination:**60 marks**	

Unit 01: INTRODUCTION TO INDUSTRIAL ENGINEERING, FACILITY LOCATION AND LAYOUT.	**9 Hours**
Definition, history and development of Industrial Engineering – Functions of Industrial Engineering – Systems concept – Introduction – Facility Location – Transportation Method – Centroidal Method – Plant Layout – Systematic Layout Planning – Block Diagram – Assembly Line Balancing – Group Technology – Cellular Manufacturing.	
Unit 02: WORK STUDY	**9 Hours**
Method study, basic procedure – Selection - Recording of process - Critical analysis, Development - Implementation - Micro motion and memo motion study – Work measurement - Techniques of work measurement - Time study - Production study - Work sampling - Synthesis from standard data - Predetermined motion time standards.	
Unit 03: FORECASTING	**9 Hours**
Introduction–Determinants of Demand – Demand Patterns – Measures of forecast error – Qualitative Forecasting Methods – Delphi techniques. Market Research, Nominal Group Technique – Quantitative Forecasting methods – Moving Average Methods, Exponential Smoothing Methods, Regression methods–Monitoring and Control of Forecasts – Requirements and Selection of Good forecasting methods.	
Unit 04: MANUFACTURING SYSTEMS&MATERIAL HANDLING SYSTEMS	**9 Hours**
Introduction–Flexible Manufacturing System–CAD/CAM–Lean Manufacturing–Agile Manufacturing—Relationship between Material Handling and Plant Layout–Functions of Material Handling Systems–Objectives of Material Handling Systems–Principles of Material Handling Systems–Types of Material Handling Equipment's.	
Unit 05: QUALITY CONTROL & DECISION-MAKING	**9 Hours**
Definitions of Quality– Dimensions of Quality– Quality Planning, Assurance and Control– Costs of Quality–Total Quality Management– Seven Basic Tools for Quality Control– Quality Function Deployment– Quality Awards–Decision-Making Environments– Decision Tree Analysis.	

Theory: 45Hrs	**Tutorial: --**	**Practical: --**	**Project:--**	**Total Hours: 45 Hrs**

TEXT BOOKS

1.	Pravin Kumar, Industrial Engineering and Management,Pearson Publications.2017.
2.	O.P. Khanna, Industrial Engineering and Management, DhanpatRai Publications.2021

REFERENCES

1.	S.K. Sharma, Industrial Engineering & Management,Khanna Publishing House, 2022.

2.	James A. Tompkins, Facilities Planning,Wiley Publication,2010.
3.	Juran&Gryna, Quality Planning and Analysis,McGraw-Hill Education Publication, 2017.
4.	Elwood S. Buffa, Modern Production/Operations Management,Wiley Publication,2007.

28/1/26

Dr.D.SENTHIL KUMAR, M.E.,Ph.D
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5

U23ME942	SURFACE ENGINEERING AND COATING TECHNOLOGIES	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the students will be able to

CO1:	Summarize surface topography, friction laws, and frictional behaviour under different operating conditions.
CO2:	Analyse the principles, types, and mechanisms of wear and corrosion, assess materials, and design prevention strategies.
CO3:	Assess the frictional behaviour of advanced alloys, ceramics, polymers, and biomaterials for applications in biotribology and nanotribology.
CO4:	Investigate surface properties and contrast the principal techniques used in engineering surface modification and coating.
CO5:	Examine coating characteristics using common analytical techniques and **validate** coating quality through ASTM testing procedures.

Pre-requisite:

Engineering Materials and Metallurgy

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	3	2	-	-	-	-	-	-	-	3	2
CO2	3	3	-	3	2	-	-	-	-	-	-	-	3	3
CO3	3	2	2	3	2	-	-	-	-	-	-	-	3	3
CO4	3	2	2	3	2	-	-	-	-	-	-	-	3	2
CO5	3	2	-	3	3	-	-	-	-	-	-	-	3	3

Course Assessment methods

Direct		Indirect
CIE test I (8)	Objectives Test (6)	Course end survey

CIE test II (8) CIE test III (8) Assignment/seminar/Quiz (5)	Attendance (5) Total CIE: **40 marks** Semester End Examination :**60 marks**	

Unit 01: SURFACE TOPOGRAPHY AND FRICTION	**9 Hours**
Basics of surface features – Roughness parameters – surface measurement – Cause of friction Laws of friction – Static friction – Rolling Friction – Stick-slip Phenomenon – Friction properties of metal and nonmetals – Friction in extreme conditions – Thermal considerations in sliding contact.	
Unit 02: WEAR AND CORROSION	**9 Hours**
Introduction – Types of wear and Fretting - Wear Laws of wear – Theoretical wear models – Wear of metals and non-metals – International standards in friction and wear measurement - Introduction – Principle of corrosion – Types of corrosion – Factors influencing corrosion – Laboratory testing, Evaluation, Prevention of Corrosion – Corrosion inhibitors.	
Unit 03: SURFACE COATING MATERIALS	**9 Hours**
Introduction – High and low friction materials - Advanced alloys – Super alloys, Titanium alloys, Magnesium alloys, Aluminium alloys, and Nickel-based alloys – Ceramics – Polymers – Biomaterials – Applications – Bio Tribology - Nanotribology.	
Unit 04: SURFACE COATING TECHNOLOGY	**9 Hours**
Surface properties – Hydrophobic – Super hydrophobic – Hydrophilic – Surface metallurgy – Surface coating Techniques –Electroless- Electroplating- PVD – CVD – PECVD – Ion implantation – Surface welding – Thermal spraying – Laser surface hardening and alloying – New trends in coating technology – DLC – CNC – Thick coatings – Nano-engineered coatings – Other coatings, Corrosion resistant coatings.	
Unit 05: COATING CHARACTERIZATION	**9 Hours**
Characterization of coatings – XRD, SEM, FESEM, AFM, Optical and Magnetic properties -measurement of thickness- porosity-adhesion strength, residual stresses, flexural strength testing- spectroscopic analysis of modified surfaces etc., Quality testing of coating (ASTM-standards).	

Theory: 45 Hrs	**Tutorial: --**	**Practical: --**	**Project:--**	**Total Hours: 45 Hrs**

TEXT BOOKS

1. G. W. Stachowiak & A. W. Batchelor, *Engineering Tribology*, 5th ed., Butterworth-Heinemann, 2025.
2. R. Gohar & H. Rahnejat, *Fundamentals of Tribology*, 3rd ed., World Scientific, 2018.
3. C. M. Cotell, J. A. Sprague & F. A. Smidt, Jr. (eds), *ASM Handbook, Vol. 5: Surface Engineering*, ASM International, 1994.

REFERENCES

1.	J. Paulo Davim (ed.), Materials and Surface Engineering, Woodhead Publishing, February 2012.
2.	P. M. Martin, Introduction to Surface Engineering and Functionally Engineered Materials, John Wiley & Sons, 2011.
3.	J. R. Davis, Corrosion: Understanding the Basics, ASM International, 2000.
4.	T. Burakowski & T. Wierzchoń, Surface Engineering of Metals: Principles, Equipment, Technologies, CRC Press, 1998.

Dr.D.SENTHIL KUMAR, M.E.,Ph.D
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5

U23GE602B	COMPREHENSION	L	T	P	J	C
		1	0	0	0	1

B.E. Mechanical Engineering

Course Assessment Methods

CIE Test I (30) CIE Test II (30) CIE Test III (40)	Total CIE: 100 Marks Semester End Examination: NIL

Course Contents for CIE 1 — **5 Hours**

Applied Mechanics & Design

Fundamental concepts of stress–strain behaviour- elastic constants - Poisson's ratio - principal stresses-Mohr's circle-bending moment and shear force diagrams-torsion of circular shafts, and Euler's buckling theory-Analysis of trusses, friction (belt friction, screw jack) - strain energy. Theory of machines - cams, gears, gear trains, flywheels, governors-balancing of rotating and reciprocating masses- single degree-of-freedom vibrations - Design of shafts, keys, couplings, riveted and welded joints.

Course Contents for CIE 2 — **5 Hours**

Fluid Mechanics and Thermal Sciences

Bernoulli equation & applications – laminar - turbulent flow characteristics - pipe losses - dimensional analysis. Zeroth, First & Second Laws applications, entropy calculations, steady-flow energy analysis, ideal and real gas relations- steam property evaluation. Thermodynamic cycles - Otto, Diesel, Brayton and Rankine cycles. Vapour compression refrigeration cycle - psychrometric processes. Heat transfer fundamentals: one-dimensional steady conduction, fins, convection correlations, radiation laws.

Course Contents for CIE 3 — **5 Hours**

Materials, Manufacturing and Metrology

Fundamentals of engineering materials - iron–carbon phase diagram - heat treatment processes. Casting - riser and gating design – principles of welding, brazing and soldering. Metal forming processes - rolling, forging, and extrusion load analysis. Machining principles - chip formation, cutting forces, tool materials, tool wear, and Taylor's tool-life equation - metrology concepts - limits, fits, tolerances, comparators - surface finish measurement - concepts of coordinate measuring machine.

Theory Hours:15	Tutorial: --	Practical: --	Project: --	Total Hours: 15

15/12/25

Dr.D.SENTHIL KUMAR, ME.PhD
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5

U23ME604	AUTOMATION AND SIMULATION LABORATORY	L	T	P	J	C
		0	0	4	0	2

Course Outcomes

At the end of the course, the student will be able to

CO1:	Design and develop basic fluid power circuits and electro-pneumatic circuits for industrial applications.
CO2:	Develop PLC ladder logic programs for the simple automation systems and Analyse the performance of controller.
CO3:	Solve real-time industrial automation problems using FluidSim, Lab VIEW, and MATLAB software.

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	2	3					2			3	2	2
CO2	2	3	2	3					2			3	2	2
CO3	3	2	3	3					2		2	3	3	3

Course Assessment methods

Direct		Indirect
CIE test I (15) Quiz I- (5) CIE test II (15) Quiz II- (5)	RTPS (10) Record (10) Total CIE: 60 marks Semester End Examination (40 marks)	Course end survey

List of Experiments:

1. Design the fluid power circuits to control the direction actuators.
2. Design of fluid power circuits to control the speed of actuators.
   a. Meter in circuit b. Meter out circuit
3. Design a fluid power circuit for the automatic actuation of cylinder sequentially.
4. Design of Electro pneumatic circuits using trainer kit.
5. Develop a ladder logic program for various basic industrial logic (AND.OR, NOT, NOR and EX-OR) using PLC.
6. Develop ladder programming to set timer and counter in PLC for the actuation of pneumatic cylinder
7. Develop ladder programming to SET and RESET solenoid using PLC.
8. Develop ladder programming for the Servo motor running under open loop using PLC.
9. Develop ladder programming for the Servo motor running under closed loop using PLC.
10. Speed control of DC motor using PID controller interfacing.

11. Analyse the controller performance of Temperature, Flow and Pressure using process controller.
12. Design and simulate basic Hydraulic and Pneumatic circuits using software.
13. Design and simulate for the automatic actuation of cylinder sequentially using software
14. Simulation and indication of temperature, level and pressure using Lab View software.
15. Simulation using Lab VIEW and Data acquisition using NI Hardware
16. Simulation using MATLAB software
    a. Simulation of Cam and follower mechanism to find the displacement
    b. Simulation of air conditioning with condenser and evaporator temperatures as input to estimate the COP
    c. Simulation of heat exchanger to find the LMTD

List of Equipment (for a batch of 30 students)

1. Basic Pneumatic Trainer Kit with manual and electrical controls - 1 each
2. Basic Pneumatic Trainer Kit with PLC controls - 1 No.
3. Fluidsim- hydro & Pneumo Software - 2 sets.
4. Lab VIEW software - 40 users.
5. Data acquisition setup - 1 each.
6. MATLAB Software- 20 users.

Total Number of Hours: 60

Dr.D.SENTHIL KUMAR, M.E.,Ph.D
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5.

U23ME605	COMPUTER AIDED ANALYSIS LABORATORY	L	T	P	J	C
		0	0	4	0	2

Course Outcomes

At the end of the course, the students will be able to

CO1:	Apply FEA software to analyze structural and thermal problems and interpret key results for engineering applications.
CO2:	Design and develop HVAC duct layouts for various building types using relevant standards and modelling tools.
CO3:	Apply engineering analysis and simulation tools to solve real-time structural, thermal, vibration, and HVAC design problems by performing FEA on various elements and developing practical HVAC duct layouts for different building types.

Pre-requisite:

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3				3					3				
CO2	3	2	2		3					3			3	
CO3	3	3	3	2	3					3			3	3

Course Assessment methods

Direct		Indirect
CIE test I (15) Quiz I- (5) CIE test II (15) Quiz II- (5)	RTPS (10) Record (10) Total CIE: 60 marks Semester End Examination (40 marks)	Course end survey

LIST OF EXPERIMENTS

1. **Finite Element Analysis Using simulation software**
   i. Analysis of 1D element such as bar, rod and truss
   ii. Analysis of beams (cantilever, simply supported and fixed beam)
   iii. Analysis of an axis-symmetric element
   iv. Mode frequency analysis of beams (cantilever, simply supported and fixed beam)
   v. 2D heat transfer analysis (conduction and convection)
   vi. Harmonic analysis
   vii. Analysis of 3D components
2. **Design and modelling of HVAC duct systems**
   i. Develop a layout of HVAC Duct Systems for Corporate Office
   ii. Develop a layout of HVAC Duct Systems for Shopping Mall
   iii. Develop a layout of HVAC Duct Systems for Residential building

List of Equipment's:

1. Computer systems configuration: i7 - 7th GEN-8GB RAM-1TB HDD 22" LED DISPY

List of Equipment's: (for a batch of 30 students)

1. Solid Works 2019 -100 users.
2. ANSYS 12 – 50 users.

Theory: --	Tutorial: --	Practical: 60 Hrs	Project:--	Total Hours: 60 Hrs

17/12/25

Dr.D.SENTHILKUMAR, M.E.,Ph.D
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5

U23ME606	MINI PROJECT	L	T	P	J	C
		0	0	0	2	1

Course Outcomes

At the end of the course, the student will be able to

CO1:	Identify a real-world problem, determine the requirements, develop design solutions, and articulate technical ideas, strategies, and methodologies.
CO2:	Apply the new tools, algorithms, and techniques that contribute to obtain the solution of the project.
CO3:	Demonstrate project execution, documentation, and communication skills through presentations and reviews.

Pre-requisite:

--

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	-	2	2	2	3	-	-	2	3	2
CO2	3	3	3	3	3	2	2	2	3	-	3	2	3	2
CO3	2	-	-	-	2	2	-	-	-	3	-	3	3	2

Course Assessment Methods

Direct		Indirect
Review-I- 10 Review- II- 10 Review- III- 10 Final Project Report-10 marks	Total CIE: **40 marks** Semester End Examination: **60 marks**	Course end survey

1. The students formed into a team of convenient groups of not more than 4 members on a project are not allowed to change their team members.
2. Every project team should report to their faculty guide for discussion from the day of beginning of 6th semester.
3. The group is required to design and analyze the selected problem addressed in their project work to develop a solution.
4. A project report has to be submitted by each student group at the end of the 6th semester.
5. Three reviews have to be conducted by a team of faculty (minimum of 1 and maximum of 2) along with their faculty guide as a member of faculty team (for monitoring the progress of project planning and implementation).

Total Hours: 30 Hrs

Dr. D. SENTHIL KUMAR, ME.,Ph.D
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5

U23GE601	SOFT SKILLS AND APTITUDE – IV	L	T	P	J	C
		0	0	2	0	1

Course Outcomes

After successful completion of this course, the students should be able to

CO1:	Showcase soft-skill competencies through hands-on activities and case study-based approaches.
CO2:	Solve advanced problems beyond SSA-I, II & III levels in quantitative aptitude and logical reasoning, aiming to score 65–70% in company-specific internal assessments.
CO3:	Demonstrate verbal aptitude skills above SSA-I, II & III levels in key English topics, targeting 65–70% in company-specific internal assessments

Pre-requisite: Softskills and Aptitude I,II & III

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	1	1	2	2	3	3	3	1	3	1	1
CO2	3	3	3	2	2	2	1	3	3	2	1	3	2	2
CO3	1	1	1	1	1	1	1	3	3	3	1	3	1	1

Course Assessment methods

Direct				Indirect
CIE test I	(15)	RTPS	(10)	Course end survey
Quiz 1	(5)	Record	(10)	
CIE test II	(15)	Total CIE	: 60 marks	
Quiz 2	(5)	Semester End Examination: 40 marks		

1. Soft Skills	**Demonstrating Soft -Skills capabilities with reference to the following topics:** a. Mock group discussions b. Mock interviews c. Mock stress interviews d. Attention to detail e. Corporate profiles and Industry Insights f. Behavioural assessment tools and techniques

2. Quantitative Aptitude and Logical Reasoning		**Solving problems with reference to the following topics:** a. Stocks and Shares b. Functions & Polynomial c. Trigonometry d. Heights & Distance e. Statistics f. Crypt Arithmetic g. Input & Output h. Flow chart i. Platform-based questions: Cocubes, SHL, Mettl, HirePro, Pod AI, Do Select. j. Company specific questions for Product & Service companies.		
3. Verbal Aptitude		**Demonstrating English language skills with reference to the following topics:** a. Listening and repeating sentences verbatim with good voice modulation and pronunciation b. Reading comprehension c. Critical reasoning d. Theme detection e. Arranging jumbled words into meaningful sentences f. Reading sentences with clarity and fluency g. Company specific verbal questions		
Theory: 0	**Tutorial: 0**	**Practical: 30 hrs**	**Project: 0**	**Total Hours: 30 hrs**

Dr.S.Anita
Professor & Head
Department of Training

Dr. S. ANITA
Professor and Head
Department of Training,
SONA COLLEGE OF TECHNOLOGY,
SALEM-636 005.

U23ADS1003	SOFTWARE ENGINEERING	L	T	P	J	C
		3	0	0	0	3

PREAMBLE

The objective of this course is to introduce the concepts of Software engineering that encompasses the principles, methodologies, and tools used in the creation and maintenance of software systems. The course is designed in such a way that the students will acquire the necessary skills to apply the software engineering principles for software development in a methodical way to develop reliable, efficient, and high-quality software. The course addresses various stages of the software development lifecycle, including requirements analysis, design, implementation, testing, deployment, and maintenance.

The students will have the hands-on practice to draw all UML diagrams that helps in visualizing, specifying, constructing, and documenting the artifacts of software systems, making it a critical tool in software engineering. The students also get the knowledge to design and test the Object-Oriented Systems

COURSE OUTCOMES

At the end of the course, the student will be able to

CO1	Identify the scope and requirements of software engineering in IT industry and apply different SDLC models in different applications.
CO2	Design a Software Requirements Specification (SRS) document for real-time applications.
CO3	Analyze the object-oriented methodologies and workflows and apply object-oriented principles, techniques, appropriate UML models, and other artifacts to construct a design for a real-world problem.
CO4	Analyze and design system requirements using UML model to determine the use cases and identifying classes and their relationships.
CO5	Describe the different kind of software testing, System Usability Testing, User Satisfaction Testing.

Pre-requisite: NIL

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	1	3			3	3	3	1	2	-*	-*
CO2	2	3	3	1	3			3	3	3		2	-*	-*
CO3	2	3	3		3			3	3	3		2	-*	-*
CO4	1	3	3		3			3	3	3		2	-*	-*
CO5	1	3	3		3	1	3	3	3	3		2	-*	-*

-* Since this course is offered as an **Open Elective**, the relevance and contribution of each CO to specific PSOs may **vary depending on the parent program** to which the student belongs.

Course Assessment methods

Direct		Indirect
CIE test I (8) CIE test II (8) CIE test III (8) Objectives Test (6)	Attendance (5) Assignment / Seminar / Quiz – 5 Total CIE: 40 marks Semester End Examination: 60 Marks	Course end survey

UNIT I	SOFTWARE PRODUCT AND PROCESS	9 Hours
Introduction: The Nature of Software, Software Process, Process Models - A Generic Process Model, Prescriptive Process Models: The Waterfall Model, Incremental Model, Evolutionary Process Models, Concurrent Model, Agile Development- Agile process, Scrum.		
UNIT II	**SOFTWARE REQUIREMENTS AND ANALYSIS**	**9 Hours**
Software Requirements: Functional and Non-Functional requirements, Requirements Engineering: Requirement Engineering Process -Establishing the Groundwork, Eliciting requirements, Negotiating requirements, Validating requirements. Feasibility Studies, Software Requirement Specification (SRS) Document.		
UNIT III	**METHODOLOGY, MODELING, AND UNIFIED MODELING LANGUAGE**	**9 Hours**
Object Oriented Systems Development Life Cycle - Object Oriented Methodologies: Rumbaugh Methodology, Booch Methodology, Jacobson Methodology and Unified Approach. Unified Modeling Language: UML diagrams: Use case diagram, Activity Diagram, Class diagram, Sequence and collaboration diagram, Component Diagram, Deployment diagram.		
UNIT IV	**OBJECT ORIENTED ANALYSIS AND DESIGN**	**9 Hours**
Object Oriented Analysis: Identifying use cases, Classification, Identifying Object relationships. Object Oriented Design: Axioms, Corollaries, Designing Classes.		
UNIT V	**SOFTWARE QUALITY AND USABILITY TESTING**	**9 Hours**
Introduction, Software Quality Assurance Testing, Testing strategies: Black Box Testing, White Box Testing, Top-Down Testing, Bottom-Up Testing. Test cases, Test Plan, Continuous Testing, Myer's Debugging Principles, System Usability Testing, User Satisfaction Testing.		

Theory: 45 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 45 Hrs

TEXT BOOKS

1.	Roger S. Pressman, "Software Engineering – A practitioner's Approach", 9th Edition, McGraw-Hill International Edition, 2023.(UNIT-1)
2.	Ian Sommerville, "Software Engineering", 10th Edition, Pearson Education Asia, 2017. (UNIT-2)
3.	Ali Bahrami, "Object Oriented Systems Development", Tata McGraw-Hill, 2017. (UNIT-3,4,5)

REFERENCES

1.	Carlo Ghezzi, "Fundamentals of Software Engineering, 2/e", Pearson Education, 2016.

J. Akila

Dr. J. AKILANDESWARI
PROFESSOR & HEAD
Department of Information Technology
SONA COLLEGE OF TECHNOLOGY
SALEM - 636 005

O.E

U23BM1002	BASIC LIFE SUPPORT	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to		K - Levels
CO1:	Analyse Various BLS and First Aid Techniques	K2
CO2:	Understand Essentials of Anatomy and Physiology	K2
CO3:	Analyse Various BLS techniques for adults	K4
CO4:	Analyse Various BLS techniques for children and infants	K4
CO5:	Apply Respiratory techniques and AED at critical conditions	K3

**K1-Remebering, K2-Understanding, K3-Applying, K4- Analyzing, K5-Evaluating, K6- Creating

Pre-requisite:

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	-	-	-	1	3	1	-	-	-	1	-	-	-
CO2	3	1	-	-	-	1	3	1	-	-	-	1	-	-	-
CO3	3	1	-	-	-	1	3	1	-	-	-	1	-	-	-
CO4	3	1	-	-	-	1	3	1	-	-	-	1	-	-	-
CO5	3	1	-	-	-	1	3	1	-	-	-	1	-	-	-

Direct		Indirect
CIE test I (8) CIE test II (8) CIE test III (8) Objectives Test (6) Attendance (5)	Assignment / Seminar / Quiz (5) Total CIE: **40 marks** Semester End Examination : **60 marks**	Course end survey

UNIT 01: INTRODUCTION TO BASIC LIFE SUPPORT	9 Hours
General Concepts of Basic Life Support (BLS) – Chain of survival. BLS Algorithm, First Aid: Basic First A techniques- first aid kit, Law, Resuscitation, Top to Toe Assessment, Hygiene and Hand Washing.	
UNIT 02: ESSENTIALS OF ANATOMY AND PHYSIOLOGY OF HUMAN BODY	**9 Hours**
Levels of Organization-Chemicals-Cells-Tissues-Organs-Organ Systems, Metabolism and Homeostasis, Terminology and General Plan of the Body.	
UNIT 03: ADULT BASIC LIFE SUPPORT	**9 Hours**
BLS for adults: Adult BLS Algorithm, CPR, One Rescuer and Two Rescuer BLS for Adults- Adult Mouth-to-Mask Ventilation, Adult Bag-Mask Ventilation, Self-Assessment for Adult BLS - Case study.	
UNIT 04: PAEDIATRIC BASIC LIFE SUPPORT	**9 Hours**
BLS for children: BLS Algorithm children, One Rescuer and Two Rescuer BLS for children, Child Ventilation. BLS for Infants: One Rescuer and Two Rescuer BLS for infants-Case Studies.	
UNIT 05: AUTOMATED EXTERNAL DEFIBRILLATOR AND FOREIGN BODY AIRWAY OBSTRUCTION	**9 Hours**
AED for Adults, AED for Children and Infant, Self-Assessment for AED, FBAO- Respiration, Difficult Breathing, Drowning, Strangulation and Hanging, Chocking, Suffocation - Airway Management-Chest Discomforts-Case Studies.	

Theory: 45 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 45 Hrs

REFERENCES

1. Dr. Karl Disque, Basic Life Support Provider Handbook, Satori Continuum Publishing, USA, 2021.
2. INDIAN FIRST AID MANUAL – 7th Edition, St. John Ambulance Association (India) – Indian Red Cross Society National Headquarters, New Delhi, 2016.
3. Basic Life Support Training Manual, 1st Edition, Published by in Medical Developnfent Division, Ministry of Health Malaysia, Malaysia in December 2017.
4. Valerie C. Scanlon, Tina Sanders, Essentials of Anatomy and Physiology,5th Edition, F. A. Davis Company

Course Designer(s)	Academic Coordinator	BOS – Chairman
Prof.S.Mukesh Assistant Professor / BME	Dr.K.Manikandan Assistant Professor / BME	Dr.S.Prabakar Professor & Head

Professor and Head
Department of Biomedical Engineering
Knowledge College of Technology, Salem-5

U23BM1004	HOSPITAL MANAGEMENT	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to		K-Levels
CO1 :	Explain the basics of Hospital Management.	K2
CO2 :	Illustrate the knowledge of Human resource management and marketing in hospitals.	K3
CO3 :	Describe various Quantitative methods in healthcare management.	K2
CO4 :	Comprehend their knowledge in Hospital information system and supportive services.	K3
CO5 :	Analyze the quality and safety aspects in Hospital.	K3

**K1-Remebering, K2-Understanding, K3-Applying, K4- Analyzing, K5-Evaluating, K6- Creating

Pre-requisite: --

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	1	-	2	3	2	2	-	-	-	1	-	-	2
CO2	2	-	3	-	2	3	2	2	2	-	2	1	-	-	2
CO3	2	-	3	-		3	2	2	2	-	2	1	-	-	2
CO4	2	-	3	-	3	3	2	2	2	-	1	1	-	-	2
CO5	2	-	3	-	-	2	3	3	-	-	-	1	-	-	2

Course Assessment methods

Direct		Indirect
CIE test I (8) CIE test II (8) CIE test III (8) Objectives Test (6) Attendance (5)	Assignment / Seminar / Quiz (5) Total CIE: **40 marks** Semester End Examination : **60 marks**	Course end survey

UNIT 01: HEALTHCARE AND HOSPITAL ADMINISTRATION	9 Hours
Indian and Global Healthcare Systems, Types of Hospitals, Distinction between Hospital and Industry, Hospital Planning and Functional Layout, Equipment Planning, Strategic planninng, Role of Hospital Manager, Leadership- Motivation- Organizational behaviour, Ethics and Law, Fraud and abuse, Contemporary Challenges in Hospital Administration.	
UNIT 02: HUMAN RESOURCE MANAGEMENT AND MARKETING	**9 Hours**
Principles and Functions of HRM, Different Departments of Hospital, Tools of HRD, HumanResource Inventory and Manpower Planning, Recruitment- Selection and Induction Procedures, Methods of Training, Leadership grooming, Promotion and Transfer Policies, Conflict Resolution and Grievance Handling in Hospitals, Service Marketing in Healthcare- Patient Satisfaction- Branding.	
UNIT 03: QUANTITATIVE METHODS IN HEALTHCARE MANAGEMENT	**9 Hours**
Introduction to quantitative decision-making methods in healthcare management, Forecasting, Facility location and Facility layout, Staffing- Workload Analysis- Scheduling Tools, Resource allocation and Productivity, Supply chain and inventory management, Quality Control, Project Management, Basic Queuing and Capacity Models, Cost–Benefit and Cost–Effectiveness Analysis.	
UNIT 04: HOSPITAL INFORMATION SYSTEM AND SUPPORTIVE SERVICES	**9 Hours**
Clinical Information Systems and EMR, Administrative Information Systems, Medical Records Department, Central Sterilization and Supply Department – Non-Clinical Support Services: Pharmacy, Food, Laundry Services, Telemedicine and Digital Health Technologies, Biomedical Engineering and Equipment Maintenance Management, Disaster Management & Emergency Response System, Data Privacy-Cybersecurity and Interoperability in Healthcare IT.	
UNIT 05: FINANCE, QUALITY AND SAFETY ASPECTS IN HOSPITAL MANAGEMENT	**9 Hours**
Hospital Budgeting & Costing, Revenue Cycle Management: Insurance- TPA and Claims, Elements and Implementation of quality system, Quality auditing, International Standards: ISO 9001, JCI, -Features of NABH, NABA, NABL, Risk & Security Management, Fire Safety and Alarm System, Environmental & Waste Management, Hospital Field-visit / Virtual Visit.	

Theory: 45 Hrs	Tutorial:	Practical: --	Project:--	Total Hours: 45 Hrs

TEXT BOOKS

1.	R.C. Goyal and D.K.Sharma, Hospital Administration and Human Resource Management, PHI, 7th Edition, 2017.
2.	G.D. Kunders, Hospitals – Facilities Planning and Management, TMH, New Delhi, 1st Edition, 2017.

3.	S. M. Jha – Hospital Management, Himalaya Publishing House, 2nd Edition, 2011.
REFERENCES	
1.	Sharon B. Buchbinder and Nancy H. Shanks- Introduction to Healthcare Management,Jones and Bartlett Learning, 2017.
2.	Louis Gapenski – Healthcare Finance: An Introduction to Accounting & Financial Management, ACHE Learn, 6th Edition, 2015.
3.	Yasar A. Ozcan- Quantitative Methods in Healthcare management, Jossey Bass- JohnWiley and Sons, 2009.
4.	Nanette B. Sayles – Health Information Management Technology, AHIMA, 6th Edition, 2020.
5.	Girdhar J Gyani and Alexander Thomas - Handbook Of Healthcare Quality & Patient Safety, JBM Publishers, 3rd Edition, 2021.

Course Designer(s)	Academic Coordinator	BOS Chairman
Prof.M.Kiruthikha Assistant Professor / BME	Dr.K.Manikandan Assistant Professor / BME	Dr.S.Prabakar Professor & Head

Dr.S.PRABAKAR M.E.
Professor and Head
Department of Biomedical Engg.
Sona College of Technology

U23CE1008	Municipal Solid Waste Management	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the students will be able to

CO1:	Analyze the sources, quantity, characteristics, and impacts of solid waste and interpret the principles, regulations, and emerging IoT-based approaches for sustainable solid waste management.
CO2:	Evaluate on-site solid waste storage and segregation methods with respect to public health, economic aspects, and suitability under Indian conditions.
CO3:	Design and assess efficient solid waste collection, transportation, and transfer systems considering vehicles, manpower, routing, and field-level challenges.
CO4:	Compare and recommend appropriate off-site solid waste processing and resource recovery techniques based on technical feasibility and Indian case studies.
CO5:	Plan and design environmentally safe solid waste disposal systems, including sanitary landfills and advanced landfill management techniques.

Pre-requisite:

Nil

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	3	-	3	3	3	3	-	-	-	3	2	-
CO2	2	-	3	-	-	3	2	3	-	-	-	3	2	-
CO3	2	-	3	-	-	3	2	3	-	-	-	3	2	-
CO4	2	-	3	-	-	3	3	3	-	-	-	3	2	-
CO5	2	-	3	-	-	3	2	3	-	-	-	3	2	-
SDG	3, 4, 6, 7,11, 12, 13 & 15													

Course Assessment methods

Direct		Indirect
CIE test I (8) CIE test II (8) CIE test III (8) Assignment/seminar/Quiz (5)	Objectives Test (6) Attendance (5) Total CIE: 40 marks Semester End Examination (60)	Course end survey

UNIT-I - SOURCES AND TYPES	09 Hours
Sources and types of solid wastes - Quantity - factors affecting generation of solid wastes; characteristics - methods of sampling and characterization; Effects of improper disposal of solid wastes - public health effects. Principle of solid waste management –IoT Applications in Waste management; Public awareness; Role of NGOs; Solid waste management rules 2016 - Construction and demolition Wastes	
UNIT-II - ON-SITE STORAGE AND PROCESSING	**09 Hours**
On-site storage methods - Materials used for containers - on-site segregation of solid wastes - public health & economic aspects of storage - options under Indian conditions - Critical evaluation of options	
UNIT-III - COLLECTION AND TRANSFER	**09 Hours**
Methods of Residential and commercial waste collection - Collection vehicles - Manpower- collection routes - Analysis of collection systems; Transfer stations - Selection of location, operation & maintenance; options under Indian conditions - Field problems- solving	
UNIT-IV - OFF-SITE PROCESSING	**09 Hours**
Processing techniques and equipment; Resource recovery from solid wastes - Composting, incineration, Pyrolysis - Options under Indian conditions - Case studies.	
UNIT-V - DISPOSAL	**09 Hours**
Dumping of solid waste; Sanitary landfills - Site selection, design and operation of sanitary landfills - Leachate collection and treatment, Land fill bio reactor, Landfill capping, Landfill mining.	

Theory: 45 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 45 Hrs

TEXT BOOKS

1. George Tchobanoglous, "Integrated Solid Waste Management", McGraw-Hill Publishers,2003
2. Vesilind P.A. and Rimer A.E, "Unit Operations in Resource Recovery Engineering", Prentice Hall, Inc., 1981

REFERENCES

1. Manual on Municipal Solid Waste Management, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2000
2. Landreth R.E, and P.A and Rebers, "Municipal Solid Wastes –problems and Solutions", Lewis Publishers, 2000
3. Ramachandra T.V, "Management of Municipal Solid Waste", TERI press, New Delhi, 2009
4. Paul T Willams, "Waste Treatment and Disposal", John Wiley and Sons, 2000
5. http://nptel.iitm.ac.in

U23CE1009	Energy Efficiency and Green Building	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the students will be able to

CO1:	Acquire the basics understanding of green building concept and associated resources.
CO2:	Analyze the various methods to design green building parameters.
CO3:	Understand the availability of construction materials for energy efficient construction
CO4:	Aware about the various green building rating systems prevail in the country
CO5:	Understand the role of UNFCCC and know about clean development mechanism

Pre-requisite:

Nil

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	2	3	-	-	-	-	-	-	-
CO2	3	-	-	-	-	2	3	-	-	-	-	-	-	-
CO3	3	-	-	-	2	2	3	-	-	-	-	2	-	2
CO4	3	2	2	-	2	2	3	-	-	-	-	2	2	2
CO5	3	2	2	-	2	2	3	-	-	-	-	2	2	2
SDG	7,8,9,11,12 & 13													

Course Assessment methods

Direct		Indirect
CIE test I (8) CIE test II (8) CIE test III (8) Assignment/seminar/Quiz (5)	Objectives Test (6) Attendance (5) Total CIE: 40 marks Semester End Examination (60)	Course end survey

UNIT-I - INTRODUCTION	09 Hours
Definition and concepts, Energy and water as a resource - Criticality of resources - Needs of modern living - Heat loss and heat gain in buildings- thermal comfort improvement methods - other building comforts - indoor air quality requirements -electrical energy conservation.	
UNIT-II - PASSIVE SOLAR HEATING AND COOLING	**09 Hours**
Zero Energy Building (ZEB) - Nearly Zero Energy Building (NZEB) - energy consumption - defining low energy buildings- opportunities and techniques for energy conservation in buildings - water conservation - water management system - water efficient landscaping - green roofing - rainwater harvesting - sanitary fixtures and plumbing systems - wastewater treatment and reuse - process water strategies - adoption to sustainable resources, process and technologies- Energy Conservation Opportunities in Public and Private Buildings.	
UNIT-III - CONSTRUCTION MATERIALS AND DAYLIGHTING	**09 Hours**
Construction materials - Embodied energy, carbon content, and emission of CO_2 - Current practice and low environmental impact alternatives. Materials, components and details – Insulation – Optical materials – Glazing materials – Day lighting,– Orientation of buildings – Sources and concepts – Daylight apertures – Light Shelves - Electric Lighting – Light Distribution – Electric Lighting control for day lighted buildings – Switching controls.	
UNIT-IV - BUILDING ASSESSMENT SCHEMES AND HEAT CONTROL	**09 Hours**
Energy efficiency ratings & ECBC - 2007 - Various energy efficiency rating systems for buildings - LEED, BEE, & GRIHA - case studies - Hourly Solar radiation – Heat insulation – Heat transmission through building sections – Thermal performance of Building sections. Ventilation – Requirements – Minimum standards for ventilation – Energy Conservation in Ventilating systems- - Energy Audit – open source software packages in energy efficient building analysis and design.	
UNIT-V - CLEAN DEVELOPMENT MECHANISM	**09 Hours**
Clean Development Mechanism - CDM Benefits for energy conservation methodology and procedure - Eligibility Criteria - UNFCCC - role of UNFCCC and Government of India.	

Theory: 45 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 45 Hrs

TEXT BOOKS

1.	Sustainable Building, Design Manual: Published by The Energy and Resources Institute, Darbari Seth block, IHC Complex, Lodhi Road, New Delhi-110003.
2.	KILBERT, Charles, (2008) Sustainable construction: Green Building Design and Delivery John Wiley and Sons.

3.	BROWN, G.Z. and DEKAY, Mark, 2001. Sun, Wind & Light - Architectural Design Strategies, Second Edition , John Wiley & sons, Inc.

REFERENCES

1.	Residential Energy: Cost Savings and Comfort for Existing Buildings by John Krigger and Chris Dorsi, Published by Saturn Resource Management, 2013.
2.	Brown, G.Z. and DeKay, M., Sun, Wind and Light - Architectural Design Strategies, John Wiley and Sons Inc,3rd Edition, 2014.
3.	Majumdar, M (Ed), Energy - Efficient Buildings in India, Tata Energy Research Institute, Ministry of Non-Conventional Energy Sources, 2009.
4.	ECBC Code 2007 (Edition 2008) published by Bureau of Energy Efficiency, New Delhi.

U23CS1010	CLOUD COMPUTING	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the students will be able to

CO1:	describe cloud concepts, service models, deployment types and applications.
CO2:	comprehend the cloud architecture and virtualization tools.
CO3:	implement basic AWS, Azure and GCP services.
CO4:	apply various cloud security techniques to protect cloud applications.
CO5:	apply Google workspace to implement basic services in latest technologies.

Pre-requisite:

CO / PO, PSO Mapping

(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	2	-	2	-	2	2	-	2	1	1	1
CO2	3	3	2	2	2	-	2	-	2	2	1	2	1	1	1
CO3	3	3	3	2	3	1	2	1	2	2	2	2	1	1	1
CO4	2	2	2	2	2	2	2	3	2	2	2	2	1	1	1
CO5	2	2	2	2	2	1	2	2	2	2	2	2	1	1	1

Course Assessment methods

Direct		Indirect
CIE test I (8) CIE test II (8) CIE test III (8) Objectives Test (6) Attendance (5)	Assignment/seminar/Quiz (5) Total CIE: **40 marks** Semester End Examination: **60 marks**	Course end survey

Unit 01: INTRODUCTION TO CLOUD COMPUTING — **9 Hours**

Introduction to Cloud Computing – Evolution and benefits – Cloud service models: IaaS, PaaS, SaaS – Cloud deployment models: Public, Private, Hybrid, Community – Examples of cloud applications – Overview of AWS, Azure, Google Cloud.

Unit 02: CLOUD ARCHITECTURE AND VIRTUALIZATION — **9 Hours**

Cloud architecture basics – Virtualization concepts and types – Hypervisors and Virtual Machines – Introduction to Containers – Load balancing and scalability – Resource pooling.

Unit 03: CLOUD PLATFORMS AND SERVICES — **9 Hours**

Introduction to AWS services: EC2, S3, RDS – Microsoft Azure: Virtual Machines, Storage – Google Cloud Platform basics – Cloud storage and databases – Serverless computing – Free tier services.

Unit 04: CLOUD SECURITY AND MANAGEMENT — **9 Hours**

Cloud security fundamentals – Common security threats – Data privacy and compliance – Identity and Access Management – Encryption basics – Backup and disaster recovery – Cost management and SLA.

Unit 05: EMERGING TRENDS AND COLLABORATIVE TOOLS — **9 Hours**

Cloud collaboration tools: Google Workspace, IoT and Edge computing – AI and ML services in cloud – Big Data analytics – Serverless architecture – Future trends in cloud computing.

Theory: 45 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 45 Hrs

Dr.B. SATHYABHAMA, B.E.,M.Tech.,Ph.D.
PROFESSOR & HEAD,
Dept. of Computer Science and Engineering
SONA COLLEGE OF TECHNOLOGY
SALEM-636 005

TEXTBOOK	
1.	Rajkumar Buyya, Christian Vecchiola and S. Thamarai Selvi, "Mastering Cloud Computing: Foundations and Applications Programming (2nd Edition)", McGraw Hill Education, 2024.
REFERENCES	
1.	Thomas Erl, Ricardo Puttini and Zaigham Mahmood, "Cloud Computing: Concepts, Technology & Architecture", Pearson Education, 2019.
2.	Anthony T. Velte, Toby J. Velte and Robert Elsenpeter, "Cloud Computing: A Practical Approach", McGraw-Hill, 2010.
3.	George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud", O'Reilly Media, 2009.
4.	Barrie Sosinsky, "Cloud Computing Bible", Wiley Publishing, 2011.
5.	Tim Mather, Subra Kumaraswamy and Shahed Latif, "Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance", O'Reilly Media, 2009.

Dr.B. SATHIYABHAMA, M.E., Ph.D.
PROFESSOR & HEAD,
Dept. of Computer Science and Engineering
SONA COLLEGE OF TECHNOLOGY
SALEM-636 005

U23EC1009	SENSORS AND SMART STRUCTURES TECHNOLOGIES	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1:	Insight into the basic concept regarding smart materials and their use in structures.
CO2:	Analyze the use of measuring techniques in smart materials and structures.
CO3:	Identify the suitable sensors for smart materials.
CO4:	Apply the techniques of actuators in smart structures.
CO5:	Relate the data acquisition techniques, signal processing and control for smart structures.

Pre-requisite:

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

Cos	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	1	2	1						3		
CO2	2	1	2	1	2	1	2					3		
CO3	2	1	2	1	2	1						3		
CO4	2	1	2	1	2	1	2					3		
CO5	2	1	2	1	2	1						3		

Course Assessment methods

Direct			Indirect
CIE test I	(8)	Assignment/seminar/Quiz (5)	Course end survey
CIE test II	(8)	Total CIE : **40 marks**	
CIE test III	(8)	Semester End Examination : **60 marks**	
Objectives Test	(6)		
Attendance	(5)		

Unit 01: INTRODUCTION TO SMART MATERIALS AND STRUCTURES	**9 Hours**

Introduction to Smart Materials and Structures – Instrumented Structures Functions and Response –Sensing Systems – Smart Bridge – Self Diagnosis – Signal Processing Consideration for bridges – Actuation Systems and Effectors

Unit 02: MEASURING TECHNIQUES	**9 Hours**

Strain Measuring Techniques using Electrical Strain Gauges, Types – Resistance – Capacitance – Inductance – Wheatstone Bridges – Pressure Transducers – Load Cells – Temperature Compensation – Strain Rosettes.

Unit 03: SENSORS	9 Hours
Sensing Technology – Types of Sensors – Physical Measurement using Piezo Electric Strain Measurement – Inductively Read Transducers – The LVDT – Fiber Optic Techniques. Chemical and Bio-Chemical Sensing in Structural Assessment – Absorptive Chemical Sensors – Spectroscopes – Fibre Optic Chemical Sensing Systems and Distributed Measurement –Fire Sensor –Emergency Fire Alarm –Humidity Sensor – Accelerometers – Motion Sensors and Pressure Sensors	
Unit 04: ACTUATORS	**9 Hours**
Actuator Techniques – Actuator and Actuator Materials – Piezoelectric and Electrostrictive Material – Magnetostrictive Material – Shape Memory Alloys – Electro Rheological Fluids– Electro Magnetic Actuation – Role of Actuators and Actuator Materials	
Unit 05: SIGNAL PROCESSING AND CONTROL SYSTEMS	**9 Hours**
Data Acquisition and Processing – Signal Processing and Control for Smart Structures – Sensors as Geometrical Processors : Signal Processing – Control System – Linear and Non-Linear systems.	

Theory: 45 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 45 Hrs

TEXT BOOK

1. A.K. Sawhney, "A Course in Electical and Electronic and Measurements and Instrumentation",Dhanpat rai and co pvt limited, 2015.
2. Brain Culshaw , "Smart Structure and Materials", Artech House, Borton. London, 1996.

REFERENCES

1. L. S. Srinath , "Experimental Stress Analysis", Tata McGraw,1998.
2. J. W. Dally & W. F. Riley, "Experimental Stress Analysis", Tata McGraw, 1998.
3. Srinivasan, A.V and Michael McFarland. D, "Smart Structures -Analysis and Design", Cambridge University Press, 2001

Prepared By
Dr.V.Sudha

Approved By
Dr. R.S.Sabeenian

Dr. R.S. SABEENIAN, M.E.,Ph.D.,
MBA.,FIETE.,FIE(I).,MIEEE.,MISTE.,MIUPRAI.,
Professor & Head of the Department,
Department of Electronics and Communication Engineering,
Sona College of Technology,
Salem-636 005. Tamil Nadu.

U23EE1013	ENERGY CONSERVATION AND AUDITING	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the students will be able to

CO1:	assess role of energy in global economic development.
CO2:	discuss energy efficiency in electrical systems.
CO3:	explain methodology of energy audit and concept of instruments used.
CO4:	apply energy conservation concepts in buildings.
CO5:	apply the energy efficient technologies in electrical systems.

Pre-requisite:

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	3	3		2			2	3	3	3	2
CO2	2	2	3	3	3				2			3	3	2
CO3	2	2	3	3	3	3			3		2	3	3	2
CO4	2	2	3	3	3	2			3		2	3	3	2
CO5	2	2	3	3	3		3		3			3	3	2

Course Assessment methods

Direct			Indirect
CIE test I	(8)	Assignment/seminar/Quiz (5)	
CIE test II	(8)	Total CIE: **40 marks**	
CIE test III	(8)	Semester End Examination: **60 marks**	Course end survey
Objectives Test	(6)		
Attendance	(5)		

Unit 01: ENERGY SCENARIO — **9 Hours**

Commercial and Non-commercial energy, primary energy resources, commercial energy production, final energy consumption, energy needs of growing economy, long term energy scenario, energy pricing, energy sector reforms, energy and environment, energy security, energy conservation and its importance,

restructuring of the energy supply sector, energy strategy for the future, air pollution, climate change. Energy Conservation Act-2001 and its features.

Unit 02: ENERGY EFFICIENCY IN ELECTRICAL SYSTEMS	**9 Hours**
Electricity billing, Electrical load management and maximum demand Control, Maximum demand controllers; Power factor improvement, Automatic power factor controllers, efficient operation of transformers, energy efficient motors, Soft starters, Variable speed drives; Performance evaluation of fans and pumps, Flow control strategies and energy conservation opportunities in fans and pumps, Electronic ballast, Energy efficient lighting and measures of energy efficiency in lighting system.	

Unit 03: ENERGY AUDIT	**9 Hours**
Definition and objectives of energy management and energy audit, Need for energy audit, Types of energy audit, Methodology for conducting a detailed energy audit, ENCON (Energy Conservation) opportunities and measures, Energy audit report preparation, Energy cost benchmarking, Energy performance assessment, Fuel and energy substitution, Instruments and metering for energy audit, Basic principles of material and energy balance, Components of material and energy balance, Sankey diagram, Financial analysis terms – Payback Period, ROI, NPV, IRR	

Unit 04: ENERGY CONSERVATION IN BUILDINGS	**9 Hours**
Importance of energy efficiency in buildings, Overview of building energy consumption patterns, National building energy codes (ECBC), Energy-efficient lighting design principles LED lighting, occupancy sensors, daylight sensors, Day lighting strategies and window design, types of HVAC systems,Energy-efficient chillers, pumps, cooling towers, Variable speed drives (VSDs) in HVAC, Ventilation strategies and indoor air quality, Heat recovery systems and thermal storage.	

Unit 05: ENERGY EFFICIENT TECHNOLOGIES IN ELECTRICAL SYSTEMS	**9 Hours**
Efficient motors and power factor improvement, Harmonics and its impacts in building electrical systems, Demand side management (DSM) in buildings, Smart meters and building automation systems (BAS/BMS), Maximum demand controllers, automatic power factor controllers, energy efficient motors, soft starters with energy saver, variable speed drives, energy efficient transformers, electronic ballast, occupancy sensors, energy efficient lighting controls, energy saving potential of each technology, Net zero emissions -case study	

Theory: 45 Hrs	**Tutorial: --**	**Practical: --**	**Project:--**	**Total Hours: 45 Hrs**

TEXT BOOKS

1.	General Aspects of Energy Management and Energy Audit", Bureau of Energy Efficiency, Fourth Edition, 2015.
2.	Energy Efficiency in Electrical Utilities, Bureau of Energy Efficiency, Fourth Edition, 2015.

REFERENCES

1.	Chakrabarti, A. Energy Engineering and Management. PHI Learning, 2011.
2.	Murphy, W. R., & McKay, G. Energy Management. Elsevier, 2009.
3.	Rajput, R. K. Utilization of Electrical Power. Laxmi Publications, 2006.
4.	Kreith, Frank & Goswami, D. Yogi. Energy Management and Conservation Handbook. CRC Press, 2007.

S.Padma

Dr.S.PADMA, M.E., Ph.D.,
Professor and Head
Department of EEE,
Sona College of Technology
Salem-636 005. Tamil Nadu.

U23EE1021	INNOVATION, IPR AND ENTREPRENEURSHIP DEVELOPMENT	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the students will be able to

CO1:	Explain the fundamental concepts of entrepreneurship, including definitions, characteristics, and the role of entrepreneurs in economic development.
CO2:	Explain the fundamental concepts of innovation and creativity, and outline the legal procedures essential for entrepreneurial development.
CO3:	Identify different types of business reports and their purpose in entrepreneurial decision-making.
CO4:	Analyze the financial feasibility of a business idea using cost estimation, break-even analysis, and funding requirements.
CO5:	Identify the financial, technical, and marketing assistance provided by central and state government agencies for MSMEs.

Pre-requisite:

Design Thinking - A Primer- NPTEL Course

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	3	3	3	2	3	3	3	3	3	3	2
CO2	3	3	3	3	3	3	2	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	2	2	3	2	3	3	3	3	3	3	3	3	2
CO5	3	2	2	3	2	3	3	3	3	3	3	3	3	2

Course Assessment methods

Direct		Indirect
CIE test I (8) CIE test II (8) CIE test III (8) Objectives Test (6) Attendance (5)	Assignment/seminar/Quiz (5) Total CIE: **40 marks** Semester End Examination: **60 marks**	Course end survey

Unit 01: INTRODUCTION TO ENTREPRENEURSHIP AND MOTIVATION	9 Hours

Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur Entrepreneurship in Economic Growth, Factors Affecting Entrepreneurial Growth. Major Motives Influencing an Entrepreneur – Achievement Motivation Training, Self-Rating, Business Games, Thematic Apperception Test – Stress Management, Entrepreneurship Development Programs – Need, Objectives.

Unit 02: INNOVATION, CREATIVITY, AND LEGAL ASPECTS	9 Hours

Innovation and Creativity- An Introduction, Innovation in Current Environment, Types of Innovation

Sources of new Ideas, Methods of generating innovative ideas, creating problem solving, product planning and development process. Legal aspects IPR and Labor law.

Unit 03: BUSINESS AND PROJECT REPORTING	**9 Hours**
Small Enterprises – Definition, Classification – Characteristics, Ownership Structures – Project Formulation – Steps involved in setting up a Business – identifying, selecting a Good Business opportunity, Market Survey and Research, Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports – Project Appraisal – Sources of Information – Classification of Needs and Agencies.	

Unit 04: FINANCING AND ACCOUNTING	**9 Hours**
Need – Sources of Finance, Term Loans, Capital Structure, Financial Institution, Management of working Capital, Costing, Break Even Analysis, Income Tax, GST, Taxation benefits, Accounting.	

Unit 05: GOVERNMENT POLICIES AND SUPPORT FOR SMALL-SCALE ENTERPRISES	**9 Hours**
Sickness in small Business – Concept, Magnitude, Causes and Consequences, Corrective Measures - Business Incubators – Government Policy for Small Scale Enterprises – Growth Strategies in small industry – Expansion, Diversification, Joint Venture, Merger, Sub Contracting and Social responsibility of Business.	

Theory: 45 Hrs	**Tutorial: --**	**Practical: --**	**Project:--**	**Total Hours: 45 Hrs**

TEXT BOOKS

1.	Khanka. S.S., "Entrepreneurial Development" S.Chand & Co. Ltd., Ram Nagar, New Delhi, 2021.
2.	Donald F Kuratko, "Entreprenuership – Theory, Process and Practice", 9 th Edition, Cengage Learning, 2014

REFERENCES

1.	Hisrich R D, Peters M P, "Entrepreneurship" 8th Edition, Tata McGraw-Hill, 2013
2.	Mathew J Manimala, "Enterprenuership theory at cross roads: paradigms and praxis" 2 nd Edition Dream tech, 2005.
3.	Rajeev Roy, "Entrepreneurship" 2 nd Edition, Oxford University Press, 2020.
4.	Peter F. Drucker "Innovation and Entrepreneurship", Harper Business; Reprint edition 2006

S. Padma

Dr.S.PADMA, M.E., Ph.D.,
Professor and Head,
Department of EEE,
Sona College of Technology
Salem-636 005. Tamil Nadu.

U23FT1001	FUNDAMENTALS OF FASHION DESIGN	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1:	Define and discuss fashion and related terms, explain the reasons for changes in fashion, and outline the various classifications of fashion.
CO2:	Describe clothing and its purposes, and explain the role of clothing in society and its influence on social status.
CO3:	Discuss the selection of clothing for different age groups, and explain the concepts of fashion apparel and wardrobe planning.
CO4:	Assess the elements and principles of design and describe their effects on apparel.
CO5:	Plan a theme and outline the process of portfolio development.

Pre-requisite: -

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO 8	P09	PO10	PO11	PO12	PSO 1	PSO2	PSO 3
CO1	3		3	3	3	3			3		3	3	3	3	3
CO2	3		3	3	3	3			3		3	2	3	3	3
CO3	3		3	3	3	2			3		3	3	3	3	3
CO4	3		2	3	3	3			2		3	2	3	3	2
CO5	3		3	3	3	2			2		3	3	3	3	3

Course Assessment methods

Direct		Indirect
CIE test I (8) CIE test II (8) CIE test III (8) Objectives Test (6) Attendance (5)	Assignment/seminar/Quiz (5) Total CIE: 40 marks Semester End Examination (60 marks)	Course end survey

Unit 01: INTRODUCTION TO FASHION — **9 Hours**

Origin of fashion, terms and definitions, reasons for change in fashion, classification of fashion: Style, Classic, FAD, Trend, theories of fashion, movement of fashion, fashion cycle.

Unit 02: INTRODUCTION TO CLOTHING — **9 Hours**

Clothing, Purpose of clothing: protection, modesty, attraction, Importance of clothing, Clothing Culture, Men and Women clothing and ornamentation, Role and status of clothing, Clothing according to climatic conditions, factors to be considered in the selection of clothing.

Unit 03: SELECTION OF CLOTHES — **9 Hours**

Clothes for children, middle-aged and adults. Types of clothes according to different types of human figure, Different materials for different clothes, Fabrics and colours suitable for different garments.

Planning for clothing needs: Formal clothing, Clothes for parties, Clothes for sports, Casual Clothes for casualwear.

Wardrobe Planning: Wardrobe for men and women

Dr. D. RAJA, M.Tech., Ph.D.,
Professor & Head
Department of Fashion Technology
Sona College of Technology
Salem - 636 005. Tamil Nadu

Unit 04: ELEMENTS AND PRINCIPLES OF DESIGN	9 Hours
Elements of Design: Introduction, Elements of design - Silhouette, Details, Texture, Color, Lines. **Principle of design:** Introduction, Principles of Elements of design: Proportion, Balance, Rhythm, Center of Interest, Harmony.	
Unit 05: DESIGN AND DEVELOPMENT	**9 Hours**
Boards: Mood board, fabric board, colour board, accessory board. **Fashion illustration**: head theories, Illustration techniques – strokes, hatching, shading; Colouring techniques – Medias for colouring. Portfolio presentation – styles of presentation - Fashion shows.	

Theory: 45 Hrs	Tutorial: 0	Practical: 0	Project: 0	Total Hours: 45 Hrs

TEXT BOOKS	
1.	Munslow, Janine, McKelvey, Kathryn "Fashion Design Process Innovation and Practice", 2nd Edition , wiley , 2012.
2.	Nicola White, Ian Griffiths, "The Fashion Business Theory, Practice, Image", Berg, 2000.
REFERENCES	
1.	Sumathi, G. J. Elements of fashion and apparel design. New Age International, 2007.
2.	Kathryn McKelvey "Fashion Source Book" Balckwell Publishing New Delhi.
3.	Mills, Jane, and Janet K. Smith. Design concepts. Fairchild Books, 1985.
4.	Rasband J. Wardrobe strategies for women. Fairchild Publications; 2002.
5.	Jarnow JA, Judelle B, Guerreiro M. Inside the fashion business. Wiley; 1981.

Dr. D. RAJA, M.Tech., Ph.D.,
Professor & Head
Department of Fashion Technology
Sona College of Technology
Salem - 636 005. Tamil Nadu

U23IT1002	INTRODUCTION TO DATABASE TECHNOLOGY	L	T	P	J	C
		3	0	0	0	3

PREAMBLE

The objective of this course is to introduce the concepts of database systems. Any of the digital applications used by the people be it web applications or mobile applications run with the database in the background. For any e-commerce application like flipkart or amazon, database is the core requirement. Social media sites like Facebook or Twitter stores all the content such as user profiles, likes, shares, and messages in the database. All the organizations maintain their data in the database with lots of security features. Working with a database system is the most important skill needed by the IT industry.

The course is designed in such a way that the students will acquire necessary skills to store, manipulate and retrieve data. The students will learn the fundamental concepts of database systems and write queries to manipulate the database. The students will have hands on experience in working with an open source database management system.

COURSE OUTCOMES

At the end of the course, the student will be able to

CO1	Explain the need, background, architecture and evolution of database management system
CO2	Design ER models to capture application requirements and convert them into relational schemas.
CO3	Develop SQL queries to create, maintain, retrieve, manipulate and provide security to databases.
CO4	Analyze the logical data model for normalization and apply normal forms to eliminate anomalies.
CO5	Summarize and compare indexing techniques used for efficient data retrieval.

Pre-requisite: NIL

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3										1	-*	-*
CO2	3	3	3	1	1				1	1		1	-*	-*
CO3	3	3	2	1	3							1	-*	-*
CO4	3	3	2	2	2				1	1		1	-*	-*
CO5	3	2		2	2				1	1		1	-*	-*

-* Since this course is offered as an Open Elective, the relevance and contribution of each CO to specific PSOs may vary depending on the parent program to which the student belongs.

Course Assessment methods

Direct		Indirect
CIE test I (8) CIE test II (8) CIE test III (8) Objectives Test (6)	Attendance (5) Assignment/seminar (5) Total CIE: 40 marks Semester End Examination: 60 marks	Course end survey

UNIT I	INTRODUCTION	9 Hours

Database and Database Users: Characteristics of database approach, Advantages of DBMS Approach, Database Applications.

Database system concepts and architecture: Data models, Schemas, Instance, Three schema architecture and data independence, DBMS languages, DBMS interfaces, database system Environment.

UNIT II	ENTITY RELATIONSHIP AND RELATIONAL MODEL	9 Hours

ER model: Entity types, attributes, keys,, relationship types, constraints, weak entity, ER diagrams, EER concepts.

Relational data model, relational constraints and relational Algebra: Relational model concepts, Relational constraints and Relational data base schema, update operations, basic Relational algebra operations, additional relational operations, ER to relational mapping.

UNIT III	QUERY LANGUAGE	9 Hours

SQL: Data definition and constraints, Basic queries, insert, delete, update, Joins, complex queries, views, assertions and triggers.

Database security and Authorization: security issues, grant/revoke privileges, SQL injections.

UNIT IV	RELATIONAL DATABASE DESIGN	9 Hours

Functional dependencies and normalization: Functional dependencies, Normal forms: 1NF, 2NF, 3NF, Boyce Codd NF, decomposition.

UNIT V	STORAGE STRUCTURES AND INDEXING	9 Hours

Secondary Storage Devices – Placing file records – Operations on files – unordered files – ordered files - hashing – RAID - **Indexing Structures:** Types of Single-Level Ordered Indexes, Multilevel Indexes.

Theory: 45 Hrs	Tutorial: --	Practical: --	Project: --	Total Hours: 45 Hrs

TEXT BOOKS

1.	Ramez Elmasri and Shamkant Navathe, "Fundamentals of Database Systems ", 7th Edition, Addison-Wesley, 2021

REFERENCES

1.	Abraham Silberschatz, Henry F. Korth and Sudarshan. S, "Database System Concepts", 7th Edition, McGraw-Hill, 2023
2.	Raghu Ramakrishnan, "Database Management System", Tata McGraw-Hill Publishing Company, 2003.
3.	Date. C. J, Kannan. A, Swamynathan. S, "An Introduction to Database Systems", 8th Edition, Pearson Education, 2012
4.	Rajesh Narang, "Database Management systems", PHI Learning pvt. Ltd, New Delhi,2011.

J. Dhanu

Dr. J. AKILANDESWARI
PROFESSOR & HEAD
Department of Information Technology
SONA COLLEGE OF TECHNOLOG
SALEM-636 005

U23MC1008	FUNDAMENTALS OF ROBOTICS	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the students will be able to

CO1:	Distinguish between different robot classifications based on their anatomy, configuration, and motion capabilities, and summarize the function of the main robot subsystems.
CO2:	Compare the characteristics of hydraulic, pneumatic, and electric drive systems and select the most appropriate drive for a specified application.
CO3:	Classify common robotic sensors and explain their operating principles with real-time examples and analyse their functional limitations.
CO4:	Justify the selection of a suitable gripper for handling a specific part or material.
CO5:	Illustrate robotic applications across diverse sectors and select the appropriate robot cell layout for different tasks.

Pre-requisite:

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO 11	PO12	PSO1	PSO2
CO1	3	2	2	-	-	-	-	2	-	-	-	-	-	-
CO2	2	3	3	3	-	-	-	-	-	-	-	-	-	-
CO3	3	2	2	2	3	-	-	-	-	-	-	3	-	-
CO4	3	2	3	3	3	-	-	-	-	-	2	-	-	-
CO5	2	3	3	-	2	3	2	-	-	-	2	2	-	-

Course Assessment methods

Direct		Indirect
CIE test I (8) CIE test II (8) CIE test III (8) Objectives Test (6)	Attendance (5) Assignment/seminar/Quiz (5) Total CIE: **40 marks** Semester End Examination: **60 marks**	Course end survey

Unit 01: INTRODUCTION TO ROBOTICS	9 Hours
Introduction to Robotics – Automation vs Robotics – History of Robotics – Laws of Robotics - Anatomy of a Robot – Classification of Robots – Robot Configurations – Robot motions - Robot subsystems: Motion subsystem, Recognition subsystem, Control subsystem – Robot links – Joint types – Joint notation scheme - Robot Specifications – Ethics and Societal Implications of Robotics.	
Unit 02: ROBOT DRIVE SYSTEMS AND ROBOT KINEMATICS	**9 Hours**
Robot Drive systems – Hydraulic Actuators – Pneumatic actuators: Pneumatic air muscles – Electrical actuators: Stepper motor, DC motors, Servomotor – Comparison of characteristics of robot drive systems – Robot Kinematics: Forward and Inverse kinematics examples.	
Unit 03: ROBOT SENSORS	**9 Hours**
Classification of Robotic sensors and their functions – Tactile sensors – Proximity sensors: Inductive, capacitive – Hall effect sensor – Range sensor: Ultrasonic sensors, Infrared sensors, Laser range finders - Force ant Torque sensors – Encoders: Linear, Incremental – Robotic Vision system.	
Unit 04: ROBOT END EFFECTORS AND PROGRAMMING	**9 Hours**
Types of end effectors – Mechanical grippers: Linkage mechanisms, Rack and pinion, Cam actuation, Screw actuation – Pneumatic grippers – Vacuum cups – Magnetic grippers – Adhesive grippers – Tools as end effectors – Gripper force analysis – Considerations in gripper selection and design. Methods of Robot Programming: Lead through methods, Textual robot Languages – Robot language structure – VAL Programming and its commands – Simple VAL Programming examples.	
Unit 05: ROBOT CELL DESIGN AND APPLICATIONS	**9 Hours**
Robot Cell Layouts: Robot cantered cell, In-line robot cell, Mobile robot cell – Multipurpose robots and machine interference – Robotics Applications in Manufacturing: Welding Robot, AGVs – Healthcare: Surgery Robot, Therapeutic Robot – Agriculture: Crop Harvesting & Fruit Picking Robot – Defence & Space: Exoskeleton Robot, Telerobotics.	

Theory: 45 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 45 Hrs

TEXT BOOKS

1. M.P.Groover, M.Weiss,R.N. Nagal,N.G.Odrey, "Industrial Robotics - Technology, programming and Applications" Tata McGraw-Hill Publication, 2017.

REFERENCES

1. Richard D.Klafter, "Robotics Engineering" PHI Learning Private Limited, 2009.
2. Ganesh S.Hedge, "A text book in Industrial Robotics", Laxmi Publications, 2015.
3. S K Saha, "Introduction to Robotics", Tata McGraw-Hill Publication, 2024.
4. Sathya Ranjan Deb, "Robotics Technology & flexible Automation" Second edition, Tata McGraw-Hill Publication, 2009.

Dr. P. SURESH
Professor and Head
Department of Mechatronics Engineering
SONA COLLEGE OF TECHNOLOGY
Junction Main Road, SALEM - 636 005.
Ph:0427-4099999

U23MC1009	SMART AUTOMATION	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the students will be able to

CO1:	Explain the fundamentals and compare various levels of industrial evolution from Industry 1.0 to Industry 4.0 and justify the need for automation in different sectors.
CO2:	Identify and describe various sensors, actuators, and control components used in automation systems, and illustrate their working principles and applications.
CO3:	Design basic automation systems for home and smart city applications using wireless technologies and controllers.
CO4:	Analyze automation techniques used in agriculture by evaluating sensor data for soil, weather, and crop monitoring to recommend suitable smart farming solutions.
CO5:	Evaluate the role of automation and robotics in medical and textile industries and propose innovative control strategies for improving process efficiency and product quality.

Pre-requisite:

--

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	-	-	2	-	-	-	-	-	-	-
CO2	2	2	2	2	-	-	2	-	-	-	-	2	-	-
CO3	2	2	3	2	2	-	-	-	-	-	-	2	-	-
CO4	2	2	2	2	2	-	2	-	-	-	-	2	-	-
CO5	2	2	2	2	2	-	2	-	-	-	-	2	-	-

Course Assessment methods

Direct		Indirect
CIE test I (8) CIE test II (8) CIE test III (8) Objectives Test (6)	Attendance (5) Assignment/seminar/Quiz (5) Total CIE: **40 marks** Semester End Examination: **60 marks**	Course end survey

Unit 01: BASICS OF AUTOMATION	9 Hours
Evolution of automation: Industry 1.0 to Industry 5.0 - Need and scope of smart automation in modern industries - Components of a smart automated system - Comparison of traditional vs smart automation - Cyber-Physical System (CPS) fundamentals - Role of IoT and IIoT in automation - Human–machine collaboration and ergonomics - Case studies of smart factories on global perspectives.	
Unit 02: COMPONENTS FOR AUTOMATION	**9 Hours**
Sensing: Sensors – Transducers – transduction principles – sensors for detecting temperature like RTD and thermocouple, inductive type proximity sensor – Decision making: Transistor – Microprocessor and microcontroller, Relay and PLC – Actuation: Hydraulic and pneumatic cylinders, stepper and servo motors – Analog valves - Communication: Bluetooth, Zigbee and Wi-Fi.	
Unit 03: HOME AND SMART CITY AUTOMATION	**9 Hours**
Need of Home automation – Home automation using IoT – Automated gate unlock system – Wifi camera – object detection (dark mode) – biometric based door opening system - Smart Building using IoT – Automatic Solar Tracker - Automated Street Lighting - Automated Railway Crossing – Smart Traffic Lighting System.	
Unit 04: AGRICULTURE AUTOMATION	**9 Hours**
Standards for agriculture – Need for agriculture digitalization – Dielectric Soil Moisture Sensors – Weather sensors – Measurement of leaf health, chlorophyll detection, crop mapping, fertilizing, seeding and weeding machine, ripeness level detection, fruit picking robot, smart sorting system.	
Unit 05: MEDICAL AND TEXTILE AUTOMATION	**9 Hours**
Need of robots in medicine – Orthopedic surgical robots (Mako)– Robotic endoscopy and capsule robots - Ring spinning automation – auto doffing and piecing - Yarn clearing and monitoring systems - Electronic jacquard and dobby systems - Loom monitoring and control systems.	

Theory: 45 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 45 Hrs

TEXT BOOKS

1.	D. Patranabis, "Sensors and Transducers", III edition, PHI Learning Pvt.Ltd., 2004.
2.	Dwight Spivey, "Home Automation For Dummies", I edition, Wiley, 2015.

REFERENCES

1.	Diego Galar, Pascual Pasquale and Daponte Uday Kumar, "Handbook of Industry 4.0 and smart Systems", I edition, CRC Press, 2021.
2.	Shimon Y. Nof, "Springer Handbook of Automation", I edition, Springer, 2009.
3.	Pradeep Tomar and Gurjit Kaur, "Artificial Intelligence and IoT-Based Technologies for Sustainable Farming and Smart Agriculture", I edition, IGI Global, 2021.
4.	Ramesh C. Poonia, Xiao-Zhi Gao, Linesh Raja, Sugam Sharma and Sonali Vyas, "Smart Farming Technologies for Sustainable Agricultural Development", IGI Global, 2018.
5.	Achim Schweikard, Floris Ernst, "Medical Robotics", I edition, Springer, 2015.

Dr. P. SURESH
Professor and Head
Department of Mechatronics Engineering
SONA COLLEGE OF TECHNOLOGY
Junction Main Road, SALEM - 636 005.
Ph:0427-4099999

Syllabi for

B.E/B.Tech Honours (Specialization in the same Discipline)

B.E/B.Tech Honours

B.E/B.Tech Minor

courses

U23ME2013	DIGITAL MANUFACTURING AND IOT	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1:	Impart knowledge to use various elements in the digital manufacturing.
CO2:	Differentiate the concepts involved in digital product development life cycle process and supply chain management in digital environment.
CO3:	Select the proper procedure of validating practical work through digital validation in Factories.
CO4:	Implementation the concepts of IoT and its role in digital manufacturing.
CO5:	Analyze and optimize various practical manufacturing process through digital twin.

Pre-requisite:

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3		1	1	3	3		1	2	2		2	3	2
CO2	3	2	3	1	3	3	2	2	2	2		2	3	2
CO3	3		3	1	3	3	2		3	2		2	3	2
CO4	3	2	2	2	3	3	2	2	2	2	2	2	3	2
CO5	3		2		1	3		2	2	2		2	3	2

Course Assessment methods

Direct		Indirect
CIE test I (9) CIE test II (9) CIE test III (10) Objectives Test (7)	Assignment/seminar/Quiz (5) Total CIE: **40 marks** Semester End Examination: **60 marks**	Course end survey

Unit 01: INTRODUCTION — **9 Hours**

Introduction - Need - Overview of Digital Manufacturing and the Past - Aspects of Digital Manufacturing: Product life cycle, Smart factory, and value chain management - Practical Benefits of Digital Manufacturing - The Future of Digital Manufacturing.

Unit 02: DIGITAL LIFE CYCLE & SUPPLY CHAIN MANAGEMENT — **9 Hours**

Collaborative Product Development, Mapping Requirements to specifications - Part Numbering, Engineering Vaulting, and Product reuse - Engineering Change Management, Bill of Material and Process Consistency - Digital Mock up and Prototype development - Virtual testing and collateral. Overview of Digital Supply Chain - Scope& Challenges in Digital SC - Effective Digital Transformation -

Future Practices in SCM

Unit 03: SMART FACTORY	**9 Hours**
Smart Factory - Levels of Smart Factories - Benefits - Technologies used in Smart Factory - Smart Factory in IoT- Key Principles of a Smart Factory - Creating a Smart Factory - Smart Factories and Cybersecurity	
Unit 04: INDUSTRY 4.0	**9 Hours**
Introduction - Industry 4.0 -Internet of Things - Industrial Internet of Things - Framework: Connectivity devices and services - Intelligent networks of manufacturing - Cloud computing - Data analytics -Cyber physical systems -Machine to Machine communication - Case Studies.	
Unit 05: STUDY OF DIGITAL TWIN	**9 Hours**
Basic Concepts - Features and Implementation - Digital Twin: Digital Thread and Digital Shadow- Building Blocks - Types - Characteristics of a Good Digital Twin Platform - Benefits, Impact & Challenges-Future of Digital Twins.	

Theory: 45 Hrs	**Tutorial: --**	**Practical: --**	**Project:--**	**Total Hours: 45 Hrs**

TEXT BOOKS

1. Zude Zhou, Shane (Shengquan) Xie and Dejun Chen, Fundamentals of Digital Manufacturing Science, Springer-Verlag London Limited, 2012.
2. Alasdair Gilchrist, "Industry 4.0: The Industrial Internet of Things", A press, 2016.

REFERENCES

1. Lihui Wang and Andrew YehChing Nee, Collaborative Design and Planning for Digital Manufacturing, Springer-Verlag London Limited, 2009.
2. Andrew Yeh Chris Nee, Fei Tao, and Meng Zhang, "Digital Twin Driven Smart Manufacturing", Elsevier Science., United States, 2019.
3. Alp Ustundag and Emre Cevikcan, "Industry 4.0: Managing The Digital Transformation", Springer Series in Advanced Manufacturing., Switzerland, 2017
4. Ronald R. Yager and Jordan Pascual Espada, "New Advances in the Internet of Things", Springer., Switzerland, 2018.

Dr. D. SENTHIL KUMAR, M.E.,Ph.D
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5

U23ME2015	GREEN MANUFACTURING DESIGN AND PRACTICES	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1:	Explain the environmental design and selection of eco-friendly materials
CO2:	Analyse manufacturing processes towards minimization or prevention of air pollution.
CO3:	Analyse manufacturing processes towards minimization or prevention of noise pollution.
CO4:	Analyse manufacturing processes towards minimization or prevention of water pollution.
CO5:	Evaluate green co-rating and its benefits.

Pre-requisite:

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	3	1			3		1			1	1	2
CO2	1	1	3	1			3		1			1	1	2
CO3	1	1	3	1			3		1			1	1	2
CO4	1	1	3	1			3		1			1	1	2
CO5	1	1	3	1			3		1			1	1	2

Course Assessment methods

Direct		Indirect
CIE test I (8) CIE test II (8) CIE test III (8) Objectives Test (6)	Assignment/seminar/Quiz (5) Attendance(5) Total CIE: **40 marks** Semester End Examination: **60 marks**	Course end survey

Unit 01: DESIGN FOR ENVIRONMENT AND LIFE CYCLE ASSESSMENT — **9 Hours**

Environmental effects of design -selection of natural friendly material - Eco design - Environmental damage Material flow and cycles - Material recycling - Emission less manufacturing- Industrial Ecology - Pollution prevention - Reduction of toxic emission - design for recycle.

Unit 02: AIR POLLUTION SAMPLING AND MEASUREMENT — **9 Hours**

Primary and Secondary Pollutants - Automobile Pollutants - Industrial Pollution - Ambient air quality Standards - Air pollution sampling - collection of gaseous air pollutants collection of particulate pollutants-stock sampling - analysis of air pollutants - sulfur dioxide, nitrogen dioxide, carbon monoxide, oxidants and ozone.

Unit 03: NOISE POLLUTION AND CONTROL	9 Hours
Frequency and Sound Levels - Units of Noise based power radio, contours of Loudness - Effect of human, Environment and properties - Natural and Anthrogenic Noise Sources - Measuring Instruments for frequency and Noise levels - Masking of sound, Types, Kinetics, Selection of different reactors used for waste treatment - Treatment of noise at source - Path and Reception, Sources of noise - Effects of noise- Occupational Health hazards - thermal Comforts, Heat Island Effects, Radiation Effect.	
Unit 04: WATER DEMAND AND WATER QUALITY	**9 Hours**
Factors affecting consumption - Variation, Contaminants in water - Nitrates, Fluorides, Detergents, taste and odour - Radio activity in water - Criteria for different impurities in water for portable and non-portable use - Point and non-point Source of pollution - Major pollutants of Water - Water Quality Requirement for different uses - Global water crisis issues.	
Unit 05: GREEN CO-RATING	**9 Hours**
Ecological Footprint - Need for Green Co-Rating - Green Co-Rating System - Intent - System Approach - Weightage - Assessment Process - Types Of Rating - Green Co-Benefits - Case Studies Of Green Co-Rating.	

Theory: 45 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 45 Hrs

TEXT BOOKS

1. Gradel.T.E. and B.R. Allenby - Industrial Ecology - Prentice Hall - 2010
2. Rao M.N. and Dutta A.K. "Wastewater treatment", Oxford & IBH publishing Co. Pvt. Ltd., New Delhi, Second Edition, 2006.

REFERENCES

1. Gradel.T.E. and B.R. Allenby - Industrial Ecology - Prentice Hall – 2010.
2. Frances Cairncross- Costing the Earth: The Challenge for Governments, the Opportunities for Business - Harvard Business School Press - 1993.
3. World Commission on Environment and Development (WCED), Our Common Future, Oxford University Press 2005.
4. Rao M.N. and Dutta A.K. "Wastewater treatment", Oxford & IBH publishing Co. Pvt. Ltd., New Delhi, Second Edition, 2006
5. Rao CS Environmental Pollution Control Engineering-, Wiley Eastern Ltd., New Delhi, 2006.

Dr.D.SENTHIL KUMAR, M.E.,Ph.D
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5