B.E. - SAFETY AND FIRE ENGINEERING

CURRICULUM & SYLLABI

Regulation 2020

(Applicable to candidates admitted in the academic year 2020 - 2021 onwards)

K.S.R. College of Engineering

(Autonomous)

K.S.R. Kalvi Nagar, Tiruchengode - 637 215.

Namakkal (Dt), Tamilnadu, India.

Email: info@ksrce.ac.in   Website : www.ksrce.ac.in

	K.S.R. COLLEGE OF ENGINEERING (Autonomous) (Approved by AICTE & Affiliated to Anna University) K.S.R. Kalvi Nagar, Tiruchengode - 637 215	CURRICULUM UG R - 2020
Department	Department of Safety and Fire Engineering	
Programme	B.E.- Safety and Fire Engineering	

Vision of the Institution

> We envision to achieve status as an Excellent Educational Institution in the global knowledge hub, making self-learners, experts, ethical and responsible engineers, technologists, scientists, managers, administrators and entrepreneurs who will significantly contribute to research and environment friendly sustainable growth of the nation and the world.

Mission of the Institution

> To inculcate in the students self-learning abilities that enable them to become competitive and considerate engineers, technologists, scientists, managers, administrators and entrepreneurs by diligently imparting the best of education, nurturing environmental and social needs.

> To foster and maintain mutually beneficial partnership with global industries and Institutions through knowledge sharing, collaborative research and innovation.

Vision of the Safety and Fire Engineering

> To emerge as a centre of excellence in Safety and Fire Engineering using the framework of quality education through advanced industry, research, entrepreneurship and society.

Mission of the Safety and Fire Engineering

> To provide quality education and to prepare nationally and internationally competitive students for a successful career in safety, occupational health, environmental management and fire protection engineering.

> To inculcate the need for sustainable development in research and innovations.

Programme Educational Objectives (PEOs): (Safety and Fire Engineering)

The graduates of the programme will be able to

PEO 1: Have a sound knowledge in Safety and Fire Engineering aspects to provide solutions for Potential hazards.

PEO 2: Expertise in the area of Thermal, Chemical Reactions, Structural Stability and Environmental Impacts.

PEO 3: Practice their Profession through evaluation, communication, ethics and social responsibility.

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Programme Outcomes (POs) of B.E. - Safety and Fire Engineering

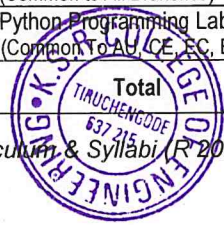| Program Outcomes (POs)	
PO1	**Engineering Graduates will be able to:** **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety and the cultural, societal and environmental considerations.
PO4	**Conduct Investigations of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.
PO5	**Modern Tool Usage:** Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6	**The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of safety, health & environment with the need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and Team Work:** Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations to give and receive clear instructions.
PO11	**Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long Learning:** Recognize the need for safety and fire engineering to have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
Program Specific Outcomes (PSOs)	
PSO1	Design a safety and fire system for industries, building and other area thereby saving the loss due to a fire and accidents.
PSO2	Analyze hazards in a work place and to rectify it by suitable safety and fire engineering solutions.

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Programme	B.E. - Safety and Fire Engineering

SEMESTER - I

SI.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20EN151	Technical English - I (Common to All Branches)	HSMC	2	0	1	3	30	70	100
2.	20MA151	Engineering Mathematics - I (Common to All Branches)	BSC	3	1	0	4	30	70	100
3.	20PH051	Engineering Physics (Common to All Branches)	BSC	3	0	0	3	30	70	100
4.	20ME144	Engineering Drawing (Common to AU, ME & SF)	ESC	1	2	0	3	30	70	100
MANDATORY COURSES										
5.	20MC052	Environmental Science and Engineering	MC	3	0	0	0	50	50	100
6.	20MC151	Induction Program	MC	-	-	-	-	-	-	-
PRACTICAL										
7.	20PH028	Physics Laboratory (Common to All Branches)	BSC	0	0	3	1	50	50	100
8.	20GE028	Manufacturing Practices Laboratory (Common to AU, CE, ME & SF)	ESC	0	0	3	1	50	50	100
		Total		12	3	7	15		700	

*Induction program will be conducted for three weeks as per AICTE guidelines

SEMESTER - II

SI.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20EN251	Technical English - II (Common to All Branches)	HSMC	2	0	1	3	30	70	100
2.	20MA241	Engineering Mathematics - II (Common to AU, CE, ME& SF)	BSC	3	1	0	4	30	70	100
3.	20CH051	Engineering Chemistry (Common to All Branches)	BSC	3	0	0	3	30	70	100
4.	20EE041	Basics of Electrical and Electronics Engineering (Common To AU, CE, CS, IT, ME & SF)	ESC	3	0	0	3	30	70	100
5.	20CS241	Python Programming (Common To AU, CE, EC, EE, ME & SF)	ESC	3	0	0	3	30	70	100
6.	20AU231	Fundamentals of Engineering Mechanics (Common to AU & SF)	ESC	3	1	0	4	30	70	100
PRACTICAL										
7.	20CH028	Chemistry Laboratory (Common to All Branches)	BSC	0	0	3	1	50	50	100
8.	20CS227	Python Programming Laboratory (Common To AU, CE, EC, EE, ME & SF)	ESC	0	0	3	1	50	50	100
		Total		17	2	7	22		800	

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SEMESTER - III

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20SF311	Chemical Process Principles	PCC	3	0	0	3	30	70	100
2.	20SF312	Engineering Fluid Mechanics and Machinery	PCC	3	1	0	4	30	70	100
3.	20SF313	Principles of Safety Management	PCC	3	0	0	3	30	70	100
4.	20SF314	Manufacturing Technology	PCC	3	0	0	3	30	70	100
5.	20SF315	Safety in Engineering Industry	PCC	3	0	0	3	30	70	100
6.	20MA341	Statistics and Numerical Methods (Common To AU, ME & SF)	BSC	3	1	0	4	30	70	100
PRACTICAL										
7.	20SF321	Fluid Mechanics and Machinery Laboratory	PCC	0	0	3	1	50	50	100
8.	20SF322	Manufacturing Technology Laboratory	PCC	0	0	3	1	50	50	100
9.	20SF323	Safety Engineering Laboratory	PCC	0	0	3	1	50	50	100
10.	20HR351	Career Development Skills - I (Common to All Branches)	EEC	0	2	0	0	50	50	100
		Total		18	4	9	23		1000	

SEMESTER - IV

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20SF411	Heat and Mass Transfer Operations	PCC	3	1	0	4	30	70	100
2.	20SF412	Fire Engineering Fundamentals	PCC	3	0	0	3	30	70	100
3.	20SF413	Strength of Materials	PCC	3	1	0	4	30	70	100
4.	20SF414	Electrical Technology and Safety	PCC	3	0	0	3	30	70	100
5.	20SF415	Occupational Health and First Aid	PCC	3	0	0	3	30	70	100
6.	20SF416	Safety in Construction	PCC	3	0	0	3	30	70	100
PRACTICAL										
7.	20SF421	Strength of Materials Laboratory	PCC	0	0	3	1	50	50	100
8.	20SF422	Electrical Technology Laboratory	PCC	0	0	3	1	50	50	100
9.	20SF423	Computer Aided Machine Drawing Laboratory	PCC	0	0	3	1	50	50	100
10.	20HR492	Career Development Skills - II	EEC	0	2	0	0	50	50	100
		Total		18	4	9	23		1000	

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Programme	B.E.-Safety and Fire Engineering

SEMESTER - V

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20HS051	Universal Human Values & Understanding Harmony (Common to All Branches)	HSMC	3	0	0	3	30	70	100
2.	20SF511	Chemical Technology and Reaction Engineering	PCC	3	0	0	3	30	70	100
3.	20SF512	Principles of Engineering Design	PCC	3	1	0	4	30	70	100
4.	20SF513	Planning and Design of Fire Protection Systems	PCC	3	1	0	4	30	70	100
5.	20SF514	Chemical Process Safety	PCC	3	0	0	3	30	70	100
6.		Open Elective - I	OEC	3	0	0	3	30	70	100
PRACTICAL										
7.	20SF521	Occupational Health and First Aid Laboratory	PCC	0	0	3	1	50	50	100
8.	20SF522	Fire Safety Training	PCC	0	0	3	1	50	50	100
9.	20HR593	Career Development Skills - III	EEC	0	2	0	0	50	50	100
		Total		18	4	6	22		900	

SEMESTER - VI

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20SF611	Legal Aspects of Safety, Health & Environment	PCC	3	0	0	3	30	70	100
2.	20SF612	Process Instrumentation and Control	PCC	3	0	0	3	30	70	100
3.	20SF613	Structural Fire safety	PCC	3	0	0	3	30	70	100
4.		Professional Elective - I	PEC	3	0	0	3	30	70	100
5.		Open Elective - II	OEC	3	0	0	3	30	70	100
6.		Open Elective - III	OEC	3	0	0	3	30	70	100
PRACTICAL										
7.	20SF621	Environmental Engineering and Management Laboratory	PCC	0	0	3	1	50	50	100
8.	20SF622	Fire Engineering Laboratory	PCC	0	0	3	1	50	50	100
9.	20SF623	Industrial Training and Seminar	EEC	0	0	3	1	50	50	100
10.	20HR694	Career Development Skills - IV	EEC	0	2	0	0	50	50	100
		Total		18	2	9	21		1000	

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SEMESTER - VII

SI.No.	Course Code	Course Name	Category	Hours/ Week L	T	P	Credit C	CA	ES	Total
THEORY										
1.	20SF711	Safety in Rail and Road Transport	PCC	3	0	0	3	30	70	100
2.	20SF712	Principles of Industrial Management	HSMC	3	0	0	3	30	70	100
3.	20SF713	Life Safety in Building Fire	PCC	3	0	0	3	30	70	100
4.		Professional Elective - II	PEC	3	0	0	3	30	70	100
5.		Professional Elective - III	PEC	3	0	0	3	30	70	100
6.		Open Elective - IV	OEC	3	0	0	3	30	70	100
PRACTICAL										
7.	20SF721	Industrials Hygiene Laboratory	PCC	0	0	3	1	50	50	100
8.	20SF722	Project Phase - I	EEC	0	0	6	3	50	50	100
		Total		18	0	9	22		800	

SEMESTER - VIII

SI.No.	Course Code	Course Name	Category	Hours/ Week L	T	P	Credit C	CA	ES	Total
THEORY										
1.	20SF811	Human Factors Engineering	PCC	3	0	0	3	30	70	100
2.		Professional Elective - IV	PEC	3	0	0	3	30	70	100
3.		Professional Elective - V	PEC	3	0	0	3	30	70	100
PRACTICAL										
4.	20SF821	Project Phase - II	EEC	0	0	12	6	50	50	100
		Total		9	0	12	15		400	

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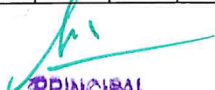K.S.R. KALVI NAGAR,
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List of Electives

PROFESSIONAL ELECTIVE - I (SEMESTER - VI)

Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
1.	20SF661	Power Plant Engineering	S1	PEC	3	0	0	3	30	70	100
2.	20SF662	Safety in Petroleum and Petrochemical Industries	S1	PEC	3	0	0	3	30	70	100
3.	20SF663	Food and Biosafety	S2	PEC	3	0	0	3	30	70	100
4.	20SF664	Fault Detection and Diagnosis	S2	PEC	3	0	0	3	30	70	100
5.	20SF665	Fire Dynamics	S3	PEC	3	0	0	3	30	70	100
6.	20SF666	Hazard Control in Manufacturing	S3	PEC	3	0	0	3	30	70	100

PROFESSIONAL ELECTIVE - II (SEMESTER - VII)

Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
1.	20SF761	Automobile Engineering and Safety	S1	PEC	3	0	0	3	30	70	100
2.	20SF762	Industrial Ecology	S4	PEC	3	0	0	3	30	70	100
3.	20SF763	Hazard Identification and Risk Assessment	S2	PEC	3	0	0	3	30	70	100
4.	20SF764	Reliability Engineering	S3	PEC	3	0	0	3	30	70	100
5.	20SF765	Fluid Power Systems	S4	PEC	3	0	0	3	30	70	100
6.	20SF766	Explosives Technology and Safety	S2	PEC	3	0	0	3	30	70	100

PROFESSIONAL ELECTIVE - III(SEMESTER - VII)

Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
1.	20SF767	Advanced Safety Engineering and Management	S2	PEC	3	0	0	3	30	70	100
2.	20SF768	Disaster Management	S2	PEC	3	0	0	3	30	70	100
3.	20SF769	Total Quality Management	S3	PEC	3	0	0	3	30	70	100
4.	20SF771	Intellectual Property Rights	S4	PEC	3	0	0	3	30	70	100
5.	20SF772	Entrepreneurship Development	S5	PEC	3	0	0	3	30	70	100
6.	20SF773	Statistical Methods forEngineers	S5	PEC	3	0	0	3	30	70	100

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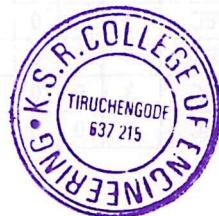K.S.R. COLLEGE OF ENGINEERING
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		PROFESSIONAL ELECTIVE - IV (SEMESTER - VIII)									
Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
1.	20SF861	Work Study and Ergonomics	S1	PEC	3	0	0	3	30	70	100
2.	20SF862	Safety in Textile Industry	S2	PEC	3	0	0	3	30	70	100
3.	20SF863	Fire Works Safety	S2	PEC	3	0	0	3	30	70	100
4.	20SF864	Dock Safety	S3	PEC	3	0	0	3	30	70	100
5.	20SF865	Safety in Mines	S4	PEC	3	0	0	3	30	70	100
6.	20SF866	Nuclear Safety	S4	PEC	3	0	0	3	30	70	100

		PROFESSIONAL ELECTIVE - V (SEMESTER - VIII)									
Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
1.	20SF867	Plant Layout and Materials Handling	S3	PEC	3	0	0	3	30	70	100
2.	20SF868	OHSAS 18000 and ISO 14000	S5	PEC	3	0	0	3	30	70	100
3.	20SF869	Safety in Powder Handling	S4	PEC	3	0	0	3	30	70	100
4.	20SF871	Professional Ethics	S5	PEC	3	0	0	3	30	70	100
5.	20SF872	Aviation Safety	S2	PEC	3	0	0	3	30	70	100
6.	20SF873	Air Pollution and Control	S2	PEC	3	0	0	3	30	70	100

		LIST OF OPEN ELECTIVES OFFERED BY SAFETY & FIRE ENGINEERING TO OTHER DEPARTMENTS									
Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
1.	20SF901	Occupational Health and Hygiene	SFE	OEC	3	0	0	3	30	70	100
2.	20SF902	Construction Safety	SFE	OEC	3	0	0	3	30	70	100
3.	20SF903	Building Fire Safety	SFE	OEC	3	0	0	3	30	70	100
4.	20SF904	Safety in Electrical Engineering	SFE	OEC	3	0	0	3	30	70	100
5.	20SF905	Legal Aspects of Safety	SFE	OEC	3	0	0	3	30	70	100
6.	20SF906	Safety in Industries	SFE	OEC	3	0	0	3	30	70	100
7.	20SF907	Food Safety	SFE	OEC	3	0	0	3	30	70	100
8.	20SF908	Safety Management and its Principles	SFE	OEC	3	0	0	3	30	70	100
9.	20SF909	Safety in Automobile Engineering	SFE	OEC	3	0	0	3	30	70	100
10.	20SF910	Safety in Transportation	SFE	OEC	3	0	0	3	30	70	100

S1 - Thermal Engineering
S2 - Safety Engineering
S3 - Design
S4 - Manufacturing Engineering
S5 - Management

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LIST OF VALUE-ADDED COURSES

Sl. No.	Course Name	Number of Hours	Offered by Internal / External
1.	Business English Certification	15	Internal / External
2.	Other Linguistic Learning like German, Japanese, etc.	15	Internal / External
3.	Fire Fighting and Training	15	Internal / External
4.	Vehicle Service Management	15	Internal / External
5.	Online Course Certification from edX/ Coursera / NPTEL, etc.	15	Internal/ External
6.	Accident and Insurance Survey	15	Internal / External
7.	Course on First Aid	15	Internal / External
8.	Introduction to Personal Protective Equipments	15	Internal / External
9.	Material Handling and its Safety	15	Internal / External
10.	Course on Intellectual Property Rights	15	Internal / External

COURSE COMPONENT SUMMARY

Total No. of Credits = 163

Sl. No.	Subject Area	Credits Per Semester								Credits Total	Percentage Credits
		I	II	III	IV	V	VI	VII	VIII		
1.	HSMC	3	3	-	-	3	-	3	-	12	7.36
2.	BSC	8	8	4	-	-	-	-	-	20	12.27
3.	ESC	4	11	-	-	-	-	-	-	15	9.20
4.	PCC	-	-	19	23	16	11	7	3	79	48.47
5.	PEC	-	-	-	-	-	3	6	6	15	9.20
6.	OEC	-	-	-	-	3	6	3	-	12	7.36
7.	EEC	-	-	-	-	-	1	3	6	10	6.13
TOTAL		15	22	23	23	22	21	22	15	163	100

Note: HS- Humanities and Social Sciences including Management Courses, BS- Basic Science Courses, ES- Engineering Science Courses, PC-Professional Core Courses, PE-Professional Elective Courses, OE- Open Elective Courses, EEC-Employability Enhancement Courses & MC - Mandatory Courses.

- HUMANITIES AND SOCIAL SCIENCES (HS)
- BASIC SCIENCE (BS)
- ENGINEERING SCIENCES (ES)
- PROFESSIONAL CORE (PC)
- PROFESSIONAL ELECTIVES (PE)
- OPEN ELECTIVES (OEC)
- EMPLOYABILITY ENHANCEMENT COURSES (EEC)
- MANDATORY COURSES (MC)

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Chairman (BoS)
Dr.M.PRABU M.E., PhD.,
Head of the Department
Department of Safety and fire Enginee
K.S.R. College of Engineering (Autonomous
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K.S.R. COLLEGE OF ENGINEERING (Autonomous)
<u>SEMESTER - I</u>

R 2020

20EN151	TECHNICAL ENGLISH - I (Common to All Branches)	L	T	P	C
		2	0	1	3

Prerequisite: No prerequisites are needed for enrolling into the course.

Course Outcomes: On successful completion of the course, the student will be able to

		Cognitive Level
CO1	Comprehend and apply Grammar in context for professional communication.	Understand
CO2	Infer the gist and specific information.	Apply
CO3	Discuss express and interact in the society and place of study.	Create
CO4	Critically interpret and comprehend a given text.	Evaluate
CO5	Prioritize the listening skills for academic and professional purposes.	Apply

UNIT - I
[09]

Synonyms & Antonyms — Use of Modal Auxiliaries – Infinitive and Gerund —Parts of Speech -Intensive Reading – Predicting Content – Interpretation - Active Listening - Listening for the main idea - Need based Correspondence (request for joining hostel, bonafide certificate)-Self Introduction- Introducing others.

UNIT - II
[09]

British & American Terminology -– Tenses (Simple Present, Present Continuous, Present Perfect, Simple Past, and Simple Future) -Predicting Content - Drawing inferences - Listening for specific details - Listening to News – Job Application and Resume – Writing Instructions- Delivering Welcome Address.

UNIT - III
[09]

Standard Abbreviations and Acronyms -Preposition of Time, Place and Movement – Active Voice & Passive Voice – Consonant Sounds – Pronunciation guidelines related to Vowels and Consonant – Skimming & Scanning - Inference – Context Based Meaning – Recommendation Writing - Proposing Vote of Thanks.

UNIT - IV
[09]

Vocabulary Building – Phrasal Verbs (Put, Give, Look, Take, Get, Call)- Impersonal passive -Newspaper Reading — Note making – Listening to Dialogues – E Mail Etiquettes & E-mail Writing- MoC – Anchoring – Role play in academic context.

UNIT - V
[09]

Homonyms - Concord (Subject & Verb Agreement)- Rearranging the jumbled sentences - Listening to Telephonic Conversation - Letter of Invitation (inviting, accepting and declining) – Paragraph writing - Letter to the Editor of a News Paper – Drills using Minimal pairs – Presentation Skills.
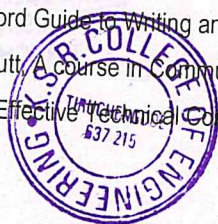
Total (L= 40, T = 5) = 45 Periods

Text Books:

1. S. Sumant, Technical English - I, Vijay Nicole, Chennai, Second Edition, 2018.
2. Meenakshi Raman, Technical Communication, Oxford University Press, New Delhi, First Edition, 2017.

Reference Books:

1. Dr.P. Rathna, English Work Book – I, VRB Publishers Pvt. Ltd., Chennai, Second Edition,2018.
2. Seely, The Oxford Guide to Writing and Speaking, Oxford University Press, New Delhi, First Edition, 2016.
3. P. Kiranmani Dutt, A course in Communication Skills,Cambridge University Press, New Delhi, First Edition, 2014.
4. M Ashra Rizvi, Effective Technical Communication, Tata McGraw HILL, New Delhi, First Edition, First Edition,2005.

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CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Comprehend and apply Grammar in context for professional communication.	-								2	3	-	2	-	-
CO2	Infer the gist and specific information.	-	-					-	-	2	3	-	1	-	-
CO3	Ability to speak, express and interact in the society and place of study.	-						-		2	3	-	1	-	-
CO4	Critically interpret and comprehend a given text.	-	-	-	-	-		-		2	3	-	1	-	-
CO5	Prioritize the listening skills for academic and professional purposes.	-	-	-	-	-				2	3	-	1	-	-
	Average	-	-	-	-	-		-	-	2	3	-	1	-	-

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

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SEMESTER - I

20MA151	ENGINEERING MATHEMATICS - I	L	T	P	C
	(Common to All Branches)	3	1	0	4

Prerequisite: No prerequisites are needed for enrolling into the course

Course Outcomes: On Completion of this course, the student will be able to	Cognitive Level
CO1 Interpret the concepts of Matrix applications in the field of engineering.	Understand
CO2 Acquire knowledge in solving ordinary differential equations.	Evaluate
CO3 Extend and apply the concepts of differential calculus problems.	Apply
CO4 Develop the skills in solving the functions of several variables.	Remember
CO5 Applying the concepts and solving the Vector Calculus problems.	Apply

UNIT-I   LINEAR ALGEBRA   [12]

Characteristic equation – Eigen values and Eigen vectors of a real matrix – Properties of Eigen values and Eigen vectors (Excluding proof) – Cayley Hamilton theorem (excluding proof) – Quadratic forms – Reduction of quadratic form to canonical form by orthogonal transformation.

UNIT - II   ORDINARY DIFFERENTIAL EQUATIONS   [12]

Linear differential equations of second and higher order with constant coefficients – Differential equations with variable coefficients – Cauchy's and Legendre's linear equations – Method of variation of parameters.

UNIT - III   DIFFERENTIAL CALCULUS   [12]

Curvature – Radius of curvature (Cartesian co-ordinates only) – Centre of curvature and Circle of curvature – Involutes and Evolutes.

UNIT - IV   FUNCTIONS OF SEVERAL VARIABLES   [12]

Partial derivatives – Total derivatives – Euler's theorem for homogenous functions – Taylor's series expansion – Maxima and Minima for functions of two variables – Method of Lagrangian multipliers.

UNIT -V   VECTOR CALCULUS   [12]

Gradient, Divergence and Curl – Directional derivative – Irrotational and solenoidal vector fields – Green's theorem in plane, Gauss divergence theorem and Stoke's theorem – Problems in Cube, Cuboid and Rectangular parallelopiped only.

Total (L: 45 T:15) = 60 Periods

Text Books:

1. Ravish R Singh and Mukul Bhatt, Engineering Mathematics - I, McGraw Hill Publications, Fourth Edition, New Delhi 2016.

2. Grewal B.S, Higher Engineering Mathematics, Tata McGraw Hill Publishing Company, Forty Third Edition, New Delhi, 2015.

Reference Books:

1. Bali N. P and Manish Goyal, Textbook on Engineering Mathematics, Laxmi Publications (P) Ltd., Seventh Edition, 2016.

2. H.K. Dass, Advance Engineering Mathematics, S. Chand and company, Eleventh Edition, 2015.

3. Narayanan.S and Manicavachagom Pillai. T.K. - Calculas Vol I and Vol II, S. Chand & Co. Sixth Edition, 2014.

4. Jain R.K. and Iyengar S.R.K., - Advanced Engineering Mathematics, Narosa Publicaitons, Eighth Edition, 2012.

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CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Interpret the concepts of Matrix applications in the field of engineering.	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO2	Acquire knowledge in solving ordinary differential equations.	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO3	Extend and apply the concepts of differential calculus problems.	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	Develop the skills in solving the functions of several variables.	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO5	Applying the concepts and solving the Vector Calculus problems.	3	3	3	3	-	-	-	-	-	-	-	-	-	-
	Average	3	3	3	3	-	-	-	-	-	-	-	-	-	-

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous)   **R 2020**

SEMESTER - I

		L	T	P	C
20PH051	**ENGINEERING PHYSICS** (Common to All Branches)	3	0	0	3

Prerequisite:NIL

Course Outcomes: On Completion of this course, the student will be able to		**Cognitive level**
CO1	Describe the impact of engineering solutions in the constructional and designing environment.	Remember
CO2	Categorize the types of lasers and utilize it for specific application based on their desirable requisite.	Analyze
CO3	Utilize the conceived concepts and techniques for synthesizing novel crystals with enhanced multifunctional properties.	Apply
CO4	Enumerate the preambles of quantum physics and implement its concepts to tackle the cumbersome engineering problems.	Apply
CO5	Comprehend the fundamental ideas of optoelectronic materials and to fabricate it for the potential applications	Understand

UNIT – I   ACOUSTICS AND ULTRASONICS

Acoustics–Introduction – Classification of sound – Characteristics of musical sound – Loudness – Weber – Fechner law – Decibel – Absorption coefficient – Reverberation – Reverberation time – Sabine 's formula: growth and decay (derivation) – Factors affecting acoustics of buildings and their remedies. Ultrasonics – Production –piezoelectric method – Properties – Velocity measurement: acoustical grating –Engineering applications– SONAR.

UNIT – II   LASER TECHNOLOGY   **[09]**

Introduction – Principle of Spontaneous emission and stimulated emission – Population inversion, pumping – Einstein's A and B coefficients (derivation). Types of lasers – Nd-YAG, CO_2 and Semiconductor lasers (homo-junction and hetero-junction) – Qualitative Industrial Applications: Lasers in welding, heat treatment and cutting – Medical applications – Holography (construction and reconstruction of images).

UNIT – III   CRYSTAL PHYSICS   **[09]**

Introduction to crystalline and amorphous solids – lattice and unit cell – seven crystal system and Bravais lattices – Miller indices(hkl) –d-spacing in cubic lattice – atomic radius – coordination number – packing factor calculation for sc, bcc, fcc and hcp– crystal defects – point, line and surface defects.

UNIT – IV   QUANTUM PHYSICS   **[09]**

Black body radiation – Planck's theory (derivation) – Deduction of Wien's displacement law and Rayleigh – Jeans' Law from Planck's theory – Compton effect - Theory and experimental verification – Matter waves – Schrödinger's wave equation – Time independent and time dependent equations – Physical significance of wave function – Particle in a one-dimensional box.

UNIT – V   OPTOELECTRONIC DEVICES   **[09]**

Photoconductive materials – Light Dependent Resistor (LDR) – Working – Applications – Photovoltaic materials – Solar cell – Construction, working and applications – Light Emitting Diode (LED) – Principle, construction and working - Liquid crystal Display (LCD) – Types and applications.

Total = 45 Periods

Text Books:

1. M.N. Avadhanulu and P.G. Kshirsagar, A text book of Engineering Physics, S. Chand and Company, New Delhi, Seventh Edition, 2014.
2. R.K. Jain & S.L. Gupta, Engineering Physics, Dhanpat Rai Publication, New Delhi, Seventh Edition, 2014.

Reference Books:

1. Bali N. P and Manish Goyal, Textbook on Engineering Mathematics, Laxmi Publications (P) Ltd., Seventh Edition, 2016.
2. H.K. Dass, Advance Engineering Mathematics, S. Chand and company, Eleventh Edition, 2015.
3. Narayanan.S and Manicavachagom Pillai. T.K. - Calculas Vol - I and Vol - II, S. Chand & Co. Sixth Edition, 2014.
4. Jain R.K. and Iyengar S.R.K., - Advanced Engineering Mathematics, Narosa Publicaitons, Eighth Edition, 2012.

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CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Describe the impact of engineering solutions in the constructional and designing environment.	3	3	-	-	2	-	-	1	-	2	-	2	-	-
CO2	Categorize the types of laser and utilize it for specific application based on their desirable requisite.	3	3	-	-	2	-	-	1	-	2	-	2	-	-
CO3	Utilize the conceived concepts and techniques for synthesizing novel crystals with enhanced multifunctional properties.	3	3	-	-	2	-	-	1	-	2	-	2	-	-
CO4	Enumerate the preambles of quantum physics and implement its concepts to tackle the cumbersome engineering problems.	3	3	-	-	2	-	-	1	-	2	-	2	-	-
CO5	Comprehend the fundamental ideas of optoelectronic materials and to fabricate it for the potential applications	3	3	-	-	2	-	-	1	-	2	-	2	-	-
	Average	3	3	-	-	2	-	-	1	-	2	-	2	-	-

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous)　　　　R 2020

SEMESTER - I

20ME144	ENGINEERING DRAWING (Common to AU, ME & SF)	L	T	P	C
		1	2	0	3

Prerequisite: *No Prerequisites are needed for enrolling into the course.*

Course Outcomes: On successful completion of the course, the student will be able to　　**Cognitive Level**

CO1	Gain knowledge on basic drafting convention and perform sketching of basic geometrical constructions and Orthographic projections of Engineering components.	Understanding
CO2	Draw orthographic projection of points, lines and plane surfaces inclined to principle planes.	Creating
CO3	Practicing projections of simple solids which are inclined to reference planes by change of position method.	Analyzing
CO4	Construct sectional views and development of surfaces of simple and truncated solids.	Creating
CO5	Prepare isometric views of simple solids and perspective projections of solids by visual ray method.	Applying

UNIT - I　　PLANE CURVES AND ORTHOGRAPHIC PROJECTION　　　　**[09]**

Introduction on drafting instruments, BIS conventions and specifications, Lettering and Dimensioning-Conics-Construction of ellipse, parabola and hyperbola by eccentricity method -Construction of cycloid-Construction of involutes-Drawing of tangents and normal to the above curves. Representation of three dimensional objects-General principles of orthographic projection- First angle projection.

UNIT - II　　PROJECTION OF POINTS, LINES AND PLANE SURFACES　　　　**[09]**

Projection of points and straight lines located in the first quadrant -Determination of true lengths and true inclinations -Projection of polygonal surface and circular lamina inclined to any one reference plane.

UNIT - III　　PROJECTION OF SOLIDS　　　　**[09]**

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

UNIT - IV　　SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES　　　　**[09]**

Sectioning of above solids in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other- Obtaining true shape of section. Development of lateral surfaces of simple and truncated solids-Prisms, pyramids, cylinders and cones.

UNIT - V　　ISOMETRIC AND PERSPECTIVE PROJECTIONS　　　　**[09]**

Principles of isometric projection - isometric scale -isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones. Perspective projection of prisms, pyramids and cylinders by visual ray method.

Total (L: 15 T: 30) = 45 Periods

Text Books:

1. Natarajan, K.V., A text book of Engineering Graphics, Dhanalakshmi Publishers, Chennai, 2019.
2. Kumar, M.S., Engineering Graphics, D.D. Publications, 2019.

Reference Books:

1. Venugopal & Prabhu Raja, V., Engineering Graphics, New Age International (P) Limited, 2009.
2. Bhatt, N.D., Engineering Drawing, Charotar Publishing House, Fifty Third Edition, 2014.
3. Shah, B., and Rana, B.C., Engineering Drawing, Pearson Education ,2009.
4. Gopalakrishna, K.R., Engineering Drawing (Vol.I & II), Subhas Publications, 2010.
5. Basant Agarwal and Agarwal C.M., Engineering Drawing, Tata McGraw Hill Publishing Company Limited,2018.

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CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Gain knowledge on basic drafting convention and perform sketching of basic geometrical constructions andOrthographic projections of Engineering components.	3	3	2	-	1	-	-	-	-	-	-	2	-	-
CO2	Draw orthographic projection of points, lines and plane surfaces inclined to principle planes.	3	3	2	-	1	-	-	-	-	-	-	2	-	-
CO3	Practicing projections of simple solids which are inclined to reference planes by change of position method.	3	3	2	-	1	-	-	-	-	-	-	2	-	-
CO4	Construct sectional views and development of surfaces of simple and truncated solids.	3	2	2	-	1	-	-	-	-	-	-	2	-	-
CO5	Prepare isometric views of simple solids and perspective projections of solids by visual ray method.	3	2	2	-	1	-	-	-	-	-	-	2	-	-
	Average	3	3	2	-	1	-	-	-	-	-	-	2	-	-

K.S.R. COLLEGE OF ENGINEERING (Autonomous)   **R 2020**

SEMESTER – I

20MC052	ENVIRONMENTAL SCIENCE AND ENGINEERING	L	T	P	C
	(Common to All Branches)	3	0	0	0

Prerequisite:NIL

Course Outcomes: On Completion of this course, the student will be able to	Cognitive level
CO1	Interpret the importance in conservation of resources for future generation.	Understand
CO2	Relate the importance of ecosystem and biodiversity.	Remember
CO3	Analyze the impact of pollution and hazardous waste in a global and societal context.	Understand
CO4	Identify the contemporary issues that result in environmental degradation that would attempt to provide solutions to overcome the problems.	Understand
CO5	Predict the concept of Sustainability and Green Chemistry.	Understand

UNIT -I   INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES   [09]

Environment – definition – scope and importance – need for public awareness; Forest resources – use – over exploitation – deforestation; Water resources – over–utilization of surface and ground water; Mineral resources – environmental effects of extracting and using mineral resources; Food resources – overgrazing – effects of modern agriculture – fertilizer–pesticide problems – water logging – salinity; Role of an individual in conservation of natural resources. **Activity:**Slogan making event on conserving natural resources or plantation of trees.

UNIT - II   ECOSYSTEM AND BIODIVERSITY   [09]

Concept of an ecosystem – structure and function of an ecosystem – producers – consumers and decomposers – Food chain – food web – energy flow in the ecosystem – ecological pyramids – Ecological succession; Forest ecosystem and Aquatic ecosystems (Estuary and marine ecosystem); Biodiversity – introduction – definition – Values of biodiversity; Hot-spots of biodiversity; Endangered and Endemic Species of India. **Activity:**Arrange a trip to visit different varieties of plants.

UNIT -III   ENVIRONMENTAL POLLUTION   [09]

Pollution – introduction and different types of pollution; Causes – effects and control measures of air pollution and water pollution – water quality parameters – hardness – definition – types; Alkalinity – definition – types; BOD and COD (definition and significance); Noise pollution – solid waste management – hazardous waste – medical and e-wastes; Role of an individual in prevention of pollution.**Activity:**Drive for segregation of waste or cleanliness drive.

UNIT -IV   SOCIAL ISSUES AND ENVIRONMENT   [09]

Water conservation – rain water harvesting and watershed management; Environmental ethics – Issues and possible solutions; Climate change – global warming and its effects on flora and fauna – acid rain – ozone layer depletion; Disaster Management – earth quake – cyclone – tsunami – disaster preparedness – response and recovery from disaster. **Activity:** Poster making event on water management or Climate change.

UNIT -V   SUSTAINABILITY AND GREEN CHEMISTRY   [09]

Sustainable development – from unsustainable to sustainable development – Environmental Impact Assessment (EIA); Human rights; Value education; HIV/AIDS; Role of information technology in environment and human health; 12 Principles of Green Chemistry.**Activity:**Group discussion on Sustainability or Lecture from an expert on Green chemistry.

Total = 45 Periods

Text Books:

1. Dr. T. Arun Luiz, Environmental Science and Engineering, S.Chand & Company Private Limited, New Delhi, First Edition, 2016.
2. Anubha Kaushik and C. P. Kaushik, Environmental Science and Engineering, New Age International Publishers, Chennai, Fifth Edition, 2016.

Reference Books:

1. G. Tyler Miller and Scott E. Spoolman, Environmental Science, Cengage Learning India Private Limited, New Delhi, Fourteenth Edition, 2014.
2. Dr. A. Ravikrishnan, Environmental Science and Engineering, Sri Krishna Hi-tech Publishing Company Private Limited, Chennai, Tenth Edition, 2014.
3. Raman Sivakumar, Introduction to Environmental Science and Engineering, Tata McGraw Hill Education Private Limited, Fourth Edition, 2012.
4. S S. Dara, A Text book of Environmental Chemistry and Pollution Control, S. Chand & Company Limited, New Delhi, Tenth Edition, 2005.

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CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Interpret the importance in conservation of resources for future generation.	3	2	2	-	-	3	3	2	-	-	-	1	-	-
CO2	Relate the importance of ecosystem and biodiversity.	3	2	2	-	-	3	3	2	-	-	-	1	-	-
CO3	Analyze the impact of pollution and hazardous waste in a global and societal context.	3	2	2	-	-	3	3	2	-	-	-	1	-	-
CO4	Identify the contemporary issues that result in environmental degradation that would attempt to provide solutions to overcome the problems.	3	2	2	-	-	3	3	2	-	-	-	1	-	-
CO5	Predict the concept of Sustainability and Green Chemistry.	3	2	2	-	-	3	3	2	-	-	-	1	-	-
	Average	3	2	2	-	-	3	3	2	-	-	-	1	-	-

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous)R2020

SEMESTER- I

		L	T	P	C
INDUCTION PROGRAMME (COMMON TO ALL BRANCHES)		0	0	0	0

	Course outcomes: On Completion of this course, the student will be able to	Cognitive Level
CO1	Involve in physical activity, creative arts and culture and feel comfortable in the new environment.	Understand
C02	Build relationship between teachers and students and make familiarizing with departments.	Understand
C03	Concentrate on literary activities.	Apply
CO4	Develop the required skills through lectures and workshops.	Remember
C05	Acquire skills in extracurricular activities.	Analyze

List of activities during the three weeks Students Induction Programme (SIP):   **3 weeks**

MODULE I : PHYSICAL ACTIVITY

- This would involve a daily routine of physical activity with games and sports. There would be games in the evening. These would help develop team work besides health.

MODULE II : CREATIVE ARTS & CULTURE

- Every student would choose one skill related to the arts whether visual arts or performing arts such as painting, music, dance, pottery, sculpture etc. The student would pursue it every day for the duration of the program.
- These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would help in engineering design later.

MODULE III : MENTORING AND CONNECTING THE STUDENTS WITH FACULTY

- Mentoring takes place in the context and setting of *Universal Human Values*. It gets the student to explore oneself and experience the joy of learning, prepares one to stand up to peer and take decisions with courage, be aware of relationships and be sensitive to others.
- Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It is to open thinking towards the self. Universal Human Values discussions could even continue for rest of the semester as a normal course, and not stop with the induction program.

MODULE IV: FAMILIRIZATION WITH COLLEGE/DEPARTMENTS & BRANCHES

- They should be shown their department, and told what it means to get into the branch or department. Describe what role the technology related to their department plays in society and after graduation what role the student would play in society as an engineer in that branch. A lecture by an alumnus of the Dept. would be very helpful in this regard. They should also be shown the laboratories, workshops and other facilities.

MODULE V: LITERARY ACTIVITIES

- Literary activity would encompass reading a book, writing a summary, debating, enacting a play etc.

MODULE VI: PROFICIENCY MODULES:

- The induction program period can be used to overcome some critical lacunas that students might have difficulties in communication skills. These should run like crash courses, so that when normal courses start after the induction program, the student has overcome the lacunas substantially.

MODULE VII: LECTURES & WORKSHOPS

- Lectures by eminent people to be organized, say, once a week. It would give the students exposure to people who are eminent, in industry or engineering, in social service, or in public life. Alumni could be invited as well.
- Motivational lectures about life, meditation, etc. by Ramakrishna Mission, Art of Living, Vivekanand Kendras, S-VYASA, etc. may be organized. (3 sessions, 9 hours).

MODULE VIII: EXTRA CURRICULAR ACTIVITIES
- The new students should be introduced to the extra-curricular activities at the college.
- They should be shown the facilities and informed about activities related to different clubs etc. This is when selected senior students involved in or leading these activities can give presentations, under faculty supervision.

MODULE IX: FEED BACK & REPORT ON THE PROGRAMMES:
- Students should be asked to give their mid-program feedback. They should be asked to write their opinions about the program at the end of the first week.
- Finally, at the end of the program, each group (of 20 students) should be asked to prepare a single report on their experiences of the program. On the second last day, each group should present their report in front of other groups. Immediately after their presentation, they should submit their written report. This will also serve as a *closure* to the program.
- Finally, a formal written or online anonymous feedback should be collected at the end of the program.

CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Involve in physical activity, creative arts and culture and feel comfortable in the new environment.	3	-	-	-	-	3	3	2	3	2	-	3	-	-
CO2	Build relationship between teachers and students and make familiarizing with departments.	3	-	-	-	-	3	3	3	1	3	-	3	-	-
CO3	Concentrate on literary activities.	3	-	-	-	-	2	3	3	3	3	-	3	-	-
CO4	Develop the required skills through lectures and workshops	3	-	-	-	-	3	3	3	2	3	-	3	-	-
CO5	Acquire skills in extracurricular activities.	3	-	-	-	-	3	3	3	3	3	-	3	-	-
	Average	3	-	-	-	-	3	3	3	2	3	-	3	-	-

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SEMESTER - I

20GE028	**MANUFACTURING PRACTICES LABORATORY**	L	T	P	C
	(Common to All Branches)	0	0	3	1

Prerequisite: *No Prerequisites are needed for enrolling into the course.*

Course Outcomes: On successful completion of the course, the student will be able to | **Cognitive Level**

CO1	Prepare green sand mould for simple patterns and carpentry components with simple joints.	Creating
CO2	Perform welding practice to join simple structures.	Applying
CO3	Practice simple operations in lathe and drilling machine.	Understanding

GROUP A (CIVIL & MECHANICAL)

LIST OF EXPERIMENTS

1. Study of fitting, smithy, plastic moulding and glass cutting.
2. Prepare a mould using solid/split patterns in Foundry.
3. Make Lap joint / Butt joint / T joint from the given wooden pieces using carpentry tools.
4. Make a Butt joint / Lap joint / Tee joints using arc / gas welding equipment.
5. Perform simple Facing and Turning operation using Centre Lathe.
6. Make holes as per the given dimensions using drilling machine.

LIST OF EQUIPMENT

1. Fitting tools and its accessories - 15 Sets
2. Smithy tools and Open-hearth furnace setup - 2Sets
3. Foundry tools and its accessories -5 Sets
4. Carpentry tools and its accessories - 15 Sets
5. Arc Welding equipment's and its accessories - 5 Sets
6. Oxy Acetylene welding setup and its accessories -1 Set
7. Centre Lathe with its accessories - 2 Nos.
8. Pillar type drilling machine - 1 No.

CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Prepare green sand mould for simple patterns and carpentry components with simple joints.	2	-	-	3	-	-	-	3	1	-	-	3	3	1
CO2	Perform welding practice to join simple structures.	2	-	-	3	-	-	-	3	1	-	-	3	3	1
CO3	Practice simple operations in lathe and drilling machine.	2	-	-	3	-	-	-	3	1	-	-	3	3	1
	Average	2	-	-	3	-	-	-	3	1			3	3	1

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous)   R 2020

SEMESTER – II

20GE028	**GROUP B (ELECTRICAL & ELECTRONICS)** (Common to all Branches)	L T P C 0 0 3 1

Prerequisite: No prerequisites are needed for enrolling into the course

Course Outcomes: On Completion of this course, the student will be able to   *Cognitive level*

CO1	*Construct different types of wiring used in house.*	*Understand*
CO2	*Calibrate single phase Energy meter.*	*Understand*
CO3	*Demonstrate different electronic components, logic gates and CRO.*	*Understand*

List of Experiments:

ELECTRICAL ENGINEERING

1. Fluorescent lamp wiring & Stair-case wiring.
2. Residential house wiring using switches, fuse, indicator, lamp and fan.
3. Calibration of Single phase Energy meter

ELECTRONICS ENGINEERING

1. Study of Electronic components and Soldering practice.
2. Study of logic gates AND, OR, EX-OR, NOT, Half and Full Adder.
3. Study of CRO

Total : 45 Periods

CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Construct different types of wiring used in house	3	2	3	-	-	-	-	1	1	-	-	3	-	-
CO2	Calibrate single phase Energy meter	3	1	2	-	-	-	-	1	1	-	-	3	-	-
CO3	Demonstrate different electronic components, logic gates and CRO	3	2	3	-	-	-	-	1	1	-	-	3	-	-
	Average	3	2	3	-	-	-	-	1	1	-	-	3	-	-

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous)   **R 2020**

SEMESTER – II

20PH028

PHYSICS LABORATORY
(Common to All Branches)

L	T	P	C
0	0	3	1

Prerequisite: NIL

Course Outcomes: On Completion of this course , the student will be able to   **Cognitive level**

CO1	Comprehend the different physical parameters of optics.	Analyze
CO2	Perceive the production of ultrasonic waves through inverse piezoelectric effect and to determine the velocity of sound waves in the given liquid.	Remember
CO3	Explore the principle of thermal conductivity thereby to calculate the thermal conductivity of various bad conductors like cardboard, mica, etc.	Apply
CO4	Confer the experimental counterparts of materials properties such as modulus, solar cell, and energy gap.	Understand
CO5	Imbibe the concept of capillary action in fluid dynamics and to compare the coefficient of viscosity of the given liquid.	Analyze

List of Experiments in Physics Laboratory

1. Determination of wavelength of Laser using grating and the Size of the Particles.

2. Determination of thickness of the given material by Air – wedge method.

3. Determination of velocity of Ultrasonic waves and compressibility using Ultrasonic interferometer.

4. Spectrometer grating - Determination of wavelength of mercury spectrum.

5. Determination of thermal conductivity of a bad conductor by Lee's disc method.

6. Determination of Young's modulus of the material of a uniform bar by Non – Uniform bending method.

7. Determination of Band gap energy of a semiconductor.

8. Determination of Viscosity of a given liquid by Poiseuille's method.

9. Torsional pendulum - Determination of rigidity modulus of a given wire.

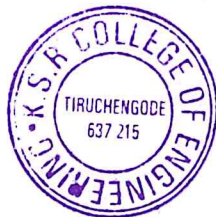10. V-I Characteristics of Solar Cell   .

Total: 30 Periodss

Text Book:
1. Faculty Members of Physics, Physics Lab manual, Department of Physics, K.S.R. College of Engineering, Namakkal, seventeenth Edition, 2018.
2. Dr. P. Mani, Physics Lab Manual & Observation Book, Dhanam Publications, Twelth Edition Chennai 2017.

References:
1. Dr. G. Senthilkumar, Physics Lab manual, VRB Publications Pvt. Ltd., Chennai, tenth Edition, 2006.
2. R Suresh & Dr. C. Kalyanasundaram, Physics Laboratory, Sri Krishna Hitech Publishing Company Pvt. Ltd., Chennai, fifth Edition, 2017.

CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Comprehend the different physical parameters of optics.	3	3	-	-	2	-	-	1	-	2	-	2	-	-
CO2	Perceive the production of ultrasonic waves through inverse piezoelectric effect and to determine the velocity of sound waves in the given liquid	3	3	-	-	-	-	-	1	-	2	-	2	-	-
CO3	Explore the principle of thermal conductivity thereby to calculate the thermal conductivity of various bad conductors like cardboard, mica, etc.	3	3	-	-	2	-	-	1	-	2	-	2	-	-
CO4	Confer the experimental counterparts of materials properties such as modulus, solar cell, and energy gap.	3	3	-	-	2	-	-	1	-	2	-	2	-	-
CO5	Imbibe the concept of capillary action in fluid dynamics and to compare the coefficient of viscosity of the given liquid.	3	3	-	-	2	-	-	1	-	2	-	2	-	-
	Average	3	3	-	-	2	-	-	1	-	2	-	2	-	-

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous)

SEMESTER - II

R 2020

		L	T	P	C
20EN251	**TECHNICAL ENGLISH - II** (Common to All Branches)	2	0	1	3

Prerequisite: No prerequisites are needed for enrolling into the course

Course Objectives: On successful completion of the course, the student will be able to	Cognitive Level
CO1 Infer and apply the enriched vocabulary, by knowing the basic grammatical structure, in academic and professional contexts.	Understand
CO2 Identify and use Standard English in diverse situations.	Apply
CO3 Interpret by reading a text and comprehend a given text.	Create
CO4 Organize and compose business letters.	Evaluate
CO5 Prioritize the listening skill for academic and personal development purposes.	Apply

UNIT - I [09]

Technical Vocabulary – Changing words from one form to another - Articles – Compound Nouns - Introducing Oneself – Biased Listening- Critical reading - Need based Correspondence (In plant training & Industrial Visit) - Context based meaning - Writing short Essays.

UNIT - II [09]

Prefixes & Suffixes - Numerical Adjectives – If Conditionals – Making Requests – Seeking Information - Listening for main ideas - Intensive Reading - E-mail Writing - Describing Likes & Dislikes - Report Writing.

UNIT - III [09]

Types of Collocations - Framing Questions – 'Wh' Question – Yes / No Question –Cause and Effect Expression - Greetings and Introductions — Inviting People - Listening and Note taking - Critical reading- Making inference - Transcoding (Interpretation of Charts).

UNIT - IV [09]

Common English idioms and phrases - Expression of Purpose – Editing text for Spelling and Punctuation - Oral Presentation - Extensive Listening - Short Comprehension Passages - Business Correspondence – Calling for Quotations, Seeking Clarification, placing order and Complaint.

UNIT - V [09]

Confused and misused words - Discourse markers – Redundancies - Instructions – Describing – Listening to fill up forms and gapped texts - Reading Short Texts from Journals and Newspapers - Telephone Etiquette - Check list – Essay Writing.
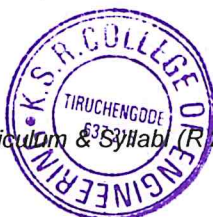
Total (L= 40, T = 5) = 45 Periods

Text Books:

1. Dr.S. Sumant, Technical English II, Tata McGraw Hill, New Delhi, Second Edition, 2016.

2. M Ashra Rizvi, Effective Technical Communication, Tata McGraw HILL, New Delhi, First Edition, 2004.

Reference Books:

1. Department of English, English for Technologists and Engineers, Orient Black Swan, Chennai, First Edition, 2016.

2. Michael Swan, Practical English Usage, Oxford University Press, New Delhi, First Edition, 2015.

3. Dept. of Humanities and social sciences, Anna University, Chennai, English for Engineers and Technologists, Orient Longman, First Edition, 2014.

4. Hory Sankar Mukerjee, Business Communication, Oxford University Press, New Delhi, First Edition,2013.

CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Infer and apply the enriched vocabulary, by knowing the basic grammatical structure, in academic and professional contexts.*	-	-	-	-	-	-	-	-	2	3	-	1	-	-
CO2	*Identify and use Standard English in diverse situations.*	-	-	-	-	-	-	-	-	2	3	-	1	-	-
CO3	*Interpret by reading a text and comprehend a given text.*	-	-	-	-	-	-	-	-	2	3	-	1	-	-
CO4	*Organize and compose business letters.*	-	-	-	-	-	-	-	-	2	3	-	1	-	-
CO5	*Prioritize the listening skill for academic and personal development purposes.*	-	-	-	-	-	-	-	-	2	3	-	1	-	-
	Average	-	-	-	-	-	-	-	-	2	3	-	1	-	-

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous)
SEMESTER - II

20MA241	ENGINEERING MATHEMATICS - II (COMMON TO AU, CE, ME& SF)	L	T	P	C
		3	1	0	4

Prerequisite: No prerequisites are needed for enrolling into the course

Course Outcomes: On Completion of this course, the student will be able to	Cognitive Level
CO1 Apply the concepts of analytic functions, conformal mapping and bilinear transformations.	Remember
CO2 Solve the of Complex Integration problems.	Understand
CO3 Solve the Fourier series problems.	Understand
CO4 Analyze the partial differential equations and its applications.	Remember
CO5 Apply Laplace transform, Inverse Laplace transform in the Engineering fields.	Apply

UNIT - I   ANALYTIC FUNCTIONS   [12]

Functions of a complex variable – Analytic functions – Necessary and sufficient conditions: Cauchy – Riemann Equation (excluding proof) – Harmonic functions – Construction of analytic functions (Milne Thomson method) – Conformal mapping: $w = z+c$, cz, $1/z$ and bilinear transformation.

UNIT - II   COMPLEX INTEGRATION   [12]

Complex integration – Statement and applications of Cauchy's integral theorem and Cauchy's integral formula – Laurent's series expansion – Singular points – Residues – Cauchy's residue theorem – Evaluation of real and definite integrals on unit circle and semi – circular contour (excluding poles on boundaries).

UNIT - III   FOURIER SERIES   [12]

Dirichlet's conditions – General Fourier series - Odd and Even functions – Half range sine and cosine series – Harmonic analysis.

UNIT - IV   PARTIAL DIFFERENTIAL EQUATIONS AND ITS APPLICATIONS   [12]

Formation of partial differential equations – Lagrange's linear equation - Solutions of one-dimensional wave equation – Problems on vibrating string with zero and non - zero initial velocity – One dimensional heat equation – Problems of steady state condition with zero and non- zero boundary values.

UNIT - V   LAPLACE TRANSFORMATION   [12]

Laplace transforms – Conditions for existence – Transform of elementary functions – Basic properties– Transform of Derivatives – Initial and final value theorems (excluding proof). Transform of periodic functions. Inverse Laplace transforms (partial fraction method only) – Solution of linear ordinary differential equations of second order with constant coefficients.

Total (L: 45 T:15) = 60 Periods

Text Books:

1. Ravish R Singh and Mukul Bhatt, Engineering Mathematics - II, McGraw Hill Publications, New Delhi, Third Edition,2016.
2. Grewal B.S, Higher Engineering Mathematics, Tata McGraw Hill Publishing Company, Forty ThirdEdition, New Delhi, 2015.

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley India, New Delhi, Seventh Edition, 2016.
2. Bali N.P and Manish Goyal, Engineering Mathematics, Laxmi Publications, Chennai, Seventh Edition, 2016.
3. P. Anuradha and V. Sudhakar, Transforms and Partial Differential Equations, Scitech publication, Chennai, Second edition,2014.
4. Lan Sneddon, Elements of Partial Differential Equations, McGraw-Hill International Editions, New Delhi, Thirty Fifth Edition, 2012.

CO PO MAPPING

CO's	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Apply the concepts of analytic functions, conformal mapping and bilinear transformations.	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO2	Solve the of Complex Integration problems.	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO3	Solve the Fourier series problems.	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	Analyze the partial differential equations and its applications.	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO5	Apply Laplace transform, Inverse Laplace transform in the Engineering fields.	3	3	3	3	-	-	-	-	-	-	-	-	-	-
	Average	3	3	3	3	-	-	-	-	-	-	-	-	-	-

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous)				R 2020	

SEMESTER - II

	ENGINEERING CHEMISTRY	L	T	P	C
20CH051	(Common to All Branches)	3	0	0	3

Prerequisite:*NIL*

Course Outcomes: On Completion of this course, the student will be able to		*Cognitive Level*
CO1	Make use of the manufacture, properties and uses of advanced engineering materials.	Understand
CO2	Explain the concept of corrosion and its control.	Understand
CO3	Use the concept of thermodynamics in engineering applications.	Understand
CO4	Recall the periodic properties such as ionization energy, electron affinity and electro negativity.	Remember
CO5	Analyze the usage of various spectroscopic techniques.	Understand

UNIT - I   ADVANCED ENGINEERING MATERIALS   [09]

Abrasives – Moh's scale of hardness – types – natural [Diamond] – synthetic [SiC]; Refractories – characteristics – classifications [Acidic, basic and neutral refractories] – properties – refractoriness – RUL – porosity – thermal spalling; Lubricants – definition – function – characteristics – properties – viscosity index, flash and fire points, cloud and pour points, oiliness; Solid lubricants – graphite and MoS_2; Nano materials – CNT– synthesis [CVD, laser evaporation, pyrolysis] – applications – medicine, electronics, biomaterials and environment.

UNIT - II   ELECTROCHEMISTRY AND CORROSION   [09]

Introduction – electrode potential – Nernst equation – EMF series and its significance – types of cells (Electrolytic & electrochemical); Corrosion – causes, consequences – classification – chemical corrosion – electro chemical corrosion – mechanism; Galvanic & differential aeration corrosion – factors influencing corrosion – corrosion control – corrosion inhibitors.

UNIT - III   CHEMICAL THERMODYNAMICS   [09]

Terminology of thermodynamics – second law; Entropy – entropy change for an ideal gas – reversible and irreversible processes – entropy of phase transition – Clausius inequality; Free energy and work function – Helmholtz and Gibb's free energy functions – criteria of spontaneity; Gibb's – Helmholtz equation (Problems); Maxwell's relations – Van't Hoff isotherm and isochore.

UNIT - IV   ATOMIC STRUCTURE AND CHEMICAL BONDING   [09]

Effective nuclear charge – orbitals – variations of s, p, d and f orbital – electronic configurations – ionization energy – electron affinity and electro negativity; Types of bonding – ionic, covalent and coordination bonding – hydrogen bonding and its types; Crystal field theory – the energy level diagram for transition metal complexes ([$Fe(CN)_6$]$^{3-}$, [$Ni(CN)_4$]$^{2-}$ and [$CoCl_4$]$^{2-}$ only); Role of transition metal ions in biological system; Band theory of solids.

UNIT - V   PHOTOCHEMISTRY AND SPECTROSCOPIC TECHNIQUES   [09]

Laws of photochemistry – Grotthuss Draper law – Stark-Einstein law – Beer-Lambert law – phosphorescence – fluorescence and it's applications in medicine – chemiluminescence; Colorimetry – principle – instrumentation (block diagram only) – estimation of iron by colorimetry; principles of spectroscopy – selection rules – vibrational and rotational spectroscopy – applications; Flame photometry – principle – instrumentation (block diagram only) – estimation of sodium; Atomic absorption spectroscopy – principle – instrumentation (block diagram only) – estimation of nickel.

Total = 45 Periods

Text Books:

1. Dr. A.Ravikrishnan, Engineering Chemistry, Srikrishna Hi-tech Publishing Company Private Limited,Chennai, Seventeenth Edition, 2016.
2. P.C. Jain and Monica Jain, Engineering Chemistry, Dhanpat Rai Publishing company, New Delhi, Seventeenth Edition, 2015.

Reference Books:

1. S S. Dara and S. S. Umare, A Text book of Engineering Chemistry, S.Chand &Company Limited, New Delhi, Fifth Edition, 2015.
2. N. Krishnamurthy, P. Vallinayagam and D. Madhavan, Engineering Chemistry, PHI Learning Private Limited, New Delhi, Third Edition, 2014.
3. S. Vairam, P. Kalyani and Suba Ramesh, Engineering Chemistry, Wiley India Private Limited, New Delhi, First Edition, 2013.
4. B. Sivasankar, Engineering Chemistry, Tata McGraw – Hill Education Private Limited, New Delhi, First Edition, 2008.

PRINCIPAL
K.S.R. COLLEGE OF ENGINEERING
K.S.R. KALVI NAGAR,
TIRUCHENGODE-637 215

CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Make use of the manufacture, properties and uses of advanced engineering materials.	3	3	2	-	-	-	2	-	-	-	-	1	-	-
CO2	Explain the concept of corrosion and its control.	3	3	2	-	-	-	3	-	-	-	-	2	-	-
CO3	Use the concept of thermodynamics in engineering applications.	3	3	2	-	-	-	2	-	-	-	-	2	-	-
CO4	Recall the periodic properties such as ionization energy, electron affinity and electro negativity.	3	3	2				2					1	-	-
CO5	Analyze the usage of various spectroscopic techniques.	3	3	2	-	-	-	3	-	-	-	-	1	-	-
	Average	3	3	2	-	-	-	2	-	-	-	-	1	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous)　　　　　　　R 2020

SEMESTER - II

20EE041	BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING	L	T	P	C
	(Common To AU, CE, CS, IT, ME & SF)	3	0	0	3

Prerequisite: *Engineering Mathematics, Engineering Physics*

Course Outcomes: On Completion of this course, the student will be able to	Cognitive Level
CO1　Solve the electric circuits by applying basic circuital laws for various combinations of circuit elements.	Apply
CO2　Explain the construction, operating principle and application of DC motor and transformers.	Understand
CO3　Enlighten the construction, operating principle and application of AC motors and Special Machines.	Understand
CO4　Illustrate the function of various measuring instruments.	Understand
CO5　Discuss the characteristics of Diodes, BJT and Digital systems.	Understand

UNIT - I　　ELECTRICAL CIRCUITS　　　　　　　　　　　　　　　　　　　　**[09]**

Structural of Electrical Power System – Ohm's Law – Kirchhoff's Laws – Circuit Analysis – Introduction to AC Circuits: R, RL & RLC series circuits, Average and RMS Value – Power and Power factor for single phase Circuits – Three Phase Star and Delta Connections – Electrical safety.

UNIT - II　　DC MOTOR AND TRANSFORMERS　　　　　　　　　　　　　　　**[09]**

Faraday's Law – Lenz's Law – Fleming's left hand and right-hand rule, DC Motor: Construction – Operation-series and shunt motor Characteristics Applications. Single Phase Transformer: Construction – Operation – EMF Equation – Types – Applications.

UNIT - III　　AC MOTORS & SPECIAL MACHINES　　　　　　　　　　　　　　**[09]**

Single Phase Induction Motor: Construction – Operation – Split Phase Induction Motor and Capacitor Start Induction Run Motor – Applications, Three Phase Induction Motor: Construction – Operation – Types – Applications. Special Machines: Stepper Motor.

UNIT - IV　　MEASURING INSTRUMENTS　　　　　　　　　　　　　　　　　　**[09]**

Basic Methods of Measurements: Direct and Indirect, Functional elements of an instrument – Errors in measurements – Analog and Digital Instruments – Basic Principle of Indicating Instruments – Moving Coil and Moving Iron Ammeter and Voltmeter. Dynamometer type Wattmeter – Induction type Energy Meter – Cathode Ray Oscilloscope.

UNIT - V　　ANALOG AND DIGITAL ELECTRONICS　　　　　　　　　　　　　　**[09]**

Semiconductor devices: PN Junction Diode, Zener diode: Operation and Characteristics – Bipolar Junction Transistor – CE Configurations and its Characteristics. Review of number systems – Digital logic gates – Introduction to Microprocessors.

Total = 45 Periods

Text Books:

1. Jegathesan, V., VinothKumar, K., Saravanakumar, R., Basic Electrical and Electronics Engineering, Wiley India, New Delhi, First Edition, 2012.
2. Smarajit Ghosh, Fundamentals of Electrical and Electronics Engineering, PHI Learning Private Limited, New Delhi, Second Edition, 2007.

Reference Books:

1. Mehta, V.K and Rohit Mehta, Principle of Electrical Engineering, S Chand & Company, New Delhi, Second Edition, 2008.
2. Muthu Subramanian, R., Saliva Hanan, S., and Muralitharan, K.A., Basic Electrical, Electronics and Computer Engineering, Tata Mc - Graw Hill, New Delhi, Second Edition, 2006.
3. Nagsarkar, T.K., and Sukhija M.S., Basics of Electrical Engineering, Oxford University press, New Delhi, Ninth Edition, 2005.
4. Mahmood Nahvi and Joseph A. Edminister, Electric Circuits, Schaum Outline Series, McGraw Hill, New Delhi, Fifth Edition, 2002.

CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Solve the electric circuits by applying basic circuital laws for various combinations of circuit elements.	3	2	2	-	-	-	-	-	-	-	-	1	-	-
CO2	Explain the construction, operating principle and application of DC motor and transformers.	3	3	2	-	-	2	1	1	-	-	-	1	-	-
CO3	Enlighten the construction, operating principle and application of AC motors and Special Machines.	3	2	2	-	-	2	1	1	-	-	-	1	-	-
CO4	Illustrate the function of various measuring instruments.	3	3	2	-	-	2	1	1	-	-	-	1	-	-
CO5	Discuss the characteristics of Diodes, BJT and Digital systems.	3	3	2	-	-	2	1	1	-	-	-	1	-	-
	Average	3	3	2	-	-	2	1	1	-	-	-	1	-	-

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

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SEMESTER – II

20CS241	PYTHON PROGRAMMING (Common to AU, CE, EE, EC, ME & SF)	L	T	P	C
		3	0	0	3

Prerequisite: *Basic knowledge of C programming.*

Course Outcomes: On successful completion of the course, the student will be able to	Cognitive Level
CO1	Illustrate basic concepts of python programming.	Understand
CO2	Apply the necessary data structures includes list, tuple and dictionary in the required fields.	Apply
CO3	Analyze, design and implement the problems using OOPs technology.	Analyze
CO4	Demonstrate the simple file operations.	Evaluate
CO5	Design web site using GUI.	Create

UNIT - I **FUNDAMENTALS OF PYTHON** **[09]**

Introduction to Python – Advantages of Python programming – Variables and Data types – Comments – I/O function – Operators – Selection control structures – Looping control structures – Functions: Declaration – Types of arguments – Anonymous functions: Lambda.

UNIT - II **DATA STRUCTURES AND PACKAGES** **[09]**

Strings – List – Tuples – Dictionaries – Sets – Exception Handling: Built-in Exceptions – User-defined exception– Modules and Packages.

UNIT - III **OBJECT ORIENTED PROGRAMMING** **[09]**

Object Oriented Programming basics – Inheritance and Polymorphism – Operator Overloading and Overriding – Get and Set Attribute Values – Name Mangling – Duck Typing – Relationships.

UNIT - IV **FILES AND DATA BASES** **[09]**

File I/O operations – Directory Operations – Reading and Writing in Structured Files: CSV and JSON – Data manipulation using Oracle, MySQL and SQLite.

UNIT - V **GUI AND WEB** **[09]**

UI design: Tkinter – Events – Socket Programming – Sending email – CGI: Introduction to CGI Programming, GET and POST Methods, File Upload.

Total = 45 Periods

Text Books:

1. Wesley J. Chun, Core Python Programming, Pearson Education, Second Edition, 2017.

2. Mark Lutz, Learning Python, O'Reilly Media, Fifth Edition, 2013.

References:

1. Bill Lubanovic, Introducing Python Modern Computing in Simple Packages, O'Reilly Media, First Edition, 2014.

2. Mark Lutz, Python Pocket Reference, O'Reilly Media, Fifth Edition, 2014.

3. David Beazley, Brian K. Jones, Python Cookbook, O'Reilly Media, Third Edition, 2013.

4. www.python.org and www.diveintopython3.net.

5. To practice: www.codeacademy.com and https://codingbat.com/python.

COPO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Illustrate basic concepts of python programming.	3	3	2	2	1	-	-	-	1	-	-	1	-	-
CO2	Apply the necessary data structures includes list, tuple and dictionary in the required fields.	3	3	3	2	2	-	-	-	1	-	-	1	-	-
CO3	Analyze, design and implement the problems using OOPs technology	3	3	3	2	2	-	-	-	1	-	-	1	-	-
CO4	Demonstrate the simple file operations	3	3	3	3	2	-	-	-	1	-	-	1	-	-
CO5	Design web site using GUI.	3	3	3	3	2	-	-	-	1	-	-	1	-	-
	Average	3	3	3	2	2	-	-	-	1	-	-	1	-	-

1: Slight (Low)　　　2: Moderate (Medium)　　　3: Substantial (High)

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SEMESTER – II

20AU231	FUNDAMENTALS OF ENGINEERING MECHANICS	L	T	P	C
	(Common To AU & SF)	3	1	0	4

Prerequisite: -

Course Outcomes: On successful completion of this course, the student will be able to	Cognitive Level
CO1	Recall the fundamental knowledge on the laws of mechanics and identify the equilibrium conditions of particles to find the resultant force for the given system of forces.	Understand
CO2	Analyze the various types of supports and their reactions to different loading conditions.	Understand
CO3	Apply the parallel and perpendicular axis theorems to find out moment of inertia and polar moment of inertia of various sections.	Apply
CO4	Analyze the relation motion, curvilinear motion, projectile motion, Newton's law, D'Alembert's principle and work energy equation.	Understand
CO5	Recognize the concept of friction at the contact surfaces of various engineering systems.	Understand

UNIT – I   BASICS AND STATICS OF PARTICLES   [12]

Introduction – Units and dimensions – Laws of mechanics – Lami's theorem, parallelogram and triangular law of forces – Vectorial representation of forces – Vector operations of forces – additions, subtraction, dot product, cross product – Coplanar forces – rectangular components – Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility.

UNIT – II   EQUILIBRIUM OF RIGID BODIES   [12]

Free body diagram – Types of supports – Action and reaction forces – stable equilibrium – Moments and couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon's theorem – Single equivalent force – Equilibrium of rigid bodies in two dimensions – Equilibrium of rigid bodies in three dimensions.

UNIT – III   PROPERTIES OF SURFACES AND SOLIDS   [12]

Determination of areas and volumes – First moment of area and centroid of sections – simple and compound sections by using standard formula – second and product moments of plane area – simple and compound sections by using standard formula – Parallel axis theorem and perpendicular axis theorem – Polar moment of inertia – Principal moments of inertia of plane areas – Principal axes of inertia – Mass moment of inertia.

UNIT– IV   DYNAMICS OF PARTICLES   [12]

Displacements, velocity and acceleration, their relationship – Relative motion – Curvilinear motion – Newton's laws of motion – D'Alembert's principle – Work energy equation – Impulse and momentum – Impact of elastic bodies.

UNIT – V   FRICTION   [12]

Friction force – Types of friction –Laws of Coulomb friction – Angle of repose – Simple contact friction –wedge friction, Screw friction, Rolling resistance, Ladder friction, Belt friction.

Total (L: 45 T:15) = 60 Periods

Text Books:

1. Beer, F.P and Johnston Jr. E.R., Vector Mechanics for Engineers (In SI Units): Statics and Dynamics, Tata McGraw-Hill Education, New Delhi, Eleventh Edition, 2017.
2. Vela Murali, Engineering Mechanics, Oxford University Press, New Delhi, First Edition 2010.

Reference Books:

1. Hibbeller. R.C and Ashok Gupta, Engineering Mechanics: Statics and Dynamics, Pearson Education, New Delhi, Eleventh Edition, 2010.
2. Irving H. Shames and Krishna Mohana Rao. G., Engineering Mechanics – Statics and Dynamics, Pearson Education, New Delhi, Fourth Edition, 2005.
3. Rajasekaran S and Sankar Subramanian G., Engineering Mechanics Statics and Dynamics, Vikas Publishing House Pvt. Ltd., Chennai, Third Edition, 2005.
4. Kumar, K.L., Engineering Mechanics, Tata McGraw-Hill Education, New Delhi, Third Revised Edition, 2008.

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CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Recall the fundamental knowledge on the laws of mechanics and identify the equilibrium conditions of particles to find the resultant force for the given system of forces.	3	3	2	2	-	-	-	-	-	-	-	-	2	-
CO2	Analyze the various types of supports and their reactions to different loading conditions.	3	3	2	2	-	-	-	-	-	-	-	-	2	-
CO3	Apply the parallel and perpendicular axis theorems to find out moment of inertia and polar moment of inertia of various sections.	3	3	2	2	-	-	-	-	-	-	-	-	2	-
CO4	Analyze the relation motion, curvilinear motion, projectile motion, Newton's law, D'Alembert's principle and work energy equation.	3	3	2	2	-	-	-	-	-	-	-	-	2	-
CO5	Recognize the concept of friction at the contact surfaces of various engineering systems.	3	3	2	2	-	-	-	-	-	-	-	-	-	-
	Average	3	3	2	2	-	-	-	-	-	-	-	-	2	-

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

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SEMESTER – I

20CH028	CHEMISTRY LABORATORY (Common To All Branches)	L	T	P	C
		0	0	3	1

Prerequisite: NIL

Course Outcomes: On Completion of this course, the student will be able to   *Cognitive level*

CO1	Apply the principle of conductometric titration.	*Understand*
CO2	Relate the role of pH in quantitative analysis of a solution.	*Understand*
CO3	Perceive the knowledge of the concentration of Iron by electrochemical methods.	*Understand*
CO4	Analyze the application of water in various fields.	*Understand*
CO5	Recall the nature of corrosion process.	*Remember*

LIST OF EXPERIMENTS:

1. Conductometric Titration – Strong Acid Vs. Strong Base.

2. Conductometric Titration – Mixture of Weak and Strong Acids Vs. Strong Base.

3. Conductometric Titration – Precipitation, $BaCl_2$ Vs. Na_2SO_4.

4. Estimation of Ferrous ion by Potentiometry – Fe^{2+} Vs $K_2Cr_2O_7$.

5. Estimation of Hydrochloric Acid by pH metry.

6. Estimation of Iron by Spectrophotometry.

7. Estimation of hardness in water by EDTA method.

8. Estimation of chloride in water sample by Argentometry.

9. Estimation of dissolved oxygen (DO) in water by Winkler's method.

10. Determination of rate of corrosion of mild steel by weight loss method.

Total: 30 Periods

Text Books:

1. Department of Chemistry Staff members, Chemistry Laboratory Manual, K.S.R. College of Engineering, Tiruchengode, Fourth Edition, 2020.

2. I. Vogel, Vogel 's Textbook of Quantitative Chemical Analysis, John Wiley &Sons, Network, Eighth Edition, 2014.

Reference Books:

1. S. K. Bhasin and Sudha Rani, Laboratory Manual of Engineering Chemistry, Dhanpat Rai Publishing Company Private Limited, New Delhi, Third Edition, 2012.

2. I. Vogel and J. Mendham, Vogel 's Textbook of Quantitative Chemical Analysis, Harlow, Prentice Hall, Sixth Edition, 2000.

3. G.H. Jeffery, J. Bassett, J. Mendham and R.C. Denny, Vogel's Text book of Quantitative Analysis Chemical Analysis, Longman, Singapore Publishers, Singapore, ELBS Fifth Edition, 1996.

4. B.S. Furniss, A.J, Hannaford, P.W.G. Smith and A.R. Tatchel, Vogel's Textbook of Practical Organic Chemistry, John Wiley & Sons, Network, Fifth Edition, 1989.

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CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Apply the principle of conductometric titration.	3	3	3	-	-	2	-	1	2	-	-	1		-
CO2	Relate the role of pH in quantitative analysis of a solution.	3	2	3	-	-	1	-	1	2	-	-	1	-	-
CO3	Perceive the knowledge of the concentration of Iron by electrochemical methods.	3	1	3	-	-	1	-	1	2	-	-	1	-	-
CO4	Analyze the application of water in various fields.	3	2	2	-	-	1	-	1	2	-	-	1	-	-
CO5	Recall the nature of corrosion process.	3	2	3	-	-	1	-	1	2	-	-	1	-	-
	Average	3	2	3	-	-	1	-	1	2	-	-	1	-	-

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

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<u>**SEMESTER – II**</u>

20CS227	PYTHON PROGRAMMING LABORATORY	L	T	P	C
	(Common to AU, CE, EE, EC, ME & SF)	0	0	3	1

Prerequisite: Basic knowledge of C programming.

Course Outcomes: On successful completion of the course, the student will be able to	Cognitive Level
CO1 Design simple programs using conditionals and loops.	Apply
CO2 Write functions to solve mathematical problems.	Understand
CO3 Demonstrate the use of files in python.	Analyze
CO4 Develop simple applications using python.	Create
CO5 Construct GUI applications using python programming.	Create

List of Experiments

1. Write a program to display the largest number among three numbers.
2. Write a program to check the prime number and to display the twin prime numbers.
3. Write a program to display the Fibonacci series and multiplication table by using looping constructs.
4. Write a program for converting decimal to octal, hexadecimals and vice versa by using functions.
5. Write a function to compute the GCD of two numbers.
6. Write a function to perform sorting list of numbers.
7. With the help of string array or list, display a simple calendar in python program without using the calendar module.
8. Demonstrate class and inheritance in python.
9. Create a text file using python file I/O. Read the content of the file and change them from lower to upper case characters. Write the updated content in another file and display it.
10. Write a program to demonstrate the user-defined exception handling mechanism in Python.
11. Design and implement a graphical user interface to perform any arithmetic operation.
12. Write a python program to insert and retrieve data using MySQL.

Total = 45 Periods

CO-PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Design simple programs using conditionals and loops.	2	3	3	2	2	-	-	-	1	-	-	1	-	-
CO2	Write functions to solve mathematical problems.	3	3	3	2	2	-	-	-	1	-	-	1	-	-
CO3	Demonstrate the use of files in python.	3	3	3	2	2	-	-	-	1	-	-	1	-	-
CO4	Develop simple applications using python.	3	3	3	1	3	-	-	-	1	-	-	1	-	-
CO5	Construct GUI applications using python programming.	3	3	3	1	3	-	-	-	1	-	-	1	-	-
	Average	3	3	3	2	2	-	-	-	1	-	-	1	-	-

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

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SEMESTER - III

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		L	T	P	C
20SF311	CHEMICAL PROCESS PRINCIPLES	3	0	0	3

Prerequisite: No prerequisites are needed for enrolling into the course

Course Outcomes: On Completion of this course, the student will be able to	Cognitive Level
CO1	Define system and surrounding and apply laws of thermodynamics to solve practical engineering problems.	Remember
CO2	Explain thermodynamics of chemical reactions and solve engineering problems.	Understand
CO3	Design and explain the functioning of heat engines/pumps and refrigeration cycles.	Create
CO4	Demonstrate and explain the basics of controllers.	Understand
CO5	Explain modern methods of chemical analysis and describe the structure of metals, polymers and ceramics.	Understand

UNIT - I   INTRODUCTION   [09]

Thermodynamics of chemical reactions, Enthalpy change, Entropy change and free energy change, Equilibrium constant, Le-Chatelier's principle elementary reaction kinetics, Order of reactions, Effect of temperature in reaction ratio, Type of chemical reactors.

UNIT - II   THERMODYNAMICS   [09]

Thermodynamics of chemical reactions, Enthalpy change, Entropy change and free energy change, Equilibrium constant, Le-Chatelier's principle elementary reaction kinetics, Order of reactions, Effect of temperature in reaction ratio, Type of chemical reactors.

UNIT - III   INSTRUMENTATION   [09]

Instrument technology, Measurement of flow, Primary or quantity methods, Secondary or rate devices - Measurement of pressure gravitational types, Bellows, Measurement of high pressure, Measurement of low pressure- Mc - Leod vacuum gauge - Temperature - Thermometers, Bi - metal thermometers, Pyrometers, Resistance thermometer, Thermo Couples, Measurement of level and volume.

UNIT - IV   PROCESS CONTROL   [09]

Measurement of force, Strain gauge and load cells, Introduction to transducers, Automatic control, Controllers, Proportional derivative, Integral and combined modes, Final control elements and computer controls.

UNIT - V   SPECTROSCOPY   [09]

Modern methods of chemical analysis, Visible spectroscopy, UV spectroscopy, Vibrational, Nuclear magnetic resonance, Mass spectrometry, X-ray diffraction, Structure of metal, polymer and ceramics.

Total = 45 Periods

Text Books:

1. Cengel, Y. A., & Boles, M. A.,Thermodynamics - An Engineering Approach, McGraw-Hill, New York.
2. Austin, E., & Fribance,Industrial Instrumentation Fundamentals, J Wiley and Sons, 1985.

Reference Books:

1. Donald L Pavia., Gary M Lampman., George S Kriz., Introduction to Spectroscopy., Pearson Education, 2017.
2. Milo D Koretsky, Engineering and Chemical Thermodynamics., Second Edition., Wiley Publications, 2012.
3. Sonntag, R. E., Borgnakke, C., Van Wylen, G. J., & Van Wyk, S., Fundamentals of Thermodynamics., Volume Six,Wiley Publications, New York, 2003.
4. Abbott, M. M., Smith, J. M., & Van Ness, H. C., Introduction to Chemical Engineering Thermodynamics., New York., McGraw-Hill, 2001.

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CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Define system and surrounding and apply laws of thermodynamics to solve practical engineering problems.	3	3	3	2	-	-	-	2	-	-	-	-	-	1
CO2	Explain thermodynamics of chemical reactions and solve engineering problems.	3	3	3	2	-	-	-	2	-	-	-	-	-	1-
CO3	Design and explain the functioning of heat engines/pumps and refrigeration cycles.	3	3	3	2	-	-	-	2	-	-	-	-	-	1
CO4	Demonstrate and explain the basics of controllers.	3	3	3	2	-	-	-	2	-	-	-	-	-	1
CO5	Explain modern methods of chemical analysis and describe the structure of metals, polymers and ceramics.	3	3	3	2	-	-	-	2	-	-	-	-	-	1
	Average	3	3	3	2	-	-	-	2	-	-	-	-	-	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

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SEMESTER - III

		L	T	P	C
20SF312	**ENGINEERING FLUID MECHANICS AND MACHINERY**	3	1	0	4

Prerequisite: No prerequisites are needed for enrolling into the course

Course Outcomes: On Completion of this course, the student will be able to	Cognitive Level
CO1 Choose mathematical knowledge to predict the properties and characteristics of a fluid.	Apply
CO2 Compare and calculate major and minor losses associated with pipe flow in piping networks.	Analyze
CO3 Mathematically predict the nature of physical quantities.	Create
CO4 Select and apply the appropriate techniques to predict the performance behavior of turbines.	Evaluate
CO5 Demonstrate the knowledge and understand the working principle of pumps.	Understand

UNIT - I   FLUID PROPERTIES AND FLOW CHARACTERISTICS   [12]

Fluid properties: Mass density, Specific weight, Specific volume, Specific gravity, Viscosity, Vapour pressure, compressibility, Surface tension and capillarity. Flow characteristics - Concept of control volume - Application of continuity equation, Energy equation and momentum equation.

UNIT - II   FLOW THROUGH PIPES   [12]

Laminar and turbulent flow characteristics, Laminar flow through the circular pipes - Boundary layer concepts - Types of boundary layer thickness - Hydraulic and energy gradient - Darcy Weisbach equation - Friction factor - Moody diagram - Minor losses - Flow through pipes in series and parallel.

UNIT - III   DIMENSIONAL AND MODEL ANALYSIS   [12]

Dimensional analysis: Dimensions, Dimensional homogeneity, Methods of dimensional analysis - Buckingham Pi theorem. Model analysis - Advantages and applications of model testing. Similitude, Types of similitude - Dimensionless parameters - Application of dimensionless parameters - Model laws.

UNIT - IV   HYDRAULIC TURBINES   [12]

Impact of jets - Euler's equation - Theory of roto-dynamics machines - Velocity components at entry and exit of the rotor - Velocity triangles. Classification of turbines - Heads and efficiencies - Velocity triangles. Axial, radial and mixed flow turbines. Pelton wheel, Francis turbine and Kaplan turbines - Working principles - Work done by water on the runner - Draft tube. Specific speed - Unit quantities - Performance curves for turbines.

UNIT - V   HYDRAULIC PUMPS   [12]

Centrifugal pumps - Working principle - Work done by the impeller - Performance curves. Reciprocating pump - Working principle - Indicator diagrams - Work saved by air vessels. Rotary pumps - Classification. Working and performance curves.

Total (L: 45, T:15) = 60 Periods

Text Books:

1. Bansal R.K,Fluid Mechanics and Hydraulic Machines, Laxmi Publications (P) Ltd., New Delhi, Ninth Edition, 2010.

2. Rajput R.K, A Text Book of Fluid Mechanics and Hydraulic Machines, S. Chand & Company Ltd., New Delhi, Fourth Edition. 2010.

Reference Books:

1. Kumar. K.L., Engineering Fluid Mechanics, Eurasia Publishing House (P) Ltd., New Delhi, SeventhEdition, 2016.
2. Modi.P.N. and Seth.S.M, Hydraulics and Fluid Mechanics, Standard Book House, New Delhi, 20th Edition 2015.
3. Graebel. W.P, Engineering Fluid Mechanics, Taylor & Francis, Indian Reprint, 2011.
4. V.L. Streeter and Wylie E.B., Fluid Mechanics, Mc - Graw Hill, 2010.

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CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Choose mathematical knowledge to predict the properties and characteristics of a fluid.	3	-	-	-	-	-	-	-	-	1	-	1	-	-
CO2	Compare and calculate major and minor losses associated with pipe flow in piping networks.	3	2	-	-	-	-	-	-	-	1	-	-	-	-
CO3	Mathematically predict the nature of physical quantities.	3	2	-	-	1	-	-	-	-	1	-	1	-	-
CO4	Select and apply the appropriate techniques to predict the performance behavior of turbines.	3	3	-	-	-	-	-	-	-	1	-	-	-	-
CO5	Demonstrate the knowledge and understand the working principle of pumps.	3	2	-	-	2	-	-	-	-	1	-	1	-	-
	Average	3	2	-	-	1	-	-	-	-	1	-	1	-	-

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

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SEMESTER - III

			L	T	P	C
20SF313	**PRINCIPLES OF SAFETY MANAGEMENT**		3	0	0	3

Prerequisite: No prerequisites are needed for enrolling into the course

Course Outcomes: On Completion of this course, the student will be able to　　　**Cognitive Level**

CO1	Demonstrate the knowledge and understanding of basic terms in safety management.	Understand
CO2	Understand safety organizational requirements for effective safety management.	Understand
CO3	Evaluate the workplace hazards and apply controls measures using hierarchy of control.	Evaluate
CO4	Evaluate the safety performance of an organization.	Evaluate
CO5	Understand accident investigation methodologies and apply systematic procedure to identify and unearth the root cause of the incident and accident.	Understand

UNIT - I　　INTRODUCTION OF SAFETY　　　　　　　　　　　　　　　**[09]**

Safety - Goals of safety engineering - Need for safety, Safety and productivity. Definitions: Accident, Injury, Unsafe act, Unsafe Condition, Dangerous Occurrence, Reportable accidents, History of safety movement - Theories of accident causation.

UNIT - II　　SAFETY ORGANIZATION　　　　　　　　　　　　　　　　**[09]**

Objectives, Types, Functions, Role of management, Supervisors, Workmen, Unions, Government and voluntary agencies in safety - Safety policy - Safety Officer – Responsibilities - Safety committee - Need, Types, Advantages.

UNIT - III　　ACCIDENT PREVENTION AND TRAINING　　　　　　　　　**[09]**

Accident Prevention Methods - Engineering, Education and Enforcement, Safety Education & Training - Importance, Various training methods, Effectiveness of training, Behavior Oriented Training – Communication - Purpose, Barrier to communication. Housekeeping: Responsibility of management and employees - Advantages of good housekeeping - 5 's of housekeeping - Work permit system - objectives, hot work and cold work permits. Typical industrial models and methodology - Entry into confined spaces.

UNIT - IV　　MONITORING SAFETY PERFORMANCE　　　　　　　　　**[09]**

Frequency rate, Severity rate, Incidence rate, Activity rate - Cost of accidents - Computation of Costs - Utility of Cost data - Plant safety inspection types, Inspection procedure - Safety sampling techniques - Job safety Analysis (JSA), Safety surveys, Safety audits - Safety Inventory Technique.

UNIT - V　　ACCIDENT INVESTIGATION　　　　　　　　　　　　　　**[09]**

Why? When? Where? Who? & How? Basics - Man - Environment & Systems. Process of Investigation - Tools - Data Collection - Handling witnesses - Case study. Accident analysis - Analytical Techniques - System Safety - Change Analysis - MORT- Multi -Events Sequencing -TOR.

Total = 45 Periods

Text Books:

1. N.V. Krishnan, Safety Management in Industry, Jaico Publishing House, 1997.
2. Ronald P. Blake, Industrial Safety: Prentice Hall, New Delhi, 1973.

Reference Books:

1. Accident Prevention Manual for Industrial Operations: National Safety Council, Chicago.
2. Willie Hammer, Occupational Safety Management and Engineering, Prentice Hall.
3. Ted S. Ferry, Modern Accident Investigation and Analysis, John Wiley & Sons.
4. John V. Grimaldi and Rollin H. Simonds, Safety Management, All India Traveller Book Seller, Delhi.

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CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Demonstrate the knowledge and understanding of basic terms in safety management.	3	2	2	-	3	3	3	2	2	2	-	1	-	3
CO2	Understand safety organizational requirements for effective safety management.	3	2	2	-	3	3	3	2	2	2	-	1	-	3
CO3	Evaluate the workplace hazards and apply controls measures using hierarchy of control.	3	2	2	-	3	3	3	2	2	2	-	1	-	3
CO4	Evaluate the safety performance of an organization.	3	3	2	-	3	3	3	2	2	2	-	1	-	3
CO5	Understand accident investigation methodologies and apply systematic procedure to identify and unearth the root cause of the incident and accident.	3	3	2	-	3	3	3	2	2	2	-	1	-	3
	Average	3	2	2	-	3	3	3	2	2	2	-	1	-	3

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

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SEMESTER - III

20SF314	MANUFACTURING TECHNOLOGY	L	T	P	C
		3	0	0	3

Prerequisite: No prerequisites are needed for enrolling into the course

Course Outcomes: On Completion of this course, the student will be able to	Cognitive Level
CO1	Knowledge of various engineering materials, properties and properties modification methods.	Understand
CO2	Identify the welding processes used for components manufacturing.	Apply
CO3	Utilize basic techniques to manufacture an engineering component in the foundry shop.	Apply
CO4	Recommends modern machine tools to enhance the productivity.	Evaluate
CO5	Know the metal forming and power metallurgy process for making components.	Understand

UNIT - I   CASTING   [09]

Casting types, procedure to make sand mould, types of core making, moulding tools, machine moulding, special moulding processes - CO_2 moulding; shell moulding, investment moulding, permanent mould casting, pressure die casting, centrifugal casting, continuous casting, casting defects.

UNIT - II   WELDING   [09]

Welding: - Introduction, Weldability, Types of welding, Gas welding, Arc welding - Submerged arc, TIG, MIG. Resistance welding, Solid state welding, Electron beam welding, Laser beam welding, Oxygen cutting - Heat auected zones, Weld defects, Inspection of welded joints.

UNIT - III   MACHINING   [09]

General principles (with schematic diagrams only) of working and commonly performed operations in the following machines: Lathe - shaper - planer - Horizontal milling machine - Universal drilling machine - cylindrical grinding machine - Capstan and turret lathe. General principles and applications of the following processes: Abrasive jet machining - Ultrasonic machining - Electric discharge machining - Electro chemical machining - Plasma arc machining - Electron beam machining and Laser beam machining.

UNIT - IV   FORMING AND SHAPING OF PLASTICS   [09]

Types of plastics - Characteristics of the forming and shaping processes - Moulding of Thermoplastics - Working principles and typical applications of - Injection moulding - Plunger and screw machines - Blow moulding - Rotational moulding - Film blowing - Extrusion - Typical industrial applications - Thermoforming - Processing of Thermosets - Working principles and typical applications - Compression moulding - Transfer moulding - Bonding of Thermoplastics - Fusion and solvent methods - Induction and Ultrasonic methods.

UNIT - V   METAL FORMING AND POWDER METALLURGY   [09]

Hot and cold forming - Forging - Rolling - Extrusion - Spinning - Wire drawing, Powder Metallurgy - Steps - Sintering - Merits - Demerits and applications - Types of dies - Progressive and combination die.
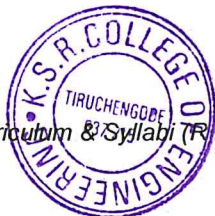
Total = 45 Periods

Text Books:

1. P.C. Sharma,A Text Book of Production Technology: Manufacturing Processes, S. Chand Publisher, 7th Edition. 2008.
2. Hajra Choudhury, Elements of Workshop Technology, Vol. I and II, Media Promoters and Publishers Pvt.Ltd., Mumbai, 2005.

Reference Books:

1. M. Adithan and A.B. Gupta,Manufacturing Technology, New Age International (P) Ltd, 5th Edition, 2012.
2. Serope Kalpajian, Steven R. Schmid,Manufacturing Processes for Engineering Materials, 4/E, Pearson Education, Inc. 2007.
3. R.K. Jain and S.C. Gu pta, Production Technology, Khanna Publishers. 16th Edition, 2001.
4. H.M.T. Production Technology - Handbook, Tata McGraw-Hill, 2000.

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CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Knowledge of various engineering materials, properties and properties modification methods.	2	2	3	2	3	2	2	3	2	1	2	1	2	1
CO2	Identify the welding processes used for components manufacturing.	3	1	3	2	2	1	1	1	1	1	1	2	2	2
CO3	Utilize basic techniques to manufacture an engineering component in the foundry shop.	2	2	2	2	1	1	1	1	2	1	1	1	1	2
CO4	Recommends modern machine tools to enhance the productivity.	2	1	2	2	3	1	1	1	3	1	1	1	2	2
CO5	Know the metal forming and power metallurgy process for making components.	2	2	2	2	1	1	1	1	2	1	1	1	2	2
	Average	2	2	2	2	2	2	1	1	1	2	1	1	1	2

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

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SEMESTER - III

		L	T	P	C
20SF315	SAFETY IN ENGINEERING INDUSTRY	3	0	0	3

Prerequisite: No prerequisites are needed for enrolling into the course

Course Outcomes: On Completion of this course, the student will be able to	Cognitive Level
CO1 Explain the General safety rules, principles, maintenance, Inspections of metal and wood working machinery.	Understand
CO2 Apply the concepts of safety in design, use and maintenance of machines.	Apply
CO3 Learn about welding, common hazards in welding, personal protective equipment and safety precautions in welding.	Understand
CO4 Analyze the safety in cold working and hot working of metals.	Analyze
CO5 Acquire knowledge on safety in finishing, inspection and testing of machines.	Understand

UNIT - I   SAFETY IN METAL WORKING MACHINERY ANDWOOD WORKING MACHINES   [09]

General safety rules, principles, maintenance, Inspections of turning machines, boring machines, millingmachine, planning machine and grinding machines, CNC machines, Wood working machinery, types, safetyprinciples, electrical guards - saws, types and its Hazards.

UNIT - II   SAFETY IN MAINTENANCE OFMACHINES   [09]

Basic Principle of Machine guarding during maintenance, machine guarding, types, fixed guard, interlock guard, automatic guard, trip guard, electron eye, positional control guard, fixed guard fencing -guard construction- guard opening. Selection and suitability: lathe - drilling - boring - milling – grinding- shaping, sawing - shearing - presses-forge hammer - flywheels - shafts-couplings - gears-sprockets wheels and chains - Pulleys and belts-benefits of good guarding systems.

UNIT - III   SAFETY IN WELDING AND GAS CUTTING   [09]

Gas welding and oxygen cutting, resistances welding, arc welding and cutting, common hazards, personal protective equipment, training, safety precautions in brazing, soldering and metalizing - explosive welding, selection, care and maintenance of the associated equipment and instruments - safety in generation, distribution and handling of industrial gases -colour coding -leak detection- Pipe line Safety- storage and handling of gas cylinders.

UNIT - IV   SAFETY IN COLD FARMING AND HOT WORKING OF METALS   [09]

Cold working, power presses, point of operation, safe guarding, auxiliary mechanisms, feeding and cutting mechanism, hand or footoperated presses, power press electric controls, power press set up and die Removal, inspection and maintenance -metal shears-press brakes. Hot working safety in forging, hot rolling mill operation, safe guards in hot rolling mills - hot bending of pipes, hazards and control measures. Safety in gas furnace operation, cupola, crucibles, ovens, foundry health hazards, work environment - Material handling in foundries.

UNIT - V   SAFETY IN FINISHING, INSPECTION AND TESTING   [09]

Heat treatment operations, electro plating, paint shops, sand and shot blasting, safety in inspection and testing, dynamic balancing, hydro testing, valves, boiler drums and headers, pressure vessels, air leak test, steam testing, safety in radiography, personal monitoring devices, radiation hazards,Health and welfare measures in engineering industry.

Total = 45 Periods

Text Books:

1. N.V. Krishnan, Safety in Industry, Jaico Publisher House, 1996.
2. Accident Prevention Manual - NSC, Chicago, 1982.

Reference Books:

1. Safety in the Use of Wood Working Machines, HMSO, UK 1992.
2. Health and Safety in Welding and Allied Processes, Welding Institute, UK, High Tech. Publishing Ltd., London, 1989.
3. Occupational Safety Manual BHEL, Trichy, 1988.
4. Samarendra Kumar Biswas, Umesh Mathur and Swapan Kumar Hazra, Fundamentals of Process Safety Engineering, First Edition, Taylor and Francis Group.

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CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Explain the General safety rules, principles, maintenance, Inspections of metal and wood working machinery.	2	3	-	3	-	3	3	2	-	-	-	2	2	3
CO2	Apply the concepts of safety in design, use and maintenance of machines.	2	3	-	3	-	3	3	2	-	-	-	2	2	3
CO3	Learn about welding, common hazards in welding, personal protective equipment and safety precautions in welding.	2	3	-	3	-	3	3	2	-	-	-	2	2	3
CO4	Analyze the safety in cold working and hot working of metals.	2	3	-	3	-	3	3	2	-	-	-	2	2	3
CO5	Acquire knowledge on safety in finishing, inspection and testing of machines.	2	3	-	3	-	3	3	2	-	-	-	2	2	3
	Average	2	3	-	3	-	3	3	2	-	-	-	2	2	3

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous)
SEMESTER - III

R 2020

20MA341	STATISTICS AND NUMERICAL METHODS (COMMON TO B.E. AU, ME & SF)	L	T	P	C
		3	1	0	4

Prerequisite: No prerequisites are needed for enrolling into the course

Course Outcomes: On Completion of this course, the student will be able to | **Cognitive Level**

CO1	Develop their skills in testing the samples by using various testing of hypothesis methods.	Remember
CO2	Analyze and infer the data using design of experiments.	Apply
CO3	Apply the numerical techniques for solving algebraic, transcendental and simultaneous equations.	Apply
CO4	Evaluate the functions by using the concepts of numerical differentiation and integration.	Evaluate
CO5	Solve the ordinary differential equations with initial conditionsnumerically.	Understand

UNIT – I   TESTING HYPOTHESIS   [12]

Sampling distributions - Tests for single mean, proportion, Difference of means (large and small samples) – Tests for single variance and equality of variances – Chi-Square- test – Independence of attributes.

UNIT – II   DESIGN OF EXPERIMENTS   [12]

One way and two-way classifications - Completely Randomized Design - Randomized Block Design - Latin Square Design.

UNIT – III   SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS   [12]

Solution to algebraic and transcendental equations - Newton-Raphson method, Regula-falsi method - Solutions to simultaneous linear equations - Gauss Elimination method - Gauss-Seidel method - Eigen value of a matrix by Power method.

UNIT – IV   NUMERICAL DIFFERENTIATION AND INTEGRATION   [12]

Numerical differentiation using Newton's forward and backward interpolation methods - Numerical integration byTrapezoidal and Simpson's 1/3rd rule - Double integrals using trapezoidal rule and Simpson's rule.

UNIT – V   INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS   [12]

Solving first order Ordinary Differential Equations - Euler's and Modified Euler's Method - Fourth order Runge-Kutta Method - Milne's predictor and corrector method - Finite difference solution of second order ordinary differential equation.

Total (L: 45 T:15) = 60 Periods

Text Book:

1. Grewal. B.S. and Grewal. J.S., Numerical Methods in Engineering and Science, Khanna Publishers, New Delhi, TenthEdition, 2015.
2. S.P. Gupta, Statistical Methods, Sultan Chand & Sons, New Delhi, Fortieth edition, 2014.

Reference Books:

1. Burden, R.L and Faires, J.D, Numerical Analysis, Cengage Learning, New Delhi,Nineth Edition, 2016.
2. Devore. J.L., Probability and Statistics for Engineering and the Sciences, Cengage Learning, New Delhi, Eighth Edition, 2016.
3. P. Kandasamy, K. Thilagavathy, K. Gunavathy Numerical Methods, S. Chand Company, NewDelhi, Fifthedition, 2016.
4. S.R.K. Iyengar, R.K. Jain, Numerical Methods, New Age International Publishers, New Delhi, First edition, 2015.

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CO PO MAPPING

CO's	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Develop their skills in testing the samples by using various testing of hypothesis methods.	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO2	Analyze and infer the data using design of experiments.	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO3	Apply the numerical techniques for solving algebraic, transcendental and simultaneous equations.	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	Evaluate the functions by using the concepts of numerical differentiation and integration.	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO5	Solve the ordinary differential equations with initial conditions numerically.	3	3	3	3	-	-	-	-	-	-	-	-	-	-
	Average	3	3	3	3	-	-	-	-	-	-	-	-	-	-

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

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SEMESTER – III

20SF321	FLUID MECHANICS AND MACHINERY LABORATORY	L	T	P	C
		0	0	3	1

Prerequisite: NIL

Course Outcomes: On Completion of this course, the student will be able to　　　　*Cognitive level*

CO1	Compute the coefficient of discharge of Orifice meter and Venturi meter.	Analyze
CO2	Estimate the rate of flow of fluid by Rota meter and Pitot-tube.	Evaluate
CO3	Evaluate the major losses of fluid flow through pipes.	Evaluate
CO4	Analyze the performance of centrifugal pump, reciprocating pump and gear pump.	Analyze
CO5	Carryout the performance analysis and draw the characteristic curves of Pelton wheel, Francis turbine and Kaplan turbine.	Evaluate

LIST OF EXPERIMENTS:

1. Determination of the coefficient of discharge of given Orifice meter.
2. Determination of the coefficient of discharge of given Venturi meter.
3. Calculation of the rate of flow using Rota meter and Pitot-tube.
4. Determination of friction factor for a given set of pipes.
5. Conducting experiments and drawing the characteristics curves of centrifugal pump.
6. Conducting experiments and drawing the characteristics curves of reciprocating pump.
7. Conducting experiments and drawing the characteristics curves of gear pump.
8. Conducting experiments and drawing the characteristics curves of Pelton wheel.
9. Conducting experiments and drawing the characteristics curves of Francis turbine.
10. Conducting experiments and drawing the characteristics curves of Kaplan turbine.

Total: 30 Periods

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CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Compute the coefficient of discharge of Orifice meter and Venturi meter.	3	2	-	-	2	-	-	-	-	1	-	1	-	-
CO2	Estimate the rate of flow of fluid by Rota meter and Pitot-tube.	3	-	-	-	2	-	-	-	-	1	-	-	-	-
CO3	Evaluate the major losses of fluid flow through pipes.	3	2	-	-	0	-	-	-	-	1	-	1	-	-
CO4	Analyze the performance of centrifugal pump, reciprocating pump and gear pump.	3	3	-	-	-	-	-	-	-	1	-	-	-	-
CO5	Carryout the performance analysis and draw the characteristic curves of Pelton wheel, Francis turbine and Kaplan turbine.	3	2	-	-	1	-	-	-	-	1	-	-	-	-
	Average	3	3	-	-	2	-	-	-	-	1	-	1	-	-

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

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SEMESTER – III

			L	T	P	C
20SF322	**MANUFACTURING TECHNOLOGY LABORATORY**		0	0	3	1

Prerequisite: *NIL*

Course Outcomes: On Completion of this course, the student will be able to

Cognitive level

CO1	Know about the various processes commonly used in manufacturing of components.	Understand
CO2	Interpretation of process plan sheets to be followed for the machining of products.	Analyze
CO3	Use of appropriate method and machine tools for performing lathe and shaper operations.	Understand
CO4	Use of appropriate method and machine tools for performing milling and slotter operations.	Understand
CO5	Use of appropriate method and machine tools for performing drilling and grinding operations.	Understand

LIST OF EXPERIMENTS:

1. **LATHE**
   1.1. Facing, plain turning and step turning.
   1.2. Taper turning and knurling operation.
   1.3. Thread cutting operation.
   1.4. Boring and internal thread cutting.
2. **SHAPER**
   2.1. Machining to make a cube.
   2.2. Machining to make a V-Block.
3. **SLOTTER**
   3.1. Machining a internal or external key-way.
4. **DRILLING**
   4.1. Drilling multiple holes at a given pitch circle on a plate.
   4.2. Drilling, reaming and tapping.
5. **MILLING**
   5.1. Plain milling
   5.2. Gear milling
6. **GRINDING**
   6.1. Cylindrical Grinding

Total: 30 Periods

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CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Know about the various processes commonly used in manufacturing of components.	3	2	3	-	-	2	2	-	-	-	-	-	-	-
CO2	Interpretation of process plan sheets to be followed for the machining of products.	3	2	3	-	-	2	2	-	-	-	-	-	-	-
CO3	Use of appropriate method and machine tools for performing lathe and shaper operations.	3	2	3	-	-	2	2	-	-	-	-	-	-	-
CO4	Use of appropriate method and machine tools for performing milling and slotter operations.	3	2	3	-	-	2	2	-	-	-	-	-	-	-
CO5	Use of appropriate method and machine tools for performing drilling and grinding operations.	3	2	3	-	-	2	2	-	-	-	-	-	-	-
	Average	3	2	3	-	-	2	2	-	-	-	-	-	-	-

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

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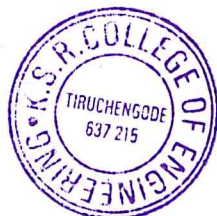K.S.R. COLLEGE OF ENGINEERING
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SEMESTER – III

20SF323	SAFETY ENGINEERING LABORATORY	L	T	P	C
		0	0	3	1

Prerequisite: NIL

Course Outcomes: On Completion of this course, the student will be able to   *Cognitive level*

CO1	Understand about Personal Protective Equipment's.	Understand
CO2	Learn about the safety and environment.	Understand
CO3	Analyze the various types of accidents and its control methods.	Analyze
CO4	Learn knowledge on different types of reports and permits.	Understand
CO5	Prepare training Units on safety for workers and other classes of population in industry and society.	Create

LIST OF EXPERIMENTS:

1. Study of Personal protective equipment.
2. Assessment of the safety performance of an industry and classification of accidents.
3. Safety assessment of a construction site.
4. Environmental impact assessment and environmental audit.
5. Accident Reporting - Exercises.
6. Job safety analysis - Exercises.
7. Safety audit - Exercises, e.g., Labs, workshops, academic, administrative and residential buildings.
8. Calculation of cost of accidents.
9. Preparation of work permits.
10. Preparation of a training Unit on any topic of safety for a target audience.

Total: 30 Periods

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CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Understand about Personal Protective Equipment's.	3	3	3	3	2	-	3	3	1	-	-	2	3	3
CO2	Learn about the safety and environment.	3	3	3	3	2	-	3	3	1	-	-	2	3	3
CO3	Analyze the various types of accidents and its control methods.	3	3	3	3	2	-	3	3	1	-	-	2	3	3
CO4	Learn knowledge on different types of reports and permits.	3	3	3	3	2	-	3	3	1	-	-	2	3	3
CO5	Prepare training Units on safety for workers and other classes of population in industry and society.	3	3	3	3	2	-	3	3	1	-	-	2	3	3
	Average	3	3	3	3	2	-	3	3	1	-	-	2	3	3

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

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SEMESTER - III

				L	T	P	C
20HR351	CAREER DEVELOPMENT SKILLS - I			0	2	0	0

Prerequisite: No prerequisites are needed for enrolling into the course

Course Outcomes: On successful completion of the course, the student will be able to　　　*Cognitive Level*

CO1	Have competent knowledge on grammar with an understanding of its basic rules.	Understand
CO2	Communicate effectively and enhance interpersonal skills with renewed self – confidence	Apply
CO3	Construct sentence in English and make correction	Apply
CO4	Perform oral communication in any formal situation	Create
CO5	Develop their LSRW skills.	Understand

UNIT - I　　　**EFFECTIVE ENGLISH – SPOKEN ENGLISH**　　　　　　**[06]**

Basic Rules of Grammar – Parts of Speech – Tenses – Verbs – Sentences construction - Vocabulary – idioms & phrases – Synonyms – Antonyms – Dialogues and conversation – Exercise (Speaking).

UNIT - II　　　**ESSENTIAL COMMUNICATION**　　　　　　**[06]**

Verbal communication – Effective communication – Active Listening – Paraphrasing – Feedback, Non-Verbal Communication – Body language of self and Others, Important of feelings in communication – Dealing with feelings in communication practice – Exercise.

UNIT - III　　　**WRITTEN COMMUNICATION – PART 1**　　　　　　**[06]**

Usage of noun, pronoun, adjective (Comparative Forms), Verb, Adjectives, Adverb, Tenses, Articles and Preposition – Change of Voice – Change of Speech – One word Substitution – Using the same word as different parts of speech – Odd Man Out – Spelling & Punctuation (Editing).

UNIT - IV　　　**WRITTEN COMMUNICATION – PART – 2**　　　　　　**[06]**

Analogies – Sentences Formation – Sentence Completion – Sentence Correction – idioms & Phrases – Jumbled Sentences, Letter Drafting (Formal Letters) – Reading Comprehension (Level 1) – Contextual Usage – Foreign Languages Words used in English – Exercise.

UNIT - V　　　**ORAL COMMUNICATION – PART – 1**　　　　　　**[06]**

Self-introduction – Situational Dialogues / Role Play (Telephonic Skills) – Oral Presentations – Prepared –'Just A Minute' Sessions (JAM) – Presentation Skills – Exercise.

Total (L= 0, T = 30) = 30 Periods

Text Books:

1. Sarah Freeman, Written Communication in English, Orient Black Swan, Hyderabad, First Edition, 2015.

2. Anne Laws, Writing Skills, Orient Black Swan., Hyderabad, 2011.

Reference Books:

1. Raj N Bakshmi, English Grammar Practice, Orient Black Swan, Hyderabad, First Edition, 2009.

2. M Ashra Rizvi, Effective Technical Communication, Tata McGraw HILL, New Delhi, First Edition, 2005.

3. Thakur K B Sinha, Enrich Your English, Vijay Nicole, Chennai, First Edition, 2005.

4. Norman Lewis. W.R., Word Power Made Easy, Goyal Publications.

CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Have competent knowledge on grammar with an understanding of its basic rules.	-	-	-	-	1	-	-	-	3	3	-	3	-	-
CO2	Communicate effectively and enhance interpersonal skills with renewed self – confidence	-	-	-	-	1	-	-	-	3	3	-	3	-	-
CO3	Construct sentence in English and make correction	-	-	-	-	1	-	-	-	3	3	-	3	-	-
CO4	Perform oral communication in any formal situation	-	-	-	-	1	-	-	-	3	3	-	3	-	-
CO5	Develop their LSRW skills.	-	-	-	-	1	-	-	-	3	3	-	3	-	-
	Average	-	-	-	-	1	-	-	-	3	3	-	3	-	-

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

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SEMESTER - IV

20SF411	**HEAT AND MASS TRANSFER**	L	T	P	C
	(Use of standard heat and mass transfer data book permitted)	3	1	0	4

Prerequisite: No prerequisites are needed for enrolling into the course

Course Outcomes: On successful completion of the course, the student will be able to	Cognitive Level
CO1 Choose the concept of heat conduction in simple and composite systems.	Apply
CO2 Compare the convective heat transfer concepts.	Analyze
CO3 Solve radiation heat transfer problems.	Evaluate
CO4 Experiment the heat exchanger applications.	Apply
CO5 Explore the mass transfer concepts.	Understand

UNIT - I   **CONDUCTION**   [12]

Basic concepts - mechanism of heat transfer - conduction, convection and radiation - Fourier law of conduction – general differential equation of heat conduction - Cartesian and cylindrical coordinates - one dimensional steady state heat conduction - conduction through plane wall, cylinders and spherical systems, composite systems – unsteady heat conduction - lumped analysis - use of Heislers chart.

UNIT - II   **CONVECTION**   [12]

Basic concepts - heat transfer coefficients - boundary layer concept - types of convection - forced convection - dimensional analysis - external flow - flow over plates, cylinders and spheres - internal flow - laminar and turbulent flow - combined laminar and turbulent - flow over bank of tubes - free convection - dimensional analysis - flow over vertical plate, horizontal plate, inclined plate, cylinders and spheres.

UNIT - III   **RADIATION**   [12]

Basic concepts, laws of radiation - Stefan Boltzmann law, Kirchhoff 's law - black body radiation - grey body radiation - shape factor algebra - electrical analogy - radiation shields - introduction to gas radiation.

UNIT - IV   **HEAT EXCHANGER**   [12]

Nusselts theory of condensation - pool boiling, flow boiling, correlations in boiling and condensation. Types of heat exchangers - heat exchanger analysis - LMTD method and NTU - effectiveness - overall heat transfer coefficient - fouling factors - extended surfaces.

UNIT - V   **MASS TRANSFER**   [12]

Basic concepts - diffusion mass transfer - Fick 's law of diffusion - steady state molecular diffusion – convective mass transfer - momentum, heat and mass transfer analogy - convective mass transfer correlations.
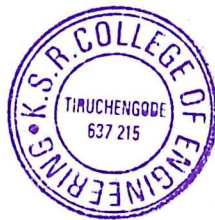
Total (L: 45 T:15) = 60 Periods

Text Books:

1. Yunus Cengel and Afshin Ghajar., Heat and Mass Transfer, Tata McGraw-Hill Book, Fifth Edition. 2015.

2. P.K. Nag,Heat and Mass Transfer - II, Third Edition, Tata McGraw-Hill New Delhi, 2011.

Reference Books:

1. C.P. Kothandaraman - Fundamentals of Heat and Mass TransferII Revised Third Edition, New Age International Publishers- 2016.

2. Er. R.K. Rajput, Heat and Mass Transfer S. Chand Second Edition, 2011.

3. R. Rudramoorthi, K. Mailsamy - Heat and Mass TransferII Second Edition Pearson Education, 2011.

4. J. P. Holman. Fundamentals of Heat and Mass Transfer, McGraw-Hill, 2010.

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CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Choose the concept of heat conduction in simple and composite systems.	3	2	1	-	-	1	2	-	-	-	-	1	-	-
CO2	Compare the convective heat transfer concepts.	3	2	1	-	-	1	2	-	-	-	-	1	-	-
CO3	Solve radiation heat transfer problems.	3	2	1	-	-	1	2	-	-	-	-	1	-	-
CO4	Experiment heat exchanger applications.	3	2	1	-	-	1	2	-	-	-	-	1	-	-
CO5	Explore the mass transfer concepts.	3	2	1	-	-	1	2	-	-	-	-	1	-	-
	Average	3	2	1	-	-	1	2	-	-	-	-	1	-	-

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

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SEMESTER - IV

20SF412	FIRE ENGINEERING FUNDAMENTALS	L	T	P	C
		3	0	0	3

Prerequisite: No prerequisites are needed for enrolling into the course

Course Outcomes: *On successful completion of the course, the student will be able to*	**Cognitive Level**
CO1	Demonstrate the theory of fire chemistry; learn about different kinds of combustion and their characteristics.	Understand
CO2	Learn about the products of combustion flame, heat, smoke, fire gases and their characteristics.	Analyze
CO3	Acquire the knowledge about the use and operation of fire service equipment, machineries and accessories.	Understand
CO4	Calculate the water requirement and the pump capacity for fire fighting and understand the basic fireground operations.	Evaluate
CO5	Identify the fire ground operations and Safety in fire engineering.	Apply

UNIT - I   FIRE CHEMISTRY   [09]

Introduction-temperature, heat, specific heat, Flash point, fire point, ignition, combustion; Ignition- pilot ignition, spontaneous ignition, ignition sources; Types of combustion-rapid, spontaneous, explosion. Development of fire-incipient, smoldering, flame and heat stages; Diffusion flames-zones of combustion, smoldering combustion, characteristics of diffusion flame; Premixed flames-burning velocity, limits of flammability, explosion and expansion ratios, deflagration and detonation, characteristics of premixed flame; Explosion- physical explosion, chemical explosion; Special kinds of combustion- Flash fire, Pool fire, Deep seated fire, Spillover, Boil over, Dust explosion, BLEVE, UVCE; Classification of fire based on material.

UNIT - II   COMBUSTION FLAME   [09]

Product of combustion flame, heat, smoke, fire gases; Flame and its characteristics, spread of flames in solids and liquids, linear and three-dimensional fire propagation; spread of fire in rooms and buildings; Effect of heat exposure to human body, body burns. Smoke - constituents of smoke, quantity and rate of production of smoke, quality of smoke, smoke density, visibility in smoke, smoke movement in buildings, modelling of smoke movement; Smoke control in buildings-natural and mechanical ventilation, pressurization; Design principles of smoke control using pressurization technique; Principles of smoke vent design.

UNIT - III   FIRE SERVICE EQUIPMENTS AND ACCESSORIES   [09]

Use, operation and maintenance of fire service equipment's and accessories - Suction and delivery Hose, Hose reel, Hose fittings-coupling, adapters, branches, branch holders, radial branches, collecting heads, stand pipe, monitors, hydrants; Introduction to fire fighting vehicles and appliances- Pumps, primers, crash tenders, rescue tenders, hose laying tenders, control vans, hydraulic platforms; Ladders- extension ladders, hook ladder, turntable ladders, snorkel; Uses and maintenance of small gear and miscellaneous equipment's used during fire fighting; Lamps and lighting sets; Ropes and Lines- Types-wire and rope lines used in fire service. Use and testing of lines, knots, Bends and hitches; General rope work.

UNIT - IV   FIRE STREAM PATH   [09]

Fire stream-path, range; nozzles-types, calculation of discharge capacity, nozzle reaction; Hydraulic and energy grade lines, pressure loss or gain because of elevation, back pressure; friction losses in pipes, fire hoses and fixtures, parallel and series connections; Flow in pipes and fire hoses, branching lines; water relay techniques; Estimation of fire protection water requirements, pump capacity and other parameters relating to fire hydraulics.

UNIT - V   FIRE GROUND OPERATIONS AND SAFETY   [09]

Toxicity of smoke- effect of harmful agents preventing escape and causing injury or death - CO, CO2, HCN, SO2, NH3, Nitrogen oxide. Fire ground operations-preplanning, action on arrival and control, methods of rescue, methods of entry. Personnel safety. Control procedure and use of other safety equipment. Ventilation and salvage operations.

Total = 45 Periods

Text Books:

1. Jain V.K., Fire Safety in Buildings, Second Edition, New Age International (P) Ltd, New Delhi., 2010.
2. GuptaR.S, A Hand book of Fire Technology, Second Edition, Universities Press.2010.

Reference Books:

1. HMSO, Manual of Fire Manship - Part -1to13London, 1991.
2. William E Clark, Fire Fighting Principles &Practices, Fire Engineering Books & Videos, 1991.
3. Ron Hirst, Underdowns Practical Fire Pre - Cautions, Gower Publishing Company Ltd., England. 1989.
4. James F Cassey, Fire Service Hydraulics, Second Edition, Pennwell Books, 1970.

CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Demonstrate the theory of fire chemistry; learn about different kinds of combustion and their characteristics.	3	3	2	-	-	3	2	-	-	-	-	2	3	3
CO2	Learn about the products of combustion flame, heat, smoke, fire gases and their characteristics.	3	3	2	-	-	3	2	-	-	-	-	2	3	3
CO3	Acquire the knowledge about the use and operation of fire service equipment, machineries and accessories.	3	3	2	-	-	3	2	-	-	-	-	2	3	3
CO4	Calculate the water requirement and the pump capacity for fire fighting and understandthe basic fireground operations.	3	3	2	-	-	3	2	-	-	-	-	2	3	3
CO5	Identify the fire ground operations and Safety in fire engineering.	3	3	2	-	-	3	2	-	-	-	-	2	3	3
	Average	3	3	2	-	-	3	2	-	-	-	-	2	3	3

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

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SEMESTER - IV

		L	T	P	C
20SF413	**STRENGTH OF MATERIALS**	3	1	0	4

Prerequisite: No prerequisites are needed for enrolling into the course

Course Outcomes: On successful completion of the course, the student will be able to   *Cognitive Level*

CO1	Acquire knowledge about Rigid, Resistant bodies, stress and stain calculation for steel bars.	Understand
CO2	Relate various loads acting on various beams and its application.	Understand
CO3	Grasping knowledge about deflection of beams and Buckingham failure analysis.	Analyze
CO4	Choose the solid and hallow shaft by torsional theory.	Evaluate
CO5	Examine the complex stresses in two dimensions.	Analyze

UNIT - I   STRESS STRAIN DEFORMATION OF SOLIDS   **[12]**

Rigid and Deformable bodies - Strength, Stiffness and Stability - Stresses; Tensile, Compressive and Shear - Deformation of simple and compound bars under axial load - Thermal stress - Elastic constants - Strain energy and unit strain energy - Strain energy in uniaxial loads.

UNIT - II   BEAMS - LOADS AND STRESSES   **[12]**

Types of beams: Supports and Loads - Shear force and Bending Moment in beams - Cantilever, Simply supported and Over hanging beams - Stresses in beams - Theory of simple bending - Stress variation along the length and in the beam section - Effect of shape of beam section on stress induced - Shear stresses in beams - Shear flow.

UNIT - III   DEFLECTION OF BEAMS   **[12]**

Elastic curve of Neutral axis of the beam under normal loads - Evaluation of beam deflection and slope: Double integration method, Macaulay Method, and Moment- Area Method - Columns - End conditions - Equivalent length of a column - Euler equation -Slenderness ratio - Rankine formula for columns.

UNIT - IV   TORSION   **[12]**

Analysis of torsion of circular bars - Shear stress distribution - Bars of Solid and hollow circular section - Stepped shaft -Twist and torsion stiffness - Compound shafts - Fixed and simply supported shafts - Application to close- Coiled helical springs - Maximum shear stress in spring section including Wahl Factor - Deflection of helical coil springs under axial loads - stresses in helical coil springs under torsion loads.

UNIT - V   ANALYSIS OF STRESSES IN TWO DIMENSIONS   **[12]**

Biaxial state of stresses -Thin cylindrical and spherical shells - Deformation in thin cylindrical and spherical shells - Biaxial stresses at a point - Stresses on inclined plane - Principal planes and stresses - Mohr 's circle for biaxial stresses - Maximum shear stress - Strain energy in bending and torsion.

Total (L: 45 T:15) = 60 Periods

Text Books:

1. Bansal R.K., Strength of Materials - II, Laxmi Publications, Sixth Edition, 2015.

2. Popov E.P, Engineering Mechanics of Solids - II, Prentice-Hall of India, New Delhi, Third Edition, 2004.

Reference Books:

1. Kazimi S.M.A,Solid Mechanics - II, Tata Mc-Graw-Hill Publishing Co. Ltd, New Delhi, Third Edition,2004.

2. Ray Hulse, Keith Sherwin & Jack Cain, Solid MechanicsII, Palgrave ANE Books,2004.

3. Ryder G.H, Strength of Materials - II, Macmillan India Ltd., Third Edition, 2002.

4. Nash W.A,Theory and Problems in Strength of Materials - II, Schaum Outline Series, McGraw-Hill Book Co, New York, Fourth Edition,1998.

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CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Acquire knowledge about Rigid, Resistant bodies, stress and stain calculation for steel bars.	3	3	2	3	-	1	2	-	-	-	-	1	-	-
CO2	Relate various loads acting on various beams and its application.	3	3	2	3	-	1	2	-	-	-	-	1	-	-
CO3	Grasping knowledge about Deflection of beams and Buckingham failure analysis.	3	3	2	3	-	1	2	-	-	-	-	1	-	-
CO4	Choose the solid and hallow shaft by torsional theory.	3	3	2	3	-	1	2	-	-	-	-	1	-	-
CO5	Examine the complex stresses in two dimensions.	3	3	2	3	-	1	2	-	-	-	-	1	-	-
	Average	3	3	2	3	-	1	2	-	-	-	-	1	-	-

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

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SEMESTER - IV

			L	T	P	C
20SF414	**ELECTRICAL TECHNOLOGY AND SAFETY**		3	0	0	3

Prerequisite: No prerequisites are needed for enrolling into the course

Course Outcomes: On successful completion of the course, the student will be able to | **Cognitive Level**

CO1	Explain the working principles and applications of various kinds of Electrical Machines and/or systems.	Understand
CO2	Choose& brief the hazards associated with electricity at work place.	Apply
CO3	Describe human safety aspects over electric and magnetic fields.	Create
CO4	Compare various protective equipment and enumerate their working and application.	Understand
CO5	Identify hazardous areas/locations in a given industrial site for selection, installation, operation and maintenance of electrical equipment.	Apply

UNIT - I   ELEMENTARY IDEAS OF ELECTRICAL EQUIPMENTS   [09]

Transformers, DC Machines, Alternators, Induction Machines- Characteristics, application Protection Relays: Requirements of relay- types of protection, Classification: Distance Relay, Differential Relay, Static Relay- Definitions and types.

UNIT - II   CIRCUIT BREAKERS   [09]

Function switch gear, Arc Phenomenon- Initialization of an Arc, Arc interruption, Recovery voltage, and Restriking voltage classification and working, Working of MCB and ELCB. Faults in Power System: Causes and types, Fuses: Definition, types of fuses, selection of fuses, advantages and disadvantages.

Grounding: Neutral grounding, Solid grounding, Resistance grounding, Arc suppression coil grounding, Equipment grounding for safety, Grounding sub-station, Grounding of line structure, Earthing.

UNIT - III   EFFECT OF ELECTRIC FIELD AND MAGNETIC FIELD   [09]

Human Safety Aspects, Effect of Current and Voltage on Human being- distance from the source, Typical V-I characteristics of skin – Nervous System, Electrical Shocks and their prevention, Insulation: Classes of Insulation, FRLS insulation, Continuity test.

UNIT - IV   SAFETY DURING INSTALLATION OF PLANT AND EQUIPMENT   [09]

Safe sequences in installation – risk during installation, Safety during testing and commissioning- steps, Test on relays- Protection and interlock system on safety.

UNIT - V   HAZARDOUS ZONES   [09]

Classification of hazardous zones. Intrinsically safe and explosion proof electrical apparatus, Selection of equipment in hazardous area. Electrical Fires: Hazards of static electricity, Safety procedures in electrical maintenance, Statutory requirements from Electrical Inspectorate. Introduction to Indian Electricity Act and Rules.

Total = 45 Periods

Text Books:
1. S. Rao, Electrical Safety, Fire Safety and Safety Management, Khanna Publishers, New Delhi.
2. John Cadick,Electrical Safety Handbook, John Cadick, Sixth Edition, TMH Publishers.

Reference Books:
1. Charles A Gross, Fundamentals of Electrical Engineering, Taylor and Francis Group, 2012.
2. H. Wayne Beaty, Handbook for Electrical Engineers, 15th Edition, Mc Graw-Hill, 2007.
3. Donald G Fink, Standard Handbook for Electrical Engineers, 12th Edition, Mc Graw-Hill, 1987.
4. Donald G Fink, Electrical Engineering, 15th Edition, Mc Graw Hill, 1907.

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CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Explain the working principles and applications of various kinds of Electrical Machines and/or systems.	3	1	2	-	2	2	1	-	-	-	-	-	3	3
CO2	Choose& brief the hazards associated with electricity at work place.	3	1	2	-	2	2	1	-	-	-	-	-	3	3
CO3	Describe human safety aspects over electric and magnetic fields.	3	1	2	-	2	2	1	-	-	-	-	-	3	3
CO4	Compare various protective equipment and enumerate their working and application.	3	1	2	-	2	2	1	-	-	-	-	-	3	3
CO5	Identify hazardous areas/locations in a given industrial site for selection, installation, operation and maintenance of electrical equipment.	3	1	2	-	2	2	1	-	-	-	-	-	3	3
	Average	3	1	2	-	2	2	1	-	-	-	-	-	3	3

1: Slight (Low)　　2: Moderate (Medium)　　3: Substantial (High)

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SEMESTER - IV

		L	T	P	C
20SF415	**OCCUPATIONAL HEALTH AND FIRST AID**	3	0	0	3

Prerequisite: No prerequisites are needed for enrolling into the course

Course Outcomes: *On successful completion of the course, the student will be able to*	Cognitive Level
CO1 Compare the concept and spectrum of health functional units and activities of occupational health service	Understand
CO2 Identify physical chemical and biological hazards in the work environment and its control measures.	Apply
CO3 React to the emergency situations.	Analyze
CO4 Demonstrate the principles of first aid.	Understand
CO5 Develop anatomy and functions of different human systems.	Apply

UNIT - I　　　OCCUPATIONAL HEALTH SERVICE　　　　　　　　　　　　[09]

Concept and spectrum of health- functional units and activities of occupational health services- occupational and work related disease- Levels of prevention of diseases - notifiable occupational diseases such as silicosis, asbestosis, pneumoconiosis, siderosis, anthracosis, aluminosis and anthrax - Lead-Nickel, Chromium and Manganese toxicity- Gas poisoning (such as CO, ammonia, coal and dust), their effects and prevention - Industrial toxicology - Local and systemic and chronic effects, Temporary and cumulative effects - Threshold limit values, Calculation of TLVs - Carcinogens, Mutagens, Teratogens. Instruments for Radiation detection and measurement. Early recognition of radiation hazard. Personal monitoring devices, Medical support. Hazards associated with the following radiations and preventive measures - Laser, infra-red, ultra violet and ELF.

UNIT - II　　　MEASUREMENT OF BODY VIBRATION　　　　　　　　　　[09]

Recognition, evaluation and control of physical hazards. Vibration - Description and measurement of vibration. Vibration control methods. Effects of whole-body vibration on human body and control measures - Noise - noise measurement, evaluation, noise control methods -hearing loss- causes - Biological effects of noise exposure.

UNIT - III　　　VENTILATION　　　　　　　　　　　　　　　　　　　[09]

Thermal stress - Heat disorders and health effects such as heat exhaustion, Hear cramp etc. WBGT index, Acclimatization. Ventilation systems - Purpose of ventilation - General principles ventilation requirements. Physiological and comfort level. Natural ventilation - Dilution ventilation - Mechanical ventilation - Local exhaust ventilation - Ventilation measuring instruments. Fundamentals of hood and duct designs. Standards on ventilation.

Purpose of lighting - Advantages of good illumination - Lighting and the work - Sourcesand kinds of artificial lighting principles of good illumination. Design of Lighting installation - Maintenance - Lighting and ColorStandards on lighting and illuminations.

UNIT - IV　　　FIRST AID　　　　　　　　　　　　　　　　　　　　[09]

Aims and Objectives. First Aid principles-Role of the first aider-sequence of action on arrival at scene. Vital signs- Breathing - pulse. Introduction to the body- Basic anatomical terms- Body cavities - Head- Cranium -Thorax- Abdomen and pelvis. Biomechanics - Structure and functions of musculoskeletal systems, Tendons, Ligaments, Facia, Bone, Muscles, joints and basic mechanisms.The respiratory system- Respiratory failure - Asphyxia- Abdominal thrust in Heimlich manoeuvre. Chest injuries-types-fractured ribs – Pneumothorax- hemothorax.

The nervous system – functions-components -brain - cerebrum - cerebellum- medulla oblongata -cerebra - Spinal fluid - Spinal cord-autonomic nervous system.　　Unconsciousness - causes-level of consciousness- management of unconscious casualty-problems of unconsciousness. Fainting - recognition - management-aftercare. Diabetes -hypoglycemia - hyperglycemia- management. Seizures (epileptic fits, convulsions) features- management, stroke. Head injuries-fractures of the base-vault and sides of skull.

UNIT - V　　　INJURIES AND HUMAN SYSTEMS　　　　　　　　　　　[09]

The circulatory system -Heart attack -Chest compression – CPRShock - Causes- Signs and Symptoms - Management of shock. Eye - eye injuries-foreign body in eye-eye trauma - corrosive chemical in eye-arc eye. Wounds – bleeding – Classification-Types of wounds-case of wounds bleeding from special sites. Fractures- Classification of fractures - Principles of immobilization - sprains and dislocation. Broad and narrow fold bandages-hand bandages- Slings. The skin. Burns - Rule of nines-pure thermal burns. Electric burns, Chemical burns, Radiation burns. Cold burns. Poisoning. Physical fitness. Lifting - Casualty Handling. Use of Stretchers.

Total = 45 Periods

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Text Books:

1. Jeanne Mager Stellman(ed)Encyclopedia of Occupational Health and Safety, Fourth Edition, International Labour Office, Geneva.

2. The Industrial Environment -Its Evaluation and Control, DHHS (NIOSH),1973.

Reference Books:

1. S.K. Halder, Industrial and Occupational Health, Kindle Edition, 2017.

2. Yudenich,V.V., Accident First Aid, Mir Publishers, Moscow, 1986.

3. Cantlie, James., First aid to the injured. St John Ambulance Association, 1932.

4. Clayton, C. Dand Clayton, F. Patty's Industrial Hygiene and Toxicology. Wiley, Inderscience, NewYork.

CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Compare the concept and spectrum of health functional units and activities of occupational health service	3	2	2	-	-	3	2	2	-	-	-	2	3	3
CO2	Identify physical chemical and biological hazards in the work environment and its control measures.	3	2	2	-	-	3	2	2	-	-	-	2	3	3
CO3	React to the emergency situations.	3	2	2	-	-	3	2	2	-	-	-	2	3	3
CO4	Demonstrate the principles of first aid.	3	2	2	-	-	3	2	2	-	-	-	2	3	3
CO5	Develop anatomy and functions of different human systems.	3	2	2	-	-	3	2	2	-	-	-	2	3	3
	Average	3	2	2	-	-	3	2	2	-	-	-	2	3	3

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

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SEMESTER - IV

		L	T	P	C
20SF416	**SAFETY IN CONSTRUCTION**	3	0	0	3

Prerequisite: No prerequisites are needed for enrolling into the course

Course Outcomes: On successful completion of the course, the student will be able to		*Cognitive Level*
CO1	List out Hazards from various Construction equipment and activities.	Remember
CO2	Mention various Control measures adopted in each Construction activity to avoid Incidents.	Apply
CO3	Demonstrate the safe use of various types of ladders, Hand held power tools, Hydraulic tools used in Construction industry.	Understand
CO4	Describe various components of cranes, safety features and its function.	Create
CO5	Choose the minimum requirements of BOCW act to the Construction site when they work.	Apply

UNIT - I   INTRODUCTION TO CONSTRUCTION INDUSTRY   [09]

Safety aspects of construction planning- Human factors in construction safety management. Roles of various groups in ensuring safety in construction industry.

UNIT - II   SAFETY IN VARIOUS CONSTRUCTION OPERATIONS   [09]

Excavation- under- water works- under-pinning & shoring- Ladders & Scaffolds - Tunneling- Blasting- Demolition- Pneumatic caissons- confined Space- Temporary Structures. Indian Standards on construction safety- National Building Code Provisions on construction safety.

UNIT - III   SAFETY IN MATERIAL HANDLING AND EQUIPMENTS   [09]

Storage & stacking of construction materials, Safety in the use of construction equipment's- Vehicles, Cranes, Tower Cranes, Lifting gears, Hoists & Lifts, Wire Ropes, Pulley blocks, Temporary power supply, Mixers, Conveyors, Pneumatic and hydraulic tools in construction.

UNIT - IV   CONTRACT CONDITIONS ON SAFETY   [09]

Health, Welfare, Social Security and Insurance. Application of ergonomics for construction safety.

UNIT - V   CONTRACT LABOUR ACT AND CENTRAL RULES   [09]

Buildings and other Construction Workers (RE & CS) Act and Central Rules. Provisions regarding Licensing, safety, health, welfare and social security aspects only.

Total = 45 Periods

Text Books:

1. National Building Code of India, Bureau of Indian Standards, New Delhi, 2005.
2. Building & Other Construction Workers (RE &CS) Act, 1996 and Central Rules.

Reference Books:

1. K.N. Vaid (Ed.), Construction Safety Management, National Institute of Construction Management and Research, Bombay.
2. V.J. Davies & K. Tomasin, Construction Safety Handbook, Thomas Telford Publishing, London.
3. James B. Full man, Construction Safety, Security & Loss Prevention, John Wiley & Sons
4. R.T. Ratay, Handbook of Temporary Structures in Construction, Mc Graw-Hill.

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CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	List out Hazards from various Construction equipment and activities.	3	2	3	2	2	-	3	-	1	-	-	2	3	3
CO2	Mention various Control measures adopted in each Construction activity to avoid Incidents.	3	2	3	2	2	-	3	-	1	-	-	2	3	3
CO3	Demonstrate the safe use of various types of ladders, Hand held power tools, Hydraulic tools used in Construction industry.	3	2	3	2	2	-	3	-	1	-	-	2	3	3
CO4	Describe various components of cranes, safety features and its function.	3	2	3	2	2	-	3	-	1	-	-	2	3	3
CO5	Choose the minimum requirements of BOCW act to the Construction site when they work.	3	2	3	2	2	-	3	-	1	-	-	2	3	3
	Average	3	2	3	2	2	-	3	-	1	-	-	2	3	3

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

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20SF421	STRENGTH OF MATERIALS LABORATORY	L	T	P	C
		0	0	3	1

Prerequisite: *NIL*

Course Outcomes: On Completion of this course, the student will be able to

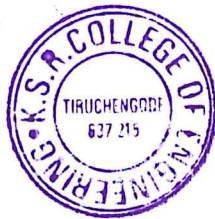|		Cognitive level
CO1	Compare the mechanical properties of materials.	Analyze
CO2	Predict the hardness of the different materials.	Create
CO3	Demonstrate torsion tests on ductile materials.	Understand
CO4	Categorize the tensile strength of various materials.	Analyze
CO5	Assess the compressive strength for different types of materials.	Evaluate

LIST OF EXPERIMENTS:

1. Tension test on a mild steel rod.
2. Double shear test on Mild steel and Aluminum rods.
3. Torsion test on mild steel rod.
4. Impact test on metal specimen.
5. Hardness test on metals - Brinnell Hardness Number.
6. Hardness test on metals - Rockwell Hardness Number.
7. Deflection test on beams.
8. Compression test on ductile materials – helical spring.
9. Tension test on helical spring.
10. Compression test on brittle materials – concrete cubes.

Total: 30 Periods

CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Compare the mechanical properties of materials.	3	2	1	-	-	2	2	-	-	-	-	1	-	-
CO2	Predict the hardness of the different materials.	3	2	1	-	-	2	2	-	-	-	-	1	-	-
CO3	Demonstrate torsion tests on ductile materials.	3	2	1	-	-	2	2	-	-	-	-	1	-	-
CO4	Categorize the tensile strength of various materials.	3	2	1	-	-	2	2	-	-	-	-	1	-	-
CO5	Assess the compressive strength for different types of materials.	3	2	1	-	-	2	2	-	-	-	-	1	-	-
	Average	3	2	1	-	-	2	2	-	-	-	-	1	-	-

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

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SEMESTER – IV

20SF422　　　　　**ELECTRICAL TECHNOLOGY LABORATORY**

L	T	P	C
0	0	3	1

Prerequisite: NIL

Course Outcomes: On Completion of this course, the student will be able to

Cognitive level

CO1	Compare the laws governing electric circuits	Understand
CO2	Study the load and speed characteristics of D.C motors	Analyze
CO3	Do load test on single phase transformer	Apply
CO4	Study the load and speed characteristics of A.C motors	Evaluate
CO5	Relate the functions of protective relays and circuit breakers.	Understand

LIST OF EXPERIMENTS:

1. Verification of Kirchou's Laws.

2. Verification of Super Position Theorem.

3. Study of B.H. Curve onC.R.O.

4. Measurement of power in an A.C. circuit by 3 ammeter and 3 voltmeter method.

5. Load test on a DC series motor.

6. Speed characteristics of DC shunt motor.

7. Regulation of a Transformer.

8. Load characteristics of a 3-phase induction motor.

9. Study of protective relays and circuit breakers.

10. Study of insulation testing and ground testing.

Total: 30 Periods

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CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Compare the laws governing electric circuits.	3	2	3	-	-	2	3	-	-	-	-	2	-	-
CO2	Study the load and speed characteristics of D.C motors.	3	2	3	-	-	2	3	-	-	-	-	2	-	-
CO3	Do load test on single phase transformer.	3	2	3	-	-	2	3	-	-	-	-	2	-	-
CO4	Study the load and speed characteristics of A.C motors.	3	2	3	-	-	2	3	-	-	-	-	2	-	-
CO5	Relate the functions of protective relays and circuit breakers.	3	2	3	-	-	2	3	-	-	-	-	2	-	-
	Average	3	2	3	-	-	2	3	-	-	-	-	2	-	-

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

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SEMESTER – IV

20SF423	COMPUTER AIDED DRAWING LABORATORY	L	T	P	C
		0	0	3	1

Prerequisite: NIL

Course Outcomes: On Completion of this course, the student will be able to   *Cognitive level*

CO1	Demonstrate graphical skills like drafting and modelling using the software packages.	*Remember*
CO2	Draw the engineering curves and title block with text and projection symbol.	*Understand*
CO3	Create 2D models of engineering components and residential building, steel truss.	*Understand*
CO4	Construct the sectional views and isometric projection of the solid objects.	*Understand*
CO5	Create, render and manipulate 3D drawings and obtain 2D drawings from 3D drawing.	*Understand*

LIST OF EXPERIMENTS:

1. Study of capabilities of software for Drafting and Modeling - Coordinate systems (absolute, relative, polar, etc.) - Creation of simple figures like polygon and general multi-line figures.

2. Drawing of a Title Block with necessary text and projection symbol.

3. Drawing of curves like parabola, spiral, in volute using B spine or cubic spine.

4. Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone, etc., and dimensioning.

5. Drawing of front view, top view and side view of objects from the given pictorial views (e.g., V block, base of a mixie, simple stool, objects with hole and curves).

6. Drawing of a plan of residential building (Two bed rooms, kitchen, hall, etc.)

7. Drawing of a simple steel truss.

8. Drawing sectional views of prism, pyramid, cylinder, cone, etc.

9. Drawing isometric projection of simple objects.

10. Creation of 3D models of simple objects and obtaining 2D multi-view drawings from 3D model.

Total: 30 Periods

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CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Demonstrate graphical skills like drafting and modeling using the software packages.	3	3	3	2	2	-	-	-	-	-	-	-	-	-
CO2	Draw the engineering curves and title block with text and projection symbol.	3	3	3	2	2	-	-	-	-	-	-	-	-	-
CO3	Create 2D models of engineering components and residential building, steel truss.	3	3	3	2	2	-	-	-	-	-	-	-	-	-
CO4	Construct the sectional views and isometric projection of the solid objects.	3	3	3	2	2	-	-	-	-	-	-	-	-	-
CO5	Create, render and manipulate 3D drawings and obtain 2D drawings from 3D drawing.	3	3	3	2	2	-	-	-	-	-	-	-	-	-
	Average	3	3	3	2	2	-	-	-	-	-	-	-	-	-

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

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SEMESTER - IV

20HR412	CAREER DEVELOPMENT SKILLS - II	L	T	P	C
		0	2	0	0

Prerequisite: No prerequisites are needed for enrolling into the course

Course Outcomes: On successful completion of the course, the student will be able to	Cognitive Level
CO1: Speak and write appropriately by understanding verbal and logical reasoning	Understand
CO2: Demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions	Apply
CO3: Enhance their skills on quantitative aptitude	Apply
CO4: Speak and write appropriately by understanding and applying the basic grammatical rules	Create
CO5: Critically evaluate problems related to quantitative aptitude	Apply

UNIT - I	VERBAL AND LOGICAL REASONING – PART 1	[06]

Alphabet Test – Synonyms & Antonyms – Idioms & Phrases – Analogies - Theme Detection – Odd Words – Statement & Conclusions - Family Tree – Blood Relations – Coding & Decoding – Syllogism – Odd Man Out.

UNIT - II	QUANTITATIVE APTITUDE – PART 1	[06]

Numbers: Number system - Squaring of Numbers – Square Roots – Cube Roots – Divisibility – HCF, LCM – Decimals.

UNIT - III	QUANTITATIVE APTITUDE – PART 2	[06]

Percentages – Averages – Ratio & Proportion – Mixtures and Allegations – logarithms.

UNIT - IV	READING COMPREHENSION&WRITTEN COMMUNICATION –PART 3	[06]

READING SKILLS: Importance of Reading – Definition of Reading – Levels of Reading – Requirements of Reading – Types of Reading – Techniques of Reading - Academic Reading Tips.

UNIT - V	QUANTITATIVE APTITUDE – PART 3	[06]

Profit and Loss – Simple Interest & Compound Interest – Problem on Ages – Calendar.

Total = 30 Periods

Text Books:

1. Anne Laws, Writing Skills, Orient Black Swan, Hyderabad, 2011.

2. R.V.Praveen, Quantitative Aptitude and Reasoning, PHI Learning PVT. LTD., New Delhi,2011

Reference Books:

1. Abhijit Guha, Quantitative Aptitude, Tata McGraw Hill Education, Third Edition, New Delhi, 2020.

2. M.B. Lal&Goswami, Objective Instant, ArithmeticUpkar Publications, New Delhi, Second Edition,2012.

3. Norman Lewis. W.R., Word Power Made Easy, Goyal Publications, 2011.

4. Agarwal. R.S.,AModern Approach to Verbal and Non- verbal Reasoning, Revised Edition 2008, Reprint 2009, S. Chand& Co Ltd., New Delhi.

CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Speak and write appropriately by understanding verbal and logical reasoning	-	-	-	-	-	-	-	-	2	3	-	3	2	2
CO2	Demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions	-	-	-	-	-	-	-	-	2	3	-	3	2	2
CO3	Enhance their skills on quantitative aptitude	-	-	-	-	-	-	-	-	2	3	-	3	2	2
CO4	Speak and write appropriately by understanding and applying the basic grammatical rules	-	-	-	-	-	-	-	-	2	3	-	3	2	2
CO5	Critically evaluate problems related to quantitative aptitude	-	-	-	-	-	-	-	-	2	3	-	3	2	2
	Average	-	-	-	-	-	-	-	-	2	3	-	3	2	2

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

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SEMESTER - V

20HS051	UNIVERSAL HUMAN VALUES AND UNDERSTANDING HARMONY (Common To All Branches)	L	T	P	C
		3	0	0	3

Prerequisite:

Course Outcomes: On successful completion of the course, the student will be able to	Cognitive Level
CO1	Explain the basic concepts of value education.	Understanding
CO2	Distinguish between the self and the body, implement the meaning of harmony in the Co–existence of Self and the Body.	Understanding
CO3	Explain the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human–human relationships.	Understanding
CO4	Describe the harmony in nature and existence, and work out their mutually fulfilling participation in the nature.	Understanding
CO5	Explain the ethical and unethical practices in work environment.	Understanding

UNIT - I   INTRODUCTION TO VALUE EDUCATION   [09]

Need and Basic Guidelines of Value Education – Content and Process of Value Education – Self Exploration – purpose of self-Exploration – Content and Process of Self exploration – Natural Acceptance – Realization and Understanding – Basic Human Aspirations – Continuous Happiness and Prosperity – Exploring Happiness and Prosperity – Basic Requirement for Fulfillment of Human Aspirations – Relationships – Physical Facilities – Right Understanding.

UNIT - II   HARMONY IN THE HUMAN BEING   [09]

Human Begin and Body – Understanding Myself as Co–existence of Self ('I') and Body, Needs of the Self and Body, Activities in the Self and Body, Self ('I') as the Conscious Entity, the Body as the Material Entity – Exercise – Body as an Instrument– Harmony in the Self ('I) – Understanding Myself – Harmony with Body.

UNIT - III   HARMONY IN THE FAMILY AND SOCIETY   [09]

Harmony in the Family – Justice – Feelings (Values) in Human Relationships – Relationship from Family to Society – Identification of Human Goal – Five dimensions of Human Endeavour.

UNIT - IV   HARMONY IN NATURE AND EXISTENCE   [09]

Order of Nature – Interconnectedness – Understanding the Four order – Innateness – Natural Characteristic – Basic Activity – Conformance – Introduction to Space – Co–existence of units of Space – Limited and unlimited – Active and No–activity – Existence is Co–existence.

UNIT - V   PROFESSIONAL ETHICS   [09]

Values in different dimensions of Human Living – Definitiveness of Ethical Human Conduct –Implications of Value based Living – Identification of Comprehensive Human Goal – Humanistic Education – Universal Human Order – Competence and Issues in Professional Ethics.

Total (L= 45, T = 0) = 45 Periods

Text Books:

1. Gaur R.R., Sangal, R., Bagaria, G.P., A Foundation Course in Human Values and Professional Ethics, Excell Books Pvt. Ltd., New Delhi, First Edition, 2016.
2. Tripaty, A.N., Human Values, New Age International Publishers, 2003.
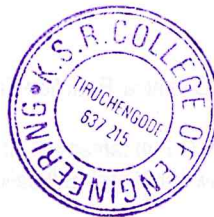
Reference Books:

1. Ivan Illich, Energy & Equity, The Trinity Press, USA, 1974.
2. Schumacher E.F., Small is Beautiful: a study of economics as if people mattered, Britain, 1973.
3. Seebauer, E.G., Robert L. Berry, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press, 2000.
4. Banerjee, B.P., Foundations of Ethics and Management, Excel Book, 2005.

CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Explain the basic concepts of value education.	3	-	-	-	-	3	-	3	-	-	-	-	3	3
CO2	Distinguish between the self and the body, implement the meaning of harmony in the Co– existence of Self and the Body.	3	-	-	-	-	3	-	3	-	-	-	-	3	3
CO3	Explain the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human–human relationships.	3	-	-	-	-	3	-	3	-	-	-	-	3	3
CO4	Describe the harmony in nature and existence, and work out their mutually fulfilling participation in the nature.	3	-	-	-	-	3	-	3	-	-	-	-	3	3
CO5	Explain the ethical and unethical practices in work environment.	3	-	-	-	-	3	-	3	-	-	-	-	3	3
		3	-	-	-	-	3		3	-	•	-	-	3	3

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

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SEMESTER - V

		L	T	P	C
20SF511	**CHEMICAL TECHNOLOGY AND REACTION ENGINEERING**	3	0	0	3

Prerequisite: No prerequisites are needed for enrolling into the course

Course Outcomes: On successful completion of the course, the student will be able to		Cognitive Level
CO1	Analyze and improve the manufacturing methods for heavy chemicals and fertilizers.	Analyze
CO2	Choose organic chemical elements like sugar, synthetic rubber, reactors and its behaviours etc..,	Create
CO3	Compare advance reaction technology and its function and application etc..,	Understand
CO4	Classify the reactors and its performance.	Understand
CO5	Perform design calculations of CSTR and PFR.	Apply

UNIT - I　　　**INORGANIC CHEMICAL TECHNOLOGY**　　　**[09]**

Inorganic chemical technology: Chlor-alkali industries-soda ash-caustic soda-chlorine hydrochloric acid. Manufacture of Sulphuric acid. Phosphorous industries - phosphoric acid-wet process phosphoric acid, electric furnace phosphoric acid, single super phosphate and triple super phosphate. Nitrogenous industries- ammonia, nitric acid, urea, ammonium sulphate, ammonium phosphate.

UNIT - II　　　**ORGANIC CHEMICAL TECHNOLOGY**　　　**[09]**

Organic chemical technology: Manufacturing processes for pulp and paper, sugar, industrial alcohol by fermentation-absolute alcohol, beers, wines, oils and fats, soaps and detergents, agrochemicals, introduction to polymers, synthetic rubbers- SBR, neoprene, urethane rubbers.

UNIT - III　　　**MECHANISM OF REACTION**　　　**[09]**

Classification of reactions, variables affecting rate of reaction, definition of reaction rate. Kineticsof homogeneous reactions - concentration dependent term of a rate equation, temperaturedependent term of a rate equation, theories of reaction - collision theory, transition theory,Arrhenius equation.

UNIT - IV　　　**PERFORMANCE OF REACTOR**　　　**[09]**

Ideal reactors - Design for homogeneous systems, batch, stirred tank and tubular Flow reactor, design of reactors for multiple reactions, combination reactor system, size comparison of reactors. Elementary ideas of non-ideal reactor performance, residence time distribution curves E, F and C...

UNIT - V　　　**SELECTION OF REACTORS**　　　**[09]**

Size comparison of Single reactors, multiple reactor system, Reactions in Parallel and Series, Yield and Selectivity.

Total = 45 Periods

Text Books:

1. Tapio Salmi and Jyri-pekka Mikkola, Chemical Reaction Engineering and Technology, CRC Press, Taylor & Francis Group, LLC, 2011.

2. Davis, Mark E. and Davis, Robert J, Fundamentals of chemical reaction engineering, McGraw-Hill, Chemical Engineering series. McGraw-Hill Higher Education, New York.

Reference Books:

1. Dr.Anil Kumar Misra,Building Materials and Construction,S. Chand Publication,2017.

2. Gopal Rao, M. and Sittig, M (Eds), Dryden´s outlines of chemical technology for the 21stCentury, Affiliated East West Press, New Delhi, third edition,2010.

3. Leven spiel, O., Chemical reaction engineering, Wiley India Pvt. Ltd., New Delhi, third edition, 2010.

4. S.K.Duggal,Building Materials, New Age International (Pvt) Limited Publishers, third edition, 2000.

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CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Analyze and improve the manufacturing methods for heavy chemicals and fertilizers.	3	-	-	3	3	-	3	3	-	3	3	2	3	3
CO2	Choose organic chemical elements like sugar, synthetic rubber, reactors and its behaviours etc..,	3	-	-	3	3	-	3	3	-	3	3	2	3	3
CO3	Compare advance reaction technology and its function and application etc..,	3	-	-	3	3	-	3	3	-	3	3	2	3	3
CO4	Classify the reactors and its performance.	3	-	-	3	3	-	3	3	-	3	3	2	3	3
CO5	Perform design calculations of CSTR and PFR.	3	-	-	3	3	-	3	3	-	3	3	2	3	3
		3	-	-	3	3	-	3	3	-	3	3	2	3	3

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

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SEMESTER - V

20SF512	PRINCIPLES OF ENGINEERING DESIGN (Use of Machine design Data Book Permitted)	L	T	P	C
		3	0	0	3

Prerequisite: No prerequisites are needed for enrolling into the course

Course Outcomes: On successful completion of the course, the student will be able to		Cognitive Level
CO1	Recalling previous knowledge required to the course engineering design.	Remember
CO2	Solve various equations required to design engineering components.	Apply
CO3	Design and solve engineering design problems.	Create
CO4	Explain and design the shaft.	Understand
CO5	Construct and design vessels and storage tanks.	Apply

UNIT - I   INTRODUCTION TO DESIGN   [09]

Steps in design- design factors- practical considerations in design- theories of failure- stress concentration - consideration of creep and thermal stress in design. Detachable joints- design of screws- thread standards- pre-loading of bolts external load with pre-load -fatigue and shock loading- Types of keys- types of pins- design of cotter and pin joint.

UNIT - II   RIVETED AND WELDED JOINTS   [09]

Stresses in riveted joints- design of riveted joints subjected to central & eccentric loads boiler and tank joints - structural joints. Welded joints-types of welded joints- design of welded joints subjected to axial, torsion and bending loads.

UNIT - III   SPRINGS   [09]

Various types of springs, optimization of helical springs - Stresses in helical spring - deflection of helical compression and extension Spring - rubber springs - springs subjected to fatigue loading- concentric and helical torsion spring.

UNIT - IV   POWER SHAFT   [09]

Power Shafting- Design for static loadsExplain- combined stresses- design of shaft for strength and deflection- axialload on shaft.

UNIT - V   CYLINDRICAL AND SPHERICAL VESSELS   [09]

Design of cylindrical and spherical vessels for internal and external pressures - design of head sandenclosures- tall vessels- supports for vessels- nonstandard flanges- pipeline design. Design of storage tanks.

Total = 45 Periods

Text Books:

1. Richard G. Budynas, J. Keith Nisbett, Shigley's Mechanical Engineering Design, Mc Graw Hill, Tenth Edition, 2011.
2. Avallone, Handbook of Mechanical Design, Mc Graw Hill, Third Edition, 2004.

Reference Books:

1. Bhandari, V.B, Design of Machine Elements, Tata Mc - Graw - Hill Education, New Delhi, Fifth Edition, 2020.
2. Bhattacharya, B.C, Introduction to Chemical Equipment Design - Mechanical Aspects, CBSPublishers and Distributors, New Delhi, 2017.
3. Mahajani, V.V. and Umarji, S.B, Joshy's Process Equipment Design, Trinity Press, New Delhi, Fifth Edition, 2014.
4. Brownell, L. E and Young, E. H, Process Equipment Design, John Wiley&Sons, NewYork, 2009.
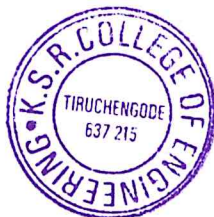
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CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Recalling previous knowledge required to the course engineering design.	2	3	-	2	-	-	-	3	-	2	-	-	3	-
CO2	Solve various equations required to design engineering components.	2	3	-	2	-	-	-	3	-	2	-	-	3	-
CO3	Design and solve engineering design problems.	2	3	-	2	-	-	-	3	-	2	-	-	3	-
CO4	Explain and design the shaft.	2	3	-	2	-	-	-	3	-	2	-	-	3	-
CO5	Construct and design vessels and storage tanks.	2	3	-	2	-	-	-	3	-	2	-	-	3	-
		2	3	-	2	-	-	-	3	-	2	-	-	3	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

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SEMESTER - V

		L	T	P	C
20SF513	PLANNING AND DESIGN OF FIRE PROTECTION SYSTEMS	3	0	0	3

Prerequisite: No prerequisites are needed for enrolling into the course

Course Outcomes: On successful completion of the course, the student will be able to	Cognitive Level
CO1 Explain the Fire Protection Systems and its Control.	Understand
CO2 Choose the Fire Fighting Equipments in the control of Fire.	Apply
CO3 Summarize the sprinklers and its types used for fire control.	Understand
CO4 Explain Fire detection and alarm systems used in fire fighting.	Understand
CO5 Demonstrate the use of Personnel Protective Equipments.	Understand

UNIT - I   INTRODUCTION OF FIRE PROTECTION SYSTEMS   [09]

Fire detection - Need and importance of automatic fire detection system, principle of detection, classification of detectors; Heat detectors - fixed temperature, rate of rise , thermistor rate of rise and rate compensated type detectors; Smoke detectors- optical and ionization type, photo electric light scattering and light obstruction type detectors; Flame detectors - infra red and ultra violet detectors; Flammable gas detection- Pellistor and laser detectors; Testing of fire detection devices as per relevant Indian standards specifications; Comparison of detectors; Performance characteristics of detectors; Lag time associated with fire detection.

UNIT - II   FIRE FIGHTING EQUIPMENTS   [09]

Hose And Hose Fitting – Detail study of hoses - coupling, branches-branch holders, Monitors – Nozzles - Stand pipes - Collecting Head - Suction hose fitting breaching. Adapters and Ramps. Portable Fire Extinguishers - Construction features - Specifications and Application-Extinguishers using water, Foam, CO_2 dry power and dry water. Foam and Foam making Equipment - Types of Foam, Properties and characteristics of good foam-practical consideration, care and maintenance.

UNIT - III   FIRE CONTROL SYSTEM   [09]

Automatic water sprinkler system - requirement and source of water supply, automatic pumps; Automatic sprinkler heads - Quartzoid type, fusible link type, modern types; mounting and protection of sprinkler heads; Sprinkler pipe works - standard and staggered lay out, hangers; Control valves for wet and dry installations; deluge valve. Drenchers; High velocity and medium velocity spray system; Principles of water sprinkler system design as per relevant standards (ISI).

UNIT - IV   FIRE DETECTION AND ALARM SYSTEM   [09]

Fire detection sensors - Fire alarm system- classification of alarm system as per NBC; Manually operated system; Automatic alarm system - Addressable and non-addressable system; Features of Local system, Auxiliary system, Remote station system, Central station system and Proprietary system.

UNIT - V   PERSONNEL PROTECTIVE EQUIPMENTS   [09]

Complete Head to Toe Protection Equipment's – Types, Construction and reliability of Head protection - Helmets, Face protection – Face shields, Body Protection – Aprons, Leg Protection – Shoes and Fall protection – Safety belts.

Total = 45 Periods

Text Books:

1. Barendra Mohan Sen, Fire Protection and Prevention the Essential Handbook, UBS Publishers and Dist., New Delhi, 2013.
2. William E Clark, Fire Fighting Principles & Practices, Fire Engineering Books & Videos, Second Edition, 1991.

Reference Books:

1. Ron Hirst, Underdowns Practical Fire Precautions, Gower Publishing CompanyLtd., England, 1989.
2. Dennis P. Nolan, Handbook of Fire and Explosion Protection Engineering, Principles for Oil, Gas, Chemical and Related Facilities, Saudi Aramco, Gulf Professional Publishing.
3. Daniel E. Della - Giustina, Fire and Safety Management Hand Book.
4. N F P A. Fire Protection Hand Book and Relevant IS codes.

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CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Explain the Fire Protection Systems and its Control.	3	3	3	-	-	3	-	-	-	-	-	3	3	3
CO2	Choose the Fire Fighting Equipments in the control of Fire.	3	3	3	-	-	3	-	-	-	-	-	3	3	3
CO3	Summarize the sprinklers and its types used for fire control.	3	3	3	-	-	3	-	-	-	-	-	3	3	3
CO4	Explain Fire detection and alarm systems used in fire fighting.	3	3	3	-	-	3	-	-	-	-	-	3	3	3
CO5	Demonstrate the use of Personnel Protective Equipments.	3	3	3	-	-	3	-	-	-	-	-	3	3	3
		3	3	3	-	-	3	-	-	-	-	-	3	3	3

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

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SEMESTER - V

20SF514	CHEMICAL PROCESS SAFETY	L	T	P	C
		3	0	0	3

Prerequisite: No prerequisites are needed for enrolling into the course

Course Outcomes: On successful completion of the course, the student will be able to		Cognitive Level
CO1	Compare between inherent safety and engineered safety and recognize the importance ofsafety in the design of chemical process plants.	Understand
CO2	Develop thorough knowledge about safety in the operation of chemical plants.	Apply
CO3	Apply the principles of safety in the storage and handling of gases.	Apply
CO4	Identify the conditions that lead to reaction hazards and adopt measures to prevent them.	Apply
CO5	Categorize the need for safety and analysis.	Analyze

UNIT - I   SAFETY IN THE STORAGE AND HANDLING OF CHEMICALS AND GASES   [09]

Types of storage-general considerations for storage layouts- atmospheric venting, pressure andtemperature relief - relief valve- storage and handling of hazardous chemicalsand industrial gases, safe disposal methods, reaction with other chemicals, hazards duringtransportation - pipe line transport - safety in chemical laboratories.

UNIT - II   CHEMICAL REACTION HAZARDS   [09]

Hazardous inorganic and organic reactions and processes, Reactivity as a process hazard,Detonations, Deflagrations, and Runaways, Assessment and Testing strategies, Self – heatinghazards of solids, Explosive potential of chemicals, Structural groups and instability of chemicals,Thermochemical screening,

UNIT - III   SAFETY IN THE DESIGN OF CHEMICAL PROCESS PLANTS   [09]

Design principles -Process design development -types of designs, feasibility survey, preliminarydesign, Flow diagrams, piping and instrumentation diagram, batch versus continuous operation,factors in equipment scale up and design, equipment specifications - reliability and safety indesigning - inherent safety - engineered safety - safety during startup and shutdown –non-destructive testing methods - pressure and leak testing - emergency safety devices - scrubbers andflares- new concepts in safety design and operation- Pressure vessel testing standards- Inspectiontechniques for boilers and reaction vessels.

UNIT - IV   SAFETY IN THE OPERATION OF CHEMICAL PROCESS PLANTS   [09]

Properties of chemicals - Material Safety Data Sheets - the various properties and formats used -methods available forproperty determination. Operational activities and hazards -standardsoperating procedures - safe operation of pumps, compressors, heaters, column, reactors, pressurevessels, storage vessels, piping systems - effects of pressure, temperature, Flow rate and humidityon operations - corrosion and control measures- condition monitoring - control valves - safety valves- pressure reducing valves, drains, bypass valves, inert gases. Chemical splashes, eye irrigation andautomatic showers.

UNIT - V   SAFETY AND ANALYSIS   [09]

Safety vs reliability- quantification of basic events, system safety quantification, Human erroranalysis, Accident investigation and analysis, OSHAS 18001 and OSHMS.

Total = 45 Periods

Text Books:

1. Maurice Jones. A, Fire Protection Systems, Jones & Bartlett Publishers, Second Edition, 2015.

2. David A Crowl & Joseph F Louvar,Chemical Process Safety, Pearson Publication, Third Edition,2014.

Reference Books:

1. Ron Hirst, Underdowns Practical Fire Precautions, Gower Publishing CompanyLtd., England, 1989.

2. Dennis P. Nolan, Handbook of Fire and Explosion Protection Engineering, Principles for Oil, Gas, Chemicaland Related Facilities,Saudi Aramco, Gulf Professional Publishing.

3. Daniel E. Della -Giustina,Fire and Safety Management Hand Book.

4. NFPA Fire Protection Hand Book and Relevant IS codes.

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CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Compare between inherent safety and engineered safety and recognize the importance of safety in the design of chemical process plants.	2	3	3	-	2	-	-	-	-	-	-	3	3	3
CO2	Develop thorough knowledge about safety in the operation of chemical plants.	2	3	3	-	2	-	-	-	-	-	-	3	3	3
CO3	Apply the principles of safety in the storage and handling of gases.	2	3	3	-	2	-	-	-	-	-	-	3	3	3
CO4	Identify the conditions that lead to reaction hazards and adopt measures to prevent them.	2	3	3	-	2	-	-	-	-	-	-	3	3	3
CO5	Categorize the need for safety and analysis.	2	3	3	-	2	-	-	-	-	-	-	3	3	3
		2	3	3	-	2	-	-	-	-	-	-	3	3	3

1: Slight (Low)   2: Moderate (Medium)   3: Subs3tantial (High)

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20AU901	BASICS OF AUTOMOBILE ENGINEERING	L	T	P	C
	(Open Elective)	3	0	0	3

Prerequisite: -

Course Outcomes: On successful completion of the course, the student will be able to		*Cognitive Level*
CO1	Provide basic platform knowledge of automobile engineering	Understand
CO2	Explain the working principal of petrol and diesel engines	Understand
CO3	Interpret the method of power transmission unit	Understand
CO4	Built knowledge of steering and brake	Understand
CO5	Illustrate the knowledge of automotive electrical systems and functioning	Understand

UNIT - I   INTRODUCTION   [09]

Automobile - Components of an automobile - Classification of automobiles - Layout of chassis - Types of drives front wheel- rear wheel - four wheel.

UNIT - II   IC ENGINES   [09]

Classification - ignition system - firing order - Otto/ Diesel cycles - Two stroke and four stroke engines – scavenging - Cooling and Lubrication systems - Fuel Supply system – air fuel ratio - Carburetor – types.

UNIT - III   TRANSMISSION SYSTEM   [09]

Clutch - Function - single plate - multi plate - friction clutches - Centrifugal and semi centrifugal clutch - Gear Box -slide mesh - constant mesh and synchromesh gear box - Torque convertor – overdrive - Propeller shaft and rear axle-Universaljoint – Differential - Rear axle drives - Wheels and Tyres.

UNIT - IV   STEERING AND BRAKE   [09]

Steering system - function and principle - Ackerman and Davis steering principles - wheel alignment –steering gear boxes.Brakes - Mechanical - hydraulic and vacuum brake - master cylinder - wheel cylinder -Bleeding of brakes.

UNIT - V   ELECTRICAL SYSTEMS   [09]

Battery – types - Dynamo and Alternator – Cut-out relay - Diagram of Wiring system - Lighting System and Accessories - Headlight - switches - Windscreen Wipers – Horn – Speedometer – Heater and Air conditioning.

Total =45 Periods

Text Books:

1. Kirpal Singh, Automobile Engineering, Vol. I & II, Standard Publishers, New Delhi, Fourteenth Edition, 2018.

2. Gupta,S. K., A Textbook of Automobile Engineering, S. Chand Publishing, New Delhi, Second Edition, 2020.

Reference Books:

1. Rajput, R K, A Textbook of Automobile Engineering, Laxmi Publications (P) Ltd, New Delhi, Second Edition, 2017.

2. Ganesan. V, Internal Combustion Engines, Tata McGraw-Hill Publishing Co., New Delhi, Fourth Edition, 2012.

3. Mathur M.L. and Sharma R.P, A Course in Internal Combustion Engines, Dhanpat Rai and sons, New Delhi, Second Edition, 2016.

4. Ramalingam K.K, Automobile Engineering, Scitech Publications (India) Pvt. Ltd, Chennai, Second Edition, 2011.

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K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF AUTOMOBILE ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20AU901　　　　Course Name: Basics of Automobile Engineering

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Provide basic platform knowledge of automobile engineering	3	3	2	-	-	-	-	-	-	-	-	-	-	-
CO2	Explain the working principal of petrol and diesel engines	3	3	2	-	-	-	-	-	-	-	-	-	-	-
CO3	Interpret the method of power transmission unit	3	3	2	-	-	-	-	-	-	-	-	-	-	-
CO4	Built knowledge of steering and brake	3	3	2	-	-	-	-	-	-	-	-	-	-	-
CO5	Illustrate the knowledge of automotive electrical systems and functioning	3	3	2	-	-	-	-	-	-	-	-	-	-	-
	Average	3	3	2	-	-	-	-	-	-	-	-	-	-	-

1: Slight (Low)　　2: Moderate (Medium)　　3: Substantial (High)

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<u>**SEMESTER – V**</u>

20SF521   **OCCUPATIONAL HEALTH AND FIRST AID LABORATORY**

L	T	P	C
0	0	3	1

Prerequisite: NIL

Course Outcomes: On Completion of this course, the student will be able to   *Cognitive level*

CO1	Experiment the operation and the use of respirable dust sampler.	Apply
CO2	Find the Noise level and illumination level at different areas.	Remember
CO3	Experiment the CPR and first aid techniques.	Apply
CO4	Explain the different types burns and its types. bandages used for fractures.	Understand
CO5	Compare the respiratory protection	Understand

LIST OF EXPERIMENTS:

1. To study about the operation and the use of respirable dust samples in an area or region.
2. To find out the air samples in the individual areausing the respirable sampler.
3. To find out the Noise at different areas and to compare with the standards,
4. To study the illumination level at different regions.
5. To Study about the CPR technique (Cardio Pulmonary Resuscitation)
6. To Study and learn about the first aid kit.
7. To study about the first aid equipment's used in an ambulance.
8. To learn and practice about the usage of bandages for fractures.
9. To study about the Respiratory Protection and its types.
10. To study about the burn and its types.

Total: 30 Periods

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CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Experiment the operation and the use of respirable dust sampler.*	3	-	3	2	-	3	3	3	-	-	-	3	2	3
CO2	*Find the Noise level and illumination level at different areas.*	3	-	3	2	-	3	3	3	-	-	-	3	2	3
CO3	*Experiment the CPR and first aid techniques.*	3	-	3	2	-	3	3	3	-	-	-	3	2	3
CO4	*Explain the different types burns and its types. bandages used for fractures.*	3	-	3	2	-	3	3	3	-	-	-	3	2	3
CO5	*Compare the respiratory protection*	3	-	3	2	-	3	3	3	-	-	-	3	2	3
		3	-	3	2	-	3	3	3	-	-	-	3	2	3

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

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SEMESTER – V

20SF522   **FIRE SAFETY TRAINING**

L	T	P	C
0	0	3	1

Prerequisite: NIL

Course Outcomes: On Completion of this course, the student will be able to   *Cognitive level*

CO1	Explain the types of fire hydrant nozzle, boxes and hoses.	Understand
CO2	Experiment the different types of fire extinguishers.	Apply
CO3	Classify the fire hoses, couplings and branches.	Understand
CO4	Explain the hoses, couplings connection and its disconnection.	Understand
CO5	Demonstrate on fire fighting.	Understand

LIST OF EXPERIMENTS:

1.   Study and demonstration of different types of Hydrant Nozzles, Boxes and Hoses.

2.   Study and demonstration about Fire Hydrant System.

3.   Fire Fighting with CO_2 extinguisher.

4.   Fire fighting with water type extinguisher.

5.   Fire Fighting with DCP extinguisher.

6.   Fire fighting with foam extinguisher.

7.   Study about Refilling different types of extinguishers.

8.   Study and demonstration of fire hoses, couplings and branches.

9.   Hose drills (dry) – laying one hose, connection and disconnection couplings.

10. Table top exercise-scenario based fire fighting.

Total: 30 Periods

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CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Explain the types of fire hydrant nozzle, boxes and hoses.	3	2	3	-	-	2	-	3	-	-	-	3	3	3
CO2	Experiment the different types of fire extinguishers.	3	2	3	-	-	2	-	3	-	-	-	3	3	3
CO3	Classify the fire hoses, couplings and branches.	3	2	3	-	-	2	-	3	-	-	-	3	3	3
CO4	Explain the hoses, couplings connection and its disconnection.	3	2	3	-	-	2	-	3	-	-	-	3	3	3
CO5	Demonstrate on fire fighting.	3	2	3	-	-	2	-	3	-	-	-	3	3	3
		3	2	3	-	-	2	-	3	-	-	-	3	3	3

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SEMESTER - V

R 2020

		L	T	P	C
20HR593	CAREER DEVELOPMENT SKILLS - III	2	0	0	0

Prerequisite: No prerequisites are needed for enrolling into the course

Course Outcomes: On successful completion of the course, the student will be able to

		Cognitive Level
CO1	Understand the nearness of leading various texts.	Apply
CO2	Perform well in verbal and logical reasoning.	Apply
CO3	Understand and develop the etiquette necessary to present oneself in a professional setting.	Understand
CO4	Demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.	Create
CO5	Enhance the comprehension Skills in core subjects.	Apply

UNIT - I   **WRITTEN AND ORAL COMMUNICATION – PART 1**   **[06]**

Reading Comprehension Level 3 - Self Introduction - News Paper Review - Self Marketing - Debate- Structured and Unstructured GDs Psychometric Assessment – Types & Strategies to answer the questions Practices: Sentence Completion - Sentence Correction - Jumbled Sentences - Synonyms & Antonyms - Using the Same Word as Different Parts of Speech - Interpretation of Pictorial Representations – Editing.

UNIT - II   **VERBAL & LOGICAL REASONING – PART 2**   **[06]**

Syllogism - Assertion and Reasons - Statements and Assumptions - Identifying Valid Inferences - identifying Strong Arguments and Weak Arguments - Statements and Conclusions- Cause and Effect - Deriving Conclusions from Passages - Seating Arrangements Practices: Analogies - Blood Relations - Statement & Conclusions.

UNIT - III   **QUANTITATIVE APTITUDE – PART 3**   **[06]**

Probability - Calendar- Clocks - Logarithms - Permutations and Combinations.

UNIT - IV   **QUANTITATIVE APTITUDE – PART 4**   **[06]**

Algebra - Linear Equations - Quadratic Equations – Polynomials – Problem on Numbers – Ages – Train – Time and Work – Sudoku – Puzzles.
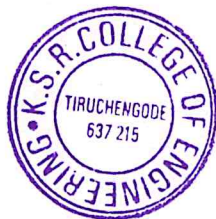
UNIT - V   **DOMAIN PROFICIENCY**   **[06]**

Fundamentals of electric circuits, Construction and operation of Electrical machines, Electrodynamic fields and field equation solution, Introduction to Non-conventional energy sources.

Total (L= 0, T = 30) = 30 Periods

Text Books :

1. Anne Laws, Writing Skills, Orient Black Swan., Hyderabad, 2011.

2. Abhijit Guha, Quantitative Aptitude, TMH, New Delhi, Third Edition,2009.

Reference Books :

1. M.B. Lal&Goswami, Objective Instant Arithmetic, Upkar Publications, New Delhi, Second edition,2012.

2. Agarwal. R.S , A. Modern Approach to Verbal and Non- verbal Reasoning, Revised Edition 2008, Reprint 2009, S.Chand& Co Ltd., New Delhi.

3. M Ashra Rizvi, Effective Technical Communication, Tata McGraw HILL, New Delhi, First Edition, 2005.

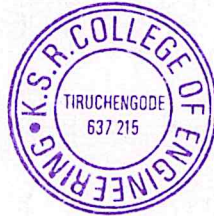4. Norman Lewis. W.R., Word Power Made Easy, Goyal Publications.

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CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Understand the nearness of leading various texts.	-	-	-	-	-	-	-	1	3	3	-	-	1	1
CO2	Perform well in verbal and logical reasoning.	-	-	-	-	-	-	-	1	3	3	-	2	1	1
CO3	Understand and develop the etiquette necessary to present oneself in a professional setting.	-	-	-	-	-	-	-	1	3	3	-	1	1	1
CO4	Demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.	-	-	-	-	-	-	-	1	3	3	-	2	1	1
CO5	Enhance the comprehension Skills in core subjects.	-	-	-	-	-	-	-	1	3	3	-	-	1	1
	Average	-	-	-	-	-	-	-	1	3	3	-	2	1	1

1: Slight (Low)　　2: Moderate (Medium)　　3: Substantial (High)

Chairman (BoS)

Dr.M.PRABU M.E., PhD.,
Head of the Department
Department of Safety and fire Engineer
K.S.R. College of Engineering (Autonomo.
Tiruchengode - 637215.

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