GRBT-20

COURSE STRUCTURE & SYLLABUS

DEPARTMENT OF MECHANICAL ENGINEERING

Godavari Institute of Engineering & Technology

Approved By AICTE NAAC'A^{+}' Grade Recognized by UCG,U/Sec.2(f)&12(B) Permanent Affiliation by JNTUK

GIET Campus, Chaitanya Knowledge city,NH-16,Rajahmundry,East Godavari, A.P.
Tel:+91-883-2484828-31 www.giet.ac.in

COURSE STRUCTURE

SYLLABUS

MECHANICAL ENGINEERING

FOR
B.Tech. FOUR YEAR COURSE
(APPLICABLE FOR BATCHES ADMITTED FROM 2020 - 2021)

GODAVARI INSTITUTE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

Approved By AICTE, NAAC - A+ Grade Recognized by UCG,U/Sec.2(f)&12(B) Permanent affiliation by JNTUK
GIET Campus, Chaitanya Knowledge city,NH-16,Rajahmundry,East Godavari, A.P.
Tel:+91-883-2484828 31 www.giet.ac.in

PROGRM OUTCOMES (Pos)

After the completion of the program, a successful student will be able to:

- Apply fundamental knowledge of Science, Mathematics and Engineering principles in solving problems related to Mechanical Engineering
- Apply Principles of design engineering, thermal engineering, production engineering and industrial engineering to arrive at a physically meaningful analysis of engineering problems.
- Present feasible designs for simple domestic and industrial Mechanical Engineering problems through drawings and other multimedia tools to meet desired needs.
- Identify, formulate and solve Mechanical engineering problems through rigorous research methodology.
- Use drafting, modelling and Analysis software and /or hardware tools for meaningful and economically viable Engineering practice.
- Apply knowledge of Thermal, Design, Automation Technologies and Management principles to inter-disciplinary engineering problems and their societal implications.
- Understand and propose, wherever possible, environment-friendly and sustainable solutions to Mechanical Engineering problems.
- Expertise in following ethical code of conduct in professional activities.
- Use their analytical, teamwork, leadership skills in the development of products and provide solutions to problems sought by local and/or global community.
- Communicate verbally, textually and graphically to collaborate effectively towards engineering activities.
- Inspire confidence in team members to realize the goals of the organization and manage finances and sizeable projects by choosing the right blend of common sense solutions.
- Develop confidence and a sense of curiosity towards life-long learning to adopt to ever changing technologies. Working professionals in Mechanical Engineering field or other disciples to develop products, processes to solve Mechanical Engineering related or other problems for betterment of society.

Department of Mechanical Engineering

Program Educational Objectives (PEOs)

Within a few years after the graduation, the graduates will be:

- Working professional in Mechanical Engineering field or other disciplines to develop products, processes to solve Mechanical Engineering related or other problems for betterment of society.
- Pursuing further education to enrich their knowledge in Mechanical Engineering or other fields.
- Undertaking entrepreneurial ventures in Mechanical Engineering or other disciplines.

VISION

To be recognized as a Global Centre of Excellence in Mechanical Engineering Education, Research and Consultancy

MISSION

Department of Mechanical Engineering strives to provide scope for all round development of the students and staff by engaging them in various activities such as

- Participative learning so that students internalize their classroom learning practices.
- Student centric learning practices such as summary sessions, learn-ahead-of class, problem solving.
- Extensive practical courses to foster learning by observation.
- Exposing students, faculty and staff to various industrial practices and usage of modern tools to reinforce their classroom/laboratory learning.
- Sensitization towards importance of ethical practice, societal responsibility, leadership skills, entrepreneurship skills, communication skills and lifelong learning.

PROGRAM SPECIFIC OUTCOMES (PSOs):

ME program specific outcomes are broken into four elements. The ME curriculum prepares graduates to:

PSO1: Join a technically sophisticated workforce as successful professionals in a wide range of mechanical engineering and related fields.

PSO2: Continuously improve and expand their technical and professional skills through formal means as well as through informal self-study.

PSO3: Pursue advanced degrees in engineering, business, or other professional fields.

PSO4: Advance themselves professionally and personally by accepting professional and social responsibilities and pursuing leadership roles.

Program Outcomes (POs):

After the completion of the program, a successful student will be able to:

PO1: Apply fundamental knowledge of Science, Mathematics and Engineering principles in solving problems related to Mechanical Engineering.

PO2: Apply principles of design engineering, thermal engineering, production engineering and industrial engineering to arrive at a physically meaningful analysis of engineering problems.

PO3: Present feasible designs for simple domestic and industrial Mechanical Engineering problems through drawings and other multimedia tools to meet desired needs.

PO4: Identify, formulate and solve Mechanical engineering problems through rigorous research methodology.

PO5: Use Drafting, Modeling and Analysis Software and/or hardware tools for meaningful and economically viable Engineering practice.

PO6: Apply knowledge of Thermal, Design, Automation Technologies and Management principles to inter-disciplinary engineering problems and their societal implications.

PO7: Understand and propose, where ever possible, environment-friendly and sustainable solutions to Mechanical Engineering problems.

PO8: Expertise in following ethical code of conduct in professional activities.

PO9: Use their analytical, teamwork, leadership skills in the development of products and provide solutions to problems sought by local and/or global community.

PO10: Communicate verbally, textually and graphically to collaborate effectively towards engineering activities.

PO11: Inspire confidence in team members to realize the goals of the organization and manage finances an sizeable projects by choosing the right blend of common sense solutions.

PO12: Develop confidence and a sense of curiosity towards life-long learning to adapt to ever changing technologies.

GRBT- 20 COURSE STRUCTURE
Mechanical Engineering
I B. Tech. I Semester

S. No	Category	Course Code	Subject Title	Hours per Week			Credits	Internal	External	Total
				L	T	P				
1	BSC	201HB101	Mathematics-I	3	0	0	3	30	70	100
2	HSMC	201HB102	Communicative English-I	3	0	0	3	30	70	100
3	BSC	201HB103b	Engineering Chemistry	3	0	0	3	30	70	100
4	ESC	201EE104	Basic Electrical and Electronics Engineering	3	0	0	3	30	70	100
5	ESC	201ME105	Engineering Graphics	1	0	4	3	30	70	100
6	BSC	201HB111b	Engineering Chemistry Laboratory	0	0	3	1.5	50	50	100
7	ESC	201EE112	Basic Electrical and Electronics Engineering Laboratory	0	0	3	1.5	50	50	100
8	ESC	201ME113d	Basic Engineering Workshop	0	0	3	1.5	50	50	100
			Total	**13**	**0**	**13**	**19.5**	**300**	**500**	**800**
	BSC =7.5	**ESC=9**	**HSMC=3**							

GRBT- 20 COURSE STRUCTURE
Mechanical Engineering
I B.Tech. II Semester

S. No	Category	Course Code	Subject Title	Periods per Week			Credits	Internal	External	Total
				L	T	P				
1	BSC	201HB201	Mathematics-II	3	0	0	3	30	70	100
2	BSC	201HB202b	Engineering Physics	3	0	0	3	30	70	100
3	ESC	201ME203a	Engineering Mechanics	3	0	0	3	30	70	100
4	ESC	201CS204a	Fundamentals of Computer Programming	3	0	0	3	30	70	100
5	ESC	201ME205	Material Science and Metallurgy	3	0	0	3	50	50	100
6	BSC	201HB211b	Engineering Physics Laboratory	0	0	3	1.5	50	50	100
7	HSMC	201HB212	Communicative English Laboratory	0	0	3	1.5	50	50	100
8	ESC	201CS213a	Fundamentals of Computer Programming Laboratory	0	0	3	1.5	50	50	100
9	MC	201HB296	Environmental Studies	2	0	0	0	100*	_	_
			Total	**17**	**0**	**9**	**19.5**	**320**	**480**	**800**
	BSC=7.5	**ESC=10.5**	**HSMC=1.5**							

GRBT- 20 COURSE STRUCTURE
Mechanical Engineering
II B.Tech. III Semester

S. No	Category	Course Code	Subject Title	Hours per Week			Credits	Internal	External	Total
				L	T	P				
1	BSC	201HB301	Mathematics-III	3	0	0	3	30	70	100
2	PCC	201ME302	Mechanics of Solids	3	0	0	3	30	70	100
3	PCC	201ME303	Production Technology	3	0	0	3	30	70	100
4	PCC	201ME304	Thermodynamics	3	0	0	3	30	70	100
5	PCC	201ME305	Fluid Mechanics & Hydraulic Machinery	3	0	0	3	30	70	100
6	PCC (LAB)	201ME311	Fluid Mechanics & Hydraulic Machinery Lab	0	0	3	1.5	50	50	100
7	PCC (LAB)	201ME312	Mechanics of Solids & Metallurgy lab	0	0	3	1.5	50	50	100
8	PCC (LAB)	201ME313	Computer Aided Design and Modelling Lab	0	0	3	1.5	50	50	100
9	SOC	201CS381	Programming with Python	0	1	2	2	----	50	50
10	MC	201CE391	Constitution of India	2	0	0	0	30	70*	100
			Total	**17**	**1**	**11**	**21.5**	**330**	**620**	**950**
	BSC =3	**PCC=16.5**	**SOC=2**							

GRBT- 20 COURSE STRUCTURE
Mechanical Engineering
II B. Tech. IV Semester

S. No	Category	Course Code	Subject Title	Periods per Week			Credits	Internal	External	Total
				L	T	P				
1	BSC	201HB401	Probability and Statistics	3	0	0	3	30	70	100
2	PCC	201ME402	Kinematics of Machinery	3	0	0	3	30	70	100
3	PCC	201ME403	Thermal Engineering	3	0	0	3	30	70	100
4	HSS	201ME404	Industrial Engineering and Management	3	0	0	3	30	70	100
5	PCC (LAB)	201ME411	Numerical Modelling for Mechanical Engineers	2	0	2	3	50	50	100
6	PCC (LAB)	201ME412	Production Technology Lab	0	0	3	1.5	50	50	100
7	PCC (LAB)	201ME413	Thermal Engineering Lab.	0	0	3	1.5	50	50	100
8	PCC (LAB)	201ME414	Computer Aided Machine Drawing	0	0	3	1.5	50	50	100
9	SOC	201HB481	English for Career	0	1	2	2	----	50	50
				14	**1**	**13**	**21.5**	**320**	**530**	**850**
Honors/Minor courses(Thehoursdistributioncanbe3-0-2or3-1-0also)				**4**	**0**	**0**	**4**			

BSC=3	**PCC=10.5**	**ESC=3**	**SOC=2**	**HSS=3**

At the end of II Year II semester, student must complete Summer Internship

GODAVARI INSTITUTE OF ENGINEERING & TECHNOLOGY

((AUTONOMOUS)

Approved by AICTE, Accredited by NBA & NAAC 'A+' Grade, Recognized under 2(f) and 12(b) of UGC, Permanently Affiliated to JNTUK, Kakinada

DEPARTMENT OF MECHANICAL ENGINEERING

4 Years B.Tech. (Mechanical Engineering) Course Structure: (2020-21)

GRBT- 20 COURSE STRUCTURE

Mechanical Engineering

III B. Tech. V Semester

S. No	Category	Course Code	Subject Title	Periods per Week			Credits	Internal	External	Total
				L	T	P				
1	PCC	201ME501	Dynamics of Machinery	3	0	0	3	30	70	100
2	PCC	201ME502	Heat Transfer	3	0	0	3	30	70	100
3	PCC	201ME503	Metal Cutting and Machine Tools	3	0	0	3	30	70	100
4	PEC		Professional Elective -1	3	0	0	3	30	70	100
		201ME564A	A. Fuels Combustion and Emission control							
		201ME564B	B. Tribology							
		201ME564C	C. Industrial Robotics							
		201ME564D	D. Advanced Materials							
5	OEC	Open Elective-1		3	0	0	3	30	70	100
		201CE565a	a. Environmental Pollution & Control							
		201EE565a	b. Fundamentals of Utilization of Electrical Energy							
		201EC565a	c. Microprocessors and Microcontrollers							
		201CS565a	d. Foundations of Operating Systems							
		201AM565a	e. Basic Automobile Engineering							
		201MM565a	f. Elements of Mining Technology							
		201PT565a	g. Fundamentals of Petroleum Engineering							
		201MB565a	h. Principles of Management							
6	MC	201MB591	IPR and Patents	2	0	0	0	30	70*	100
7	PCC (LAB)	201ME511	Theory of Machines Lab	0	0	3	1.5	50	50	100
8	PCC (LAB)	201ME512	Machine Tools Lab	0	0	3	1.5	50	50	100
9	SOC (LAB)	201ME581	Modelling and Simulation of Mechanical Systems	0	1	2	2	--	50	50
10	**201ME531-Summer Internship/ 201ME521-Mini Project-1**			0	0	0	1.5	100	--	100
			Total	**16**	**1**	**10**	**21.5**	**380**	**500**	**850**
	Honors/Minor courses(the hours distribution can be 3-0-2 or 3-1-0 also			**4**	**0**	**0**	**4**			

SOC = 2	**OEC = 3**	**PCC = 12**	**Summer Internship=1.5**	**PEC =3**		

GRBT- 20 Course Structure
Mechanical Engineering

III B. Tech. VI Semester

S. NO	Category	Course Code	Subject Title	Periods per Week			Credits	Internal	External	Total
				L	T	P				
1	PCC	201ME601	Design of Machine Members	3	0	0	3	30	70	100
2	PCC	201ME602	Engineering Metrology and Instrumentation	3	0	0	3	30	70	100
3	PCC	201ME603	CAD/CAM	3	0	0	3	30	70	100
4	PEC	Professional Elective -2		3	0	0	3	30	70	100
		201ME664A	A. Refrigeration and Air Conditioning							
		201ME664B	B. Mechatronics							
		201ME664C	C. Advanced Foundry and Welding Technology							
		201ME664D	D. Non Destructive Evaluation							
5	OEC	Open Elective – 2		3	0	0	3	30	70	100
		201CE665a	a. Solid Waste Management							
		201EE665a	a. Concepts of Power System Engineering							
		201EC665a	a. IoT and its Applications							
		201CS665a	a. Fundamentals of Databases							
		201AM665a	a. Hybrid and Electric Vehicles							
		201MM665a	a. Open Pit Slope Analysis and Design							
		201PT665a	a. Basic Concepts in							

			Petroleum Drilling Engineering							
		201MB665a	Operations Management							
	MC	201HB691	Quantitative Aptitude and Reasoning	2	0	0	0	30	70*	100
6	PCC (LAB)	201ME611	Heat Transfer Lab	0	0	3	1.5	50	50	100
7	PCC (LAB)	201ME612	Metrology and Instrumentation Lab	0	0	3	1.5	50	50	100
8	PCC (LAB)	201ME613	Computer Aided Manufacturing Lab	0	0	3	1.5	50	50	100
Continued……										
9	SOC (LAB)	201ME681	Finite Element Analysis	0	1	2	2	---	50	50
			Total	**16**	**1**	**13**	**21.5**	**300**	**550**	**850**
			Honors/Minor courses	**4**	**0**	**0**	**4**			
Industrial /Research Internship/Mini Project-2 months (Mandatory) during summer vacation										
	PEC = 3	**OEC = 3**	**PCC = 13.5**		**SOC =2**					

GRBT- 20 Course Structure
Mechanical Engineering

IV B. Tech. VII Semester

S. NO	Category	Course Code	Subject Title	Periods per Week			Credits	Internal	External	Total
				L	T	P				
1	PEC	Professional Elective -3		3	0	0	3	30	70	100
		201ME761A	A. Design of Transmission Elements							
		201ME761B	B. Mechanical Vibrations							
		201ME761C	C. Automobile Engineering							
		201ME761D	D. Advanced Manufacturing Processes							
2	PEC	Professional Elective - 4		3	0	0	3	30	70	100
		201ME762A	A. Operations Research							
		201ME762B	B. Micro Electro Mechanical Systems							
		201ME762C	C. Design for Manufacturing							
		201ME762D	D. Automation in Manufacturing							
3	PEC	Professional Elective-5		3	0	0	3	30	70	100
		201ME763A	A. Power Plant Engineering							
		201ME763B	B. Nano Technology							
		201ME763C	C. Additive Manufacturing							
		201ME763D	D. Production Planning and Control							
4	OEC	Open Elective-3		3	0	0	3	30	70	100
		201CE764a	a. Building Technology							
		201EE764a	a. Fundamentals of smart grid technologies							
		201EC764a	a. Introduction to Embedded Systems							
		201CS764a	a. Information Security							
		201AM764a	a. Modern Vehicle Technology							
		201MM764a	a. Mining and its Importance							
		201PT764a	a. Basic Concepts in Reservoir Engineering							
		201MB764a	a. Entrepreneurship for Engineers							
5	OEC	Open Elective-4		3	0	0	3	30	70	100
		201CE765a	a. Safety Engineering							
		201EE765a	a. Basics of Electrical Measurements and Instrumentation							
		201EC765a	a. Fundamentals of Digital Image Processing							
		201CS765a	a. Human computer Interaction							

		201AM765a	a. Alternative Energy Resources for Auto-motives							
		201MM765a	a. Remote Sensing & GIS in Mining							
		201PT765a	a. Introduction to Petroleum Production Engineering							
		201MB765a	a. Digital Marketing							
6	HSSC	201HB781	UHV 2 –Understanding Harmony	3	0	0	3	30	70	100
7	SOC	201ME781	Computational Fluid Dynamics Lab	0	1	2	2	---	50	50
8	**201ME731-Industrial /Research Internship/ 201ME721-Mini Project-2**			0	0	0	3	100	---	100
			Total	**1**	**1**	**6**	**23**	**280**	**470**	**750**
			Honors/Minor courses	**4**	**-**	**0**	**4**			
	PEC = 9	**SOC=2**	**PROJ=3**	**OEC = 6**			**HSMC=3**			

GRBT- 20 Course Structure
Mechanical Engineering
IV B. Tech VIII Semester

S. NO	Category	Code	Course Title	Hours per Week			Credits	Internal	External	Total
				L	T	P				
1	Major Project	201ME841	Project work	0	0	0	12	40	160	200
						Total	**12**			

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	I B.Tech. (1 Semester)			
Course Code XXXXXXX	MATHEMATICS - I (ALL BRANCHES)				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisite(s): Types of matrices, Differentiation and Integration.		3	0	0	3

Course Objective:

- This course will illuminate the students in the concepts of calculus and linear algebra.
- To equip the students understand advanced level mathematics to develop the confidence and ability to handle real world problems and their applications.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Transform the knowledge of solving system of linear equations using matrices.
CO2:	Evaluate nature of the Quadratic form.
CO3:	Acquire the knowledge maxima and minima of function of several variables
CO4:	Evaluate multiple integrals and their applications
CO5:	Understand and apply vector derivatives and vector integration theorems.

Syllabus:

Unit I: Matrix Operations and Solving Systems of Linear Equations **10 hrs**
Rank of a matrix by echelon form, solving system of linear homogeneous and non-homogeneous equations – Gauss elimination method, Eigen values and Eigen vectors and their properties, Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem.

Unit II: Quadratic forms **8 hrs**
Quadratic forms and nature of the Quadratic forms, reduction of Quadratic form to canonical form by diagonalisation and orthogonal transformation.

Unit III: Partial differentiation and Applications **10 hrs**
Partial derivatives, total derivatives, chain rule, Homogeneous functions and Euler's theorem, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.

Unit IV: Multiple Integrals and Applications **10 hrs**
Evaluation of double integrals (Cartesian and polar coordinates) and triple integrals, change of variables, change of order of integration, Finding areas and volumes.

UNIT V: Vector Calculus **10 hrs**
Scalar and vector point functions, Curl, Gradient and Divergence, directional derivative, Irrotational and Solenoidal vector fields. Line integral, Work done, Area, Surface and volume integrals. Greens, Stokes and Gauss Divergence theorems (without proof).

MATHEMATICS-I

Text books:

1. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.

Reference Books:

1. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
2. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
3. T.K.V.Iyenger, et.al., Engineering Mathematics, Volume-III, .Chand Publicatiobns, 2018.
4. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 2015.

Web Links:

1. https://nptel.ac.in/courses/111105121/
2. https://nptel.ac.in/courses/111105035/

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	-	-	-	-	-	-	-	1
CO2	3	2	2	2	-	-	-	-	-	-	-	1
CO3	3	2	2	2	-	-	-	-	-	-	-	1
CO4	3	2	2	2	-	-	-	-	-	-	-	1
CO5	3	2	2	2	-	-	-	-	-	-	-	1

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	I B.Tech I SEM			
Course Code	ENGINEERING CHEMISTRY (Common to All Branches)				
Teaching	Total contact hours–48h	L	T	P	C
Prerequisite(s): Knowledge of theoretical and experimental concepts from Intermediate level, Application of Chemistry theory and calculations required for the course.		3	0	0	3

Course Objective:

To acquaint the students with soft and hard water types and softening methods, to introduce the basic concepts of electrochemical cells and photovoltaic cells and to familiarize the students with engineering materials, their properties and applications.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	Understand the removal techniques of hardness of water
CO2	Distinguish the fuel cells and batteries
CO3	Identify different control techniques of corrosion
CO4	Understand the concepts of plastics and rubbers
CO5	Analyze the importance of nano materials

Syllabus

UNIT –I

WATER TECHNOLOGY

Hardness of water, Determination of hardness by EDTA Method - Boiler troubles - scale and sludge-priming and foaming (reasons and its preventions), specifications for drinking water by World Health Organization (WHO) standards, municipal water treatment or portable water treatment, softening of water - Lime soda process, zeolite and ion-exchange processes, Desalination of brackish water, reverse osmosis (RO) and electro dialysis.

UNIT – II

ENERGY SOURCES AND APPLICATIONS

Electrochemical cells- Galvanic cells, Electrode potential, determination of single electrode potential –Nernst's equation, reference electrodes, hydrogen and calomel electrodes – electrochemical series and its applications – primary cell, dry or Leclanche cell – secondary cell, lead acid storage cell, nickel-cadmium cell – lithium ion batteries (Lithium-MnO_2) – fuel cell, hydrogen-oxygen fuel cell, Solar cell and its applications.

UNIT – III

CORROSION ENGINEERING

Corrosion: Definition – theories of corrosion, chemical and electro chemical corrosion – pitting corrosion, differential aeration corrosion, passivity, factors affecting corrosion – nature of the metal and nature of the environment.

Corrosion Controlling Methods: Sacrificial and Impressed current cathodic protection, Metallic coatings (anodic, cathodic), applying of metallic coatings - galvanizing and tinning, metal cladding, electroplating, organic surface coatings, paints (constituents and their functions).

UNIT – IV

POLYMERS

Introduction to polymers and monomers,polymerization and its types,mechanism of addition polymerization, compounding and fabrication of plastics, differences between thermoplastic and thermo setting resins, Preparation, properties and uses of Urea-Formaldehye, PVC andpolyethylene, Natural Rubber-vulcanization of rubber, Preparation, properties and uses of BUNA-S and BUNA-N Rubber, conducting polymers and its applications.

UNIT – V

NANO MATERIALS

Introduction to Nano materials, Nano structured materials-nano rods,nano sheets, Quantum dots,Methods of preparationsby bottom up and top-down approaches -ball milling,sol-gel methods, Characterization of nanoparticles by XRD, SEM andTEM (includes basic principle of TEM), Applications of nanomaterials.

Text Books:

1. P.C. Jain and M. Jain, Engineering Chemistry, 15/e, Dhanapat Rai & Sons, (2014).
2. B.K. Sharma, Engineering Chemistry, Krishna Prakasham, (2014).

References:

1. Sashi Chawla, A Textbook of Engineering Chemistry, Dhanapath Rai and sons, (2003)
2. B.S Murthy and P. Shankar, A Text Book of NanoScience and NanoTechnology, University Press (2013).
3. S.S. Dara, A Textbook of Engineering Chemistry, S.Chand& Co, (2010)
4. V. Raghavan, A Material Science and Engineering, Prentice-Hall India Ltd, (2004).
5. N. Krishna Murthy and Anuradha, A text book of Engineering Chemistry, Murthy Publications (2014).

Weblink:

1. www.btechguru.com/courses--nptel--chemistry-and-biochemistry-video-lecture--cbc.html
2. www.chem.tufts.edu

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	-	1	1	-	-	2	-	-	2
CO2	3	2	3	2	3	3	-	-	3	-	-	3
CO3	3	2	2	2	2	2	-	-	2	-	2	2
CO4	3	2	3	2	2	3	-	-	2	-	-	3
CO5	3	2	3	2	3	3	-	-	3	-	-	3

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	I B.Tech. I Semester			
Course Code	COMMUNICATIVE ENGLISH-1 (Common to all Branches)				
Teaching	Total Contacthours-48	L	T	P	C
Prerequisite(s): Learner should be equipped with basic language and communication skills like Reading, Writing, Listening and Speaking		3	0	0	3

Course Objectives: This course aims to

- Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials.
- Impart effective strategies for good writing, to summarize information and practice writing essays.
- Improve communication in both professional and social life
- Demonstrate Language efficiency in career building
- Provide the knowledge of grammatical structures, vocabulary and encourage their appropriate use in speech and writing.

Course Outcomes:

On Completion of the course, the students will be able to	
CO1:	Develop effective reading strategies
CO2:	Demonstrate writing skills that are required for professional development and use graphic elements for communication
CO3:	Apply grammatical skills and vocabulary effectively in speech and writing
CO4:	Display language efficacy in tune with subjective knowledge
CO 5:	Use required language along with contextual vocabulary and grammar structures

UNIT-I

READING: Detailed Study: Exploration- "A Proposal to Girdle the Earth (Excerpt)" by Nellie Bly, from English All Round: Communication Skills for Under Graduate Learners-1 by Orient Black Swan. **Non-Detailed Study**: "Deliverance" by Prem chand from **Individual Society,** Pearson Publications **GRAMMAR:** Verbs, nouns, adjectives and adverbs; nouns: countable and uncountable; singular and plural forms. Simple question forms – Wh-questions; Word order in sentences. **VOCABULARY: Technical Vocabulary (GRE Model)-20 words.** Content words and function words; Word forms **WRITING SKILLS:** Paragraph Writing-Beginnings and endings of paragraphs - introducing a topic- structure and types of paragraph.

UNIT-II

READING: Detailed Study: On Campus - An excerpt from "The District School as It Was by One Who Went to It" by Warren Burton from English All Round: Communication Skills for Under Graduate Learners-1 by Orient Black Swan **Non-Detailed Study:** "Bosom Friend" by Hira Bansode from **Individual Society,** Pearson Publications **GRAMMAR:** Use of articles and zero article; prepositions. **VOCABULARY: Technical Vocabulary (GRE Model)-20 words.** Linkers, sign posts and transition signals. **WRITINGSKILLS:** Punctuation. Summarizing an oral or written text.

UNIT-III

READING: Detailed Study: Working Together - The Future of Work? (Adopted from web resources)From English All Round: Communication Skills for Under Graduate Learners-1 by Orient Black Swan. **Non-Detailed Study**"Shakespeare's Sister" by Virginia Woolf from **Individual Society,** Pearson Publications **GRAMMAR:** Tense and aspect; direct and indirect speech, reporting verbs for academic purposes.**VOCABULARY: Technical Vocabulary (GRE Model)-20 words.** Prefixes and Suffixes. **WRITING SKILLS:** Rephrasing what is read; avoiding redundancies and repetitions.

UNIT–IV

READING: Detailed Study: Fabric of Change- H. G. Wells and the Uncertainties of Progress by Peter J. Bowler from English All Round: Communication Skills for Under Graduate Learners-1by Orient Black Swan. **Non-Detailed:**"Telephone Conversation" by Wole Soyinka from **Individual Society,** Pearson Publications **GRAMMAR:** Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison. **VOCABULARY: Technical Vocabulary (GRE Model)-20 words.** Use of antonyms and homophones. Cloze encounters **WRITINGSKILLS:** Information transfer; describe, compare, contrast, and identifying significance/trends based on information provided in figures/charts/graphs/tables – Sensible writing. Defining and classifying.

UNIT – V

READING: Detailed Study: Tools for Life -Leaves from the Mental Portfolio of a Eurasian by Sui Sin Far from English All Round: Communication Skills for Under Graduate Learners-1 by Orient Black Swan. **Non-Detailed:** "Still I Rise" by Maya Angelou from **Individual Society,** Pearson Publications. **GRAMMAR:** Reading comprehension- framing right answers and editing the given text. **VOCABULARY: Technical Vocabulary (GRE Model)-20 words.** Idioms and Phrases. **WRITING SKILLS:** Writing structured essays on specific topics using suitable claims and evidences.

Text Books:

1. **Detailed Study:** ENGLISH ALL ROUND: Communication Skills for Under Graduate Learners- Published by Orient Black swan Pvt Ltd
2. **Non-detailed Study: Individual Society,** Pearson Publications

Reference books:

1. **Pathways: Listening, Speaking and Critical Thinking-1** byRebecca Tarver Chase, Becky Tarver and Henley, ELT; 2nd Edition, 2018.
2. **InfoTech English** by Maruthi Publications.

WEB REFERENCES:

1. https://www.englishclub.com/
2. http://www.world-english.org/
3. http://learnenglish.britishcouncil.org/

CO-PO Mapping:
(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	2	3	2	-	-	-	-
CO2	-	-	-	-	-	3	3	3	-	-	-	1
CO3	-	-	-	-	-	2	3	3	-	-	-	-
CO4	-	-	-	-	-	3	2	3	-	-	-	3
CO5	-	-	-	-	-	3	3	2	-	-	-	--

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	I B.Tech. I Sem (1st Semester)			
Course Code	**Engineering Graphics (Common to CE, ME, CSE(AI&ML),CSE(Cyber Security), Automobile, Mining and Petroleum Engineering)**				
Teaching	Total contact hours- 60	L	T	P	C
Prerequisite(s): Aptitude to Learn and Basic Geometry		1	0	4	3

Course Objectives:

- To highlight the significance of universal language of engineers.
- To impart basic knowledge and skills required to prepare engineering drawings.
- To impart knowledge and skills required to draw projections of solids in different contexts.
- To visualize and represent the pictorial views with proper dimensioning and scaling. Course

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Apply principles of drawing to represent dimensions of an object.
CO2:	Outline the polygons and engineering curves.
CO3:	Illustrate projections of points, lines, planes and solids.
CO4:	Illustrate the 3D views through isometric views.
CO5:	Create the isometric views and orthographic views

Syllabus:

UNIT-I

POLYGONS: Constructing regular polygons by general methods, inscribing and describing polygons on circles.

CURVES: Parabola, Ellipse and Hyperbola by general methods, cycloids, involutes.

UNIT-II

ORTHOGRAPHIC PROJECTIONS: Horizontal plane, vertical plane, profile plane, importance of reference lines, projections of points in various quadrants, projections of lines, lines parallel either to one of the reference planes (HP,VP or PP)

PROJECTIONS OF STRAIGHT LINES: Inclined to both the planes, determination of true lengths, angle of inclination and traces- HT, VT.

UNIT-III

PROJECTIONS OF PLANES: Regular planes perpendicular/parallel to one plane and inclined to the other reference plane; inclined to both the reference planes.

UNIT-IV

PROJECTIONS OF SOLIDS: Prisms, Pyramids, Cones and Cylinders with the axis inclined to one of the planes.

UNIT-V

ISOMETRIC VIEWS: Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

COMPUTER AIDED DESIGN: Drawing practice using Auto CAD, Creating 2D & 3D drawings of objects using Auto CAD

Note: In the End Examination there will be no question from CAD.

Text Books:

1. Engineering Drawing by N.D. Butt, Chariot Publications.
2. Engineering Drawing by Agarwal&Agarwal, Tata McGraw Hill Publishers.

Reference Books:

1. Engineering Drawing by K.L.Narayana& P. Kannaiah, Scitech Publishers.
2. Engineering Graphics for Degree by K.C. John, PHI Publishers.
3. Engineering Graphics by PI Varghese, McGrawHill Publishers.
4. Engineering Drawing + AutoCad – K.Venugopal, V. Prabhu Raja, New Age.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	I B.Tech			
Course Code	**BASIC ELECTRICAL AND ELECTRONICS ENGINEERING (Common for Mech, CE, AME, PET, MM, ECE, EEE)**				
Teaching	Total contact hours-45	L	T	P	C
Prerequisite(s): Basics of Physics		3	0	0	3

Course Objectives:

1. To learn the basic principles of electrical law's and analysis of networks.
2. To understand the principle of operation and construction details of DC machines.
3. To learn the principle of operation and constructional details of transformers, alternator and induction motors.
4. To study the operation of PN junction diode, half wave, full Wave rectifiers and OP-AMPS
5. To study operation of PNP and NPN transistors and various amplifiers.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Analyze the various electrical networks
CO2:	Understand the operation of DC machines,3-point starter and conduct the Swinburne's Test.
CO3:	Analyze the performance of transformer, operation of 3-phase alternator and 3-phase induction motors.
CO4:	Analyze the operation of half Wave, full wave rectifiers, op-amps.
CO5:	Explain the single stage CE amplifier and concept of feedback amplifier.

Syllabus:

UNIT –I

Introduction to Electrical Circuits: Basic definitions, Electrical circuit elements (R, L and C), Ohm's Law, Series & Parallel circuits, Kirchhoff's Laws, Simple problems.

UNIT- II

DC Generator: Generator-Principle of Operation, Construction, EMF equation, Classification, O.C.C, internal and external characteristics of shunt generator, Applications.

UNIT- III

DC Motor : Motor-principle of operation, Torque equation, Classification Speed Control Methods, Operation of 3 point starter, Applications.

UNIT –IV

Rectifiers & Linear Integrated Circuits: PN junction diodes, diode applications - Half wave and bridge rectifiers. Characteristics of operation amplifiers (OP-AMP) - application of OP-AMPS (inverting, non-inverting, integrator and differentiator).

UNIT –V

Transistors: PNP and NPN junction transistor, transistor as an amplifier, single stage CE amplifier, frequency response of CE amplifier, concepts of feedback amplifier.

Text books:

1. Principles of Electrical and Electronics Engineering by V.K.Mehta, S.Chand& Co.
2. Introduction to Electrical Engineering – M.S Naidu and S. Kamakshaiah, TMH Publ.
3. Electronic Devices and Circuits, R.L. Boylestad and Louis Nashelsky, 9th edition, PEI/PHI 2006.
4. Electrical Technology by Surinder Pal Bali, Pearson Publications.
5. Electrical Circuit Theory and Technology by John Bird, Routledge Taylor &Francis Group.

Reference Books:

1. Basic Electrical Engineering by M.S.Naidu and S.Ka1nakshiah, TMH Publications.
2. Fundamentals of Electrical Engineering by Rajendra Prasad, PHI Publications, 2th edition.
3. Basic Electrical Engineering by Nagsarlcar, Sukhija, Oxford Publications,2nd edition.
4. Industrial Electronics by GK. Mittal, PHI.

Web Links:

1. www.electrical4u.com
2. www.nptel.com

CO-PO Mapping:

1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2	1	3	-	-	2	-	1	-	1
CO2	2	3	-	-	3	-	-	2	3	-	-	1
CO3	2	3	-	-	3	-	-	2	3	-	-	1
CO4	2	1	2	-	3	-	-	2	2	-	-	1
CO5	2	1	-	-	3	-	-	2	-	1	-	1

Regulation GRBT-20	Godavari Institute of Engineering and Technology (Autonomous)	I B.Tech I SEM			
CourseCode	ENGINEERING CHEMISTRY LABORATORY (Common to All Branches)				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s): Basic knowledge of Engineering Chemistry Applications		0	0	3	1.5

COURSE OBJECTIVES

To familiarize the students with the basic concepts of Engineering Chemistry Lab, training the students on how to handle the instruments and to demonstrate the digital and instrumental methods of analysis.

COURSE OUTCOMES

On Completion of the course, the students will be able to-	
CO1:	Explain the functioning of the instruments such as pH, Conductivity and Potentiometric meters
CO2:	Determine the total hardness of water
CO3:	Perform various Redox titrations
CO4:	Preparation of polymers
CO5:	Compare viscosities of different oils

LIST OF EXPERIMENTS

1. Determination of strength of an acid by pH metric method
2. Determination of Fe (II) in Mohr's salt by potentiometric method
3. Determination of conductance by conductometric method
4. Determination of Hardness of a ground water sample
5. Determination of chromium (VI) in potassium dichromate
6. Determination of strength of $KMnO_4$ using standard Oxalic acid solution
7. Determination of Zinc by EDTA method
8. Preparation of Urea-Formaldehyde resin
9. Estimation of active chlorine content in Bleaching powder
10. Estimation of sodium hydroxide with HCl

Demonstration Experiments

1. Determination of viscosity of a liquid
2. Determination of surface tension of a liquid
3. Estimation of vitamin-C

TEXT BOOKS

1. Mendham J, Denney RC, Barnes JD, Thosmas M and Sivasankar B Vogel's Quantitative Chemical Analysis 6/e, Pearson publishers (2000).
2. N.K Bhasin and Sudha Rani Laboratory Manual on Engineering Chemistry 3/e, Dhanpat Rai Publishing Company (2007).

CO-PO Mapping:
1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No Correlation

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	1	2	2	-	-	1	-	-	1
CO2	3	2	2	1	1	2	-	-	2	-	-	1
CO3	2	2	2	1	1	2	-	-	-	-	-	1
CO4	3	2	2	1	1	2	-	-	2	1	-	1
CO5	2	2	2	1	1	2	-	-	-	-	-	1

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	I B.Tech			
Course Code	**BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY (Common for Mech, CE, AME, PET, MM, ECE, EEE)**				
Teaching	Total contact hours - 30	L	T	P	C
Prerequisite(s): Basics of Physics		0	0	3	1.5

Course Objectives:

1. To verify the Kirchhoff's laws & Ohm's law
2. To calculate the efficiencies of transformers, DC motors, Three-phase Induction Motor
3. To plot the characteristics of PN junction diode & operational amplifier
4. To plot the characteristics of Transistor.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Analyze the various electrical networks
C02:	Understand the operation or DC machines,3 -point starter and conduct the Swinburne's Test.
C03:	Analyze the performance of transformer, operation of 3-phase alternator and 3-phase induction motors.
C04:	Analyze the operation of half Wave, full wave rectifiers, op-amps.
C05:	Explain the single stage CE amplifier and concept of feedback amplifier.

List of Experiments:

1. Verification of Kirchhoff's laws
2. Verification of Ohm's laws
3. Study of various wiring components (wires, switches, fuses, sockets, plugs, Lamp holders, lamps etc. their uses and ratings)
4. Measurement of current, voltage, power in R-L-C series circuit excited by single phase supply
5. Verification of voltage & current relations in Star & delta connections
6. Swinburne's test on a DC shunt machine.
7. Transistor common base characteristics
8. Speed control of D.C. Shunt motor by Armature Voltage control and Field flux control method
9. Efficiency and regulation of a single phase transformer by direct loading method.
10. Brake test on a three phase induction motor
11. PN junction Diode characteristics a). Forward bias b).Reverse bias. (Cut in voltage & Resistance calculations)
12. Zener diode characteristics
13. Half wave rectifier
14. Full wave Rectifier
15. Transistor common emitter characteristics.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2	1	3	-		2		1		1
CO2	2	3			3			2	3			1
CO3	2	3	-		3			2	3			1
CO4	2	1	2		3			2	2			1
CO5	2	1			3			2		1		1

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	I B.Tech. I Sem (1st Semester)			
Course Code	**Basic Engineering Workshop (Common to CE, ME, Automobile, Mining and Petroleum Engineering)**				
Teaching	Total contact hours–48	L	T	P	C
Prerequisite(s): Aptitude to learn .		0	0	3	1.5

Course Objective:

- Provide insight into utilization of various tool in carpentry, fitting, tin smithy, black smithy and house wiring.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Experiment with various basic house wiring techniques.
CO2:	Develop basic prototype in the trade of tin smithy such as square tray and open scoop.
CO3:	Design v-fitting and square fitting in the trade of fitting
CO4:	Making square rod and L-bend from the round rod in black smithy
CO5:	Build various prototype like T lap joint, dovetail joint, cross lap etc. in the trade of carpentry.

List of Experiments:

Note: At least two exercises should be done from each trade.

1. Carpentry
   1. T-Lap Joint
   2. Cross Lap Joint
   3. Dovetail Joint
   4. Mortise and Tenon Joint
2. Fitting
   1. Vee Fit
   2. Square Fit
   3. Half Round Fit
   4. Dovetail Fit
3. Black Smithy
   1. Round rod to Square
   2. S-Hook
   3. Round Rod to Flat Ring
   4. Round Rod to Square headed bolt
4. Tin Smithy
   1. Taper Tray
   2. Square Box without lid

3. Open Scoop
4. Funnel

5. House wiring
    1. Ordinary bulb connection
    2. Staire case connection
    3. Parallel connection
    4. Series connection

Workshop Manual by P. Kannaiah & K.L. Narayana- Scitech Publishers

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. I Sem (III Semester)			
Course Code XXXXX	**MATHEMATICS-III** (Common to ECE, EEE, CE, MECH, PET, AME, MM)				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisite(s): Properties of derivatives and integration, complex numbers		3	0	0	3

Course Objective:

- To familiarize the techniques in transform techniques and partial differential equations
- To equip the students to solve application problems in their disciplines.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Apply the knowledge of Beta and Gamma function.
CO2:	Apply the knowledge of Laplace Transforms.
CO3:	Evaluate Fourier series for different functions. Understand properties of Fourier transformation apply for different function.
CO4:	Solve first order partial differential equations.
CO5:	Solve high order partial differential equations with constant coefficients.

Syllabus:

Unit I: Beta and Gamma function **8hrs**

Beta and Gamma functions and their properties, relation between Beta and Gamma functions, evaluation of improper integrals.

Unit II: Laplace Transforms **10 hrs**

Definition of Laplace transform, existence conditions, properties of Laplace transforms, transforms of derivatives, transforms of integrals, multiplication by t^n, division by t, periodic functions, unit step function, unit impulse function, (without proofs), inverse Laplace transforms, convolution theorem, solving ordinary linear differential equations with constant coefficients.

Unit III: Fourier series and Fourier Transforms **10 hrs**

Dirichlet's conditions, Fourier series, functions of any period, odd and even functions - half range series. Fourier integrals, Fourier cosine and sine integrals, Fourier transform, sine and cosine transform.

Unit IV: First Order Partial Differential Equations **10 hrs**

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions. Solutions of first order linear (Lagrange) partial differential equation and nonlinear (Standard typpes) equations.

Unit V: Higher Order Partial Differential Equations **10hrs**

Solutions of linear partial differential equations with constant coefficients. RHS term of the type $e^{ax+by}, \sin(ax+by), \cos(ax+by), x^m y^n$. Method of separation of variables. Solutions of one dimensional wave, Heat and two-dimensional Laplace equation.

MATHEMATICS - III

Text books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43/e, 2010.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9/e, John Wiley & Sons, 2006.

Reference Books:

1. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9/e, Wiley India, 2009.
2. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India,1995.
3. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7/e, Mc-Graw Hill, 2004.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, 2008.

Web Links:

1. https://nptel.ac.in/courses/111103070/
2. https://nptel.ac.in/courses/111/106/111106084/

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	-	-	-	-	-	-	-	1
CO2	3	3	3	1	-	-	-	-	-	-	-	1
CO3	3	3	3	1	-	-	-	-	-	-	-	1
CO4	2	3	3	1	-	-	-	-	-	-	-	1
CO5	3	3	3	1	-	-	-	-	-	-	-	1

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. I Sem (3rd semester)			
Course Code	**Mechanics of Solids**				
Teaching	Total contact hours–54	L	T	P	C
Prerequisite(s): Engineering Mechanics.		3	0	0	3

Course Objectives:

- To study the internal effects produced and deformations of bodies caused by externally applied forces.
- To understand the strength characteristics of different materials and structural members subjected to shear, torsion and bending.
- To understand the basic concepts of deflection of various beams
- To understand the concepts of circumferential and hoop stresses in thin and thick cylinders.
- To understand the basic concepts of torsion of circular shafts and springs.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Understand the concepts of stress and strain at a point as well as the stress-strain relationships for homogenous, isotropic materials.
CO2:	Calculate the stresses and strains in axially-loaded members, circular torsion members, and members subject to flexural loadings.
CO3:	Determine the deflections and rotations produced by the three fundamental types of loads: axial, torsional, and flexural.
CO4:	Calculate the stresses and strains associated with thin-wall spherical and cylindrical pressure vessels.
CO5:	Able to calculate the failure load of column and struts with different type of end condition.

Syllabus:

UNIT –I

SIMPLE STRESSES & STRAINS: Elasticity and plasticity – Types of stresses & strains–Hooke's law, Stress-strain diagram, Working stress – Factor of safety – Lateral strain, Poisson's ratio & volumetric strain, Elastic Constant and their relation – Bars of varying section – composite bars – Thermal stresses.
PRINCIPAL PLANES AND PRINCIPAL STRESSES – Mohr's circle for plane stress, Stresses on an inclined plane under different uniaxial and biaxial stress conditions. Resilience

UNIT -II

SHEAR FORCE AND BENDING MOMENT: Types of supports – Types of beams – Shear Force and bending moment diagrams for simply supported - cantilever and over hanging beams with point loads - uniformly distributed load - uniformly varying loads - Point of contra flexure – Relation between S.F, B.M and rate of loading at a section of a beam.

FLEXURAL STRESSES: Theory of simple bending – Assumptions – Derivation of bending equation: M/ I = f/y = E/R Neutral axis – Determination bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I and T sections.

UNIT -III

SHEAR STRESSES: Derivation of formula – Shear stress distribution in rectangular – triangular – circular - I and T sections.

DEFLECTION OF BEAMS: Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods, – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads & U.D.L.Mohr's theorems – Moment area method – application to simple cases including overhanging beams, statically indeterminate Beams and solution methods.

UNIT –IV

THIN CYLINDERS & SPHERES: Thin cylindrical vessels subjected to internal pressure, longitudinal and circumferential stresses & strains, Volumetric strains – changes in dimensions of thin cylinders – Thin spherical shells.

THICK CYLINDERS: Stresses in a thick cylindrical shell, lame's equation – cylinders subjected to inside & outside pressures.

COMPOUND CYLINDERS – Shrink fit allowance – Initial difference of radii at the junction.

UNIT –V

TORSION OF CIRCULAR SHAFTS AND SPRINGS: Theory of pure torsion - Torsional theory applied to circular shafts –Transmission of power by circular shafts, composite shafts, Close and open coiled helical springs under axial loads and axial twist.

COLUMNS & STRUTS: Buckling and stability, slenderness ratio, Failure of Columns & Struts, End conditions for long columns, effect of end conditions on column buckling, Expressions for crippling loads. Euler's theory of Columns, Rankine's Formula.

Text Books:

1. Mechanics of materials- BC Punmia, Lakshmi Publications(P) LTD.
2. Strength of materials, S. Ramamrutham, Dhanpathrai Publishing Company.

References:

1. Strength of materials by R.K.Bansal, LaxmiPublications .
2. Strength of materials by Bhavikatti, Lakshmi publications
3. Strength of materials by RK Rajput, S Chand publications.
4. Strength of Materials, Sadhu Singh, Khanna Publishers.
5. Elements of Strength of Materials, Timoshenko S.P., East-West affiliated.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. I Sem (3rd semester)			
Course Code	**Production Technology**				
Teaching	Total contact hours–50	L	T	P	C
Prerequisite(s): Metallurgy and Material Science, Engineering Workshop		3	0	0	3

Course Objectives:

- To impart basic knowledge and understanding about casting processes.
- To learn the solidification phenomenon of metals and alloys and melting methods.
- To impart basic knowledge and understanding of welding processes.
- To impart basic knowledge and understanding about metal forming processes.
- To impart basic knowledge and understanding processing of plastics.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Understand principles of sand casting processes.
CO2:	Discuss various casting methods and melting methods.
CO3:	Demonstrate welding methods and their applications.
CO4:	Explain metal forming methods such as rolling, forging, extrusion and sheet metal forming methods.
CO5:	Interpret the methods of fabrication of different plastics.

Syllabus:

UNIT – I

CASTING: Steps involved in making a casting, Advantage of casting and its applications, Patterns and Pattern making, Types of patterns – Materials used for patterns, pattern allowances and their construction, Principles of Gating, Gating ratio and design of Gating systems.

UNIT – II

SOLIDIFICATION AND CASTING METHODS: Melting and types of furnaces, Solidification of castings, Solidification of pure metals and alloys, short & long freezing range alloys. Casting design considerations, principle and applications of Permanent mould casting, Centrifugal casting, Die casting and Investment casting, Continuous casting.

UNIT – III

WELDING: Classification of welding processes, types of welded joints and their characteristics, Gas welding, Different types of flames and uses, Gas cutting.

ARC WELDING: Manual metal arc welding, Inert Gas welding- TIG & MIG welding. Resistance welding, Solid state welding processes- Friction welding, Friction stir welding, Forge welding, Thermit welding, Laser welding, Electron beam welding, Soldering &Brazing. Heat affected zones in welding, welding defects – causes and remedies.

UNIT – IV

METAL FORMING: Plastic deformation of metals and alloys, Hot working and Cold working, Strain hardening and Annealing. Bulk forming processes.

FORGING: Types Forging, Smith forging, Drop Forging, Roll forging, Forging hammers, Rotary forging, forging defects.

ROLLING: Fundamentals, types of rolling mills and products, Forces in rolling and power requirements.

EXTRUSION: Types of extrusion, Impact extrusion, Hydrostatic extrusion, Drawing-Wire drawing, Deep Drawing and Tube drawing.

UNIT – V

SHEET METAL FORMING: Blanking and piercing, Forces and power requirement, stretch forming, Bending, Bending, Spring back, Coining, Spinning, presses and press tools.

PROCESSING OF PLASTICS: Types of Plastics, Properties, Applications and their processing methods, Blow and Injection moulding.

Text Books:

1. Manufacturing Technology -Vol I- P.N. Rao- TMH.
2. Manufacturing Processes for Engineering Materials - Kalpakjian S and Steven R Schmid- Pearson Publ , 5thEdn.

References:

1. Manufacturing Science – A.Ghosh & A.K.Malik – East West Press Pvt. Ltd. .
2. Production Technology- R.K. Jain- Khanna.
3. A text book of Production Engineering-Dr.P C Sharma-S. Chand and company limited.
4. Manufacturing Processes- H.S. Shaun- Pearson.
5. Manufacturing Processes- J.P. Kaushish- PHI.
6. Fundamentals of Modern Manufacturing - Mikell P Groover- Wiley publication – 3rd Edition.

Useful Web-links: https://nptel.ac.in/courses/112/104/112104304/
https://swayam.gov.in/explorer?searchText=production+technology+

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. I Sem (3rd semester)			
Course Code	**Thermodynamics**				
Teaching	Total contact hours - 54	L	T	P	C
Prerequisite(s): Engineering Physics, Engineering Chemistry, Mathematics		3	0	0	3

Course Objectives:

- Familiarize concepts of heat, work, energy and governing rules for conversion of energy from one form to another.
- Explain relationships between properties of matter and basic laws of thermodynamics.
- Teach the concept of entropy for identifying the disorder and feasibility of a thermodynamic process.
- Introduce the concept of available energy for maximum work conversion.
- Familiarize with deviations from gas laws and compressibility chart and gaseous mixtures.
- Provide fundamental concepts of thermodynamics cycles used in steam power plants, IC engines and gas turbines.

Course Outcomes:

On completion of the course, the students will be able to-	
CO1:	Explain the importance of thermodynamic properties related to conversion of heat energy into work.
CO2:	Apply the laws of thermodynamics to boilers, heat pumps, refrigerators, IC engines, compressors and nozzles.
CO3:	Utilize steam properties in components of heat engines running with steam.
CO4:	Compare air standard cycles using thermodynamic relations.
CO5:	Apply thermodynamics in solving engineering problems relates heat and work

Syllabus:

UNIT-I

INTRODUCTION: BASIC CONCEPTS: Concept of continuum, macroscopic and microscopic approach, thermodynamic systems - closed, open and isolated and surroundings, thermodynamic equilibrium: properties, state, path and process, quasi-static process, work, modes of work, Zeroth law of thermodynamics – concept of temperature and heat, Gas thermometers.

FIRST LAW OF THERMODYNAMICS: First law of Thermodynamics – Corollaries – First law applied to a Process – applied to a flow process – Steady Flow Energy Equation. Limitations of the First Law – Thermal Reservoir, Heat Engine, Parameters of performance, PMM I - Joule's Experiments.

UNIT -II

SECOND LAW OF THERMODYNAMICS: Kelvin's and Clausius statements and their equivalence, corollaries-PMM-II, Heat Engines, Refrigerator and Heat Pump, Coefficient of Performance, Carnot's principle, Carnot cycle and its specialties, Thermodynamic scale of Temperature.

ENTROPY: Clausius Inequality, Entropy, Principle of Entropy Increase – Exergy Equation, Availability and Irreversibility – Thermodynamic Potentials, Gibbs and Helmholtz Functions, Elementary Treatment of Third Law of Thermodynamics.

UNIT- III

PROPERTIES OF PURE SUBSTANCES: Pure Substances, p-v-T- surfaces, T-s and h-s diagrams, Phase Transformations – Triple point at critical state properties during change of phase, Dryness Fraction – Property tables. Mollier charts – Various Thermodynamic processes and energy Transfer – Steam Calorimetry.

PROPERTIES OF GASES: Equation of State, specific and Universal Gas constants – various Non flow processes, properties, end states, Heat and Work Transfer, changes in Internal Energy – Throttling and Free Expansion Processes – Flow processes, Deviations from perfect Gas Model – Vader Waals Equation of State – Compressibility charts – variable specific Heats.
Maxwell Relations, Clausius - Clapeyron equations, Joule Thomson coefficient.

UNIT -IV

PROPERTIES OF GAS MIXTURES: Mixtures of perfect Gases – Mole Fraction, Mass friction Gravimetric and volumetric Analysis – Dalton's Law of partial pressure, Avogadro's Laws of additive volumes – Mole fraction , Volume fraction and partial pressure, Equivalent Gas const. And Molecular Internal Energy, Enthalpy, Sp. Heats and Entropy of Mixture of perfect Gases and Vapour, Atmospheric air.
PSYCHROMETRIC PROPERTIES – Introduction to Refrigeration and Air Conditioning, Dry bulb Temperature, Wet Bulb Temperature, Dew point Temperature, Thermodynamic Wet Bulb Temperature, Specific Humidity, Relative Humidity, Saturated Air, Vapour pressure, Degree of saturation – Adiabatic Saturation , Carrier's Equation – Psychrometric charts**.**

UNIT -V

AIR STANDARD CYCLES: Otto, Diesel, Dual Combustion cycles, Sterling Cycle, Atkinson Cycle, Ericsson Cycle, Lenoir Cycle – Description and representation on P–V and T-s diagram, Thermal Efficiency, Mean Effective Pressures on Air standard basis – comparison of Cycles.
REFRIGERATION CYCLES: Brayton and Rankine cycles – Performance Evaluation – combined cycles, Bell-Coleman cycle, Vapour compression cycle-performance Evaluation.

Text Books:

1. Thermodynamics, P. K. Nag, Engineering 5/e, Tata McGraw Hill.
2. Introduction to Thermodynamics, J. B. Jones and G. A. Hawkins, 2/e, John Wiley & Sons.

References:

1. Fundamentals of Engineering Thermodynamics, Moran, Michael J. and Howard N. Shapiro, 3/e, Wiley.
2. Fundamentals of Thermodynamics, Claus Borgnakke Richard E. Sonntag, 7/e, Wiley.
3. Thermal Engineering, R.K. Rajput, S. Chand & Co., 6/e, Laxmi publications.
4. Thermodynamics, Yunus A. Cengel Michaela A. Boles, 7/e, Tata McGraw Hill.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. I Sem (3rd semester)			
Course Code	**Fluid Mechanics & Hydraulic Machinery**				
Teaching	Totalcontacthours-54	L	T	P	C
Prerequisite(s): Engineering Mechanics		3	0	0	3

Course Objectives:

- The students should able to understand the properties of fluids and its importance.
- The students should able to understand the kinematic and dynamic behavior through various laws of fluids like continuity, Euler's, Bernoulli's equations, energy and momentum equations.
- The student shall be able to understand the theory of boundary layer and dimensional analysis
- The students should able to learn the working and performance characteristics of various hydraulic machines like turbines and pumps.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Discuss the properties of fluids, pressure and its measurement.
CO2:	Identify the types lines, flows and derive continuity equation, Bernoulli's equation and Buckingham's π theorem.
CO3:	Examine the energy losses in pipes and sketch EGL. Discuss about the flow measuring devices. Learn the concepts of boundary layer.
CO4:	Describe working of hydraulic turbines and performance characteristics.
CO5:	Describe working centrifugal and reciprocating pumps and its performance.

Syllabus:

UNIT-I

FLUID STATICS: Dimensions and units: physical properties of fluids- specific gravity, viscosity surface tension- vapor pressure and their influence on fluid motion- atmospheric gauge and vacuum pressure – measurement of pressure- Piezometer, U-tube and differential manometers.

UNIT-II

FLUID KINEMATICS: stream line, path line and streak lines and stream tube, classification of flows-steady & Unsteady, uniform, non uniform, laminar, turbulent, rotational, and irrotational flows-equation of continuity for one dimensional flow.

FLUID DYNAMICS: surface and body forces –Euler's and Bernoulli's equations for flow along a stream line, momentum equation and its application on force on pipe bend.

DIMENSIONAL ANALYSIS: Dimensional homogeneity, Buckingham's-π theorem, Similitude, Dimensionless numbers, model laws.

UNIT-III

CLOSED CONDUIT FLOW: Reynold's experiment- Darcy Weisbach equation- Minor losses in pipes-pipes in series and pipes in parallel- total energy line-hydraulic gradient line. Measurement of flow: pitot

tube, venturi meter, and orifice meter, flow through notches.

BOUNDARY LAYER THEORY AND APPLICATIONS: Concepts of boundary layer, boundary layer thickness and equations, boundary layer separation and its control.

UNIT-IV

BASICS OF TURBO MACHINERY: hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency, flow over radial vanes.

HYDRAULIC TURBINES: classification of turbines, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies , hydraulic design – draft tube- theory- functions and efficiency.

PERFORMANCE OF HYDRAULIC TURBINES: Geometric similarity, Unit and specific quantities, characteristic curves, governing of turbines.

UNIT-V

CENTRIFUGAL PUMPS: classification, working, work done – manomertic head- losses and efficiencies specific speed- pumps in series and parallel-performance characteristic curves.

RECIPROCATING PUMPS: Working, Discharge, slip, indicator diagrams.

Text Books:

1. Fluid Mechanics and Hydraulic Machines by RK Bansal.
2. Hydraulics, fluid mechanics and Hydraulic machinery by Modi and Seth.

References:

1. Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, Kotaria & Sons.
2. Fluid Mechanics and Machinery by D. Rama Durgaiah, New Age International.
3. Hydraulic Machines by Banga& Sharma, Khanna Publishers.

Useful Web-links: https://nptel.ac.in/courses/112/104/112104118/
https://nptel.ac.in/courses/112/104/112104117/

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. I Sem (3rd semester)			
Course Code	**Fluid Mechanics & Hydraulic Machinery Lab**				
Teaching	Totalcontacthours-45	L	T	P	C
Prerequisite(s): Engineering Mechanics		0	0	3	1.5

Course Objectives:

- To impart hands on practical exposure on study of fluid flow and working of hydraulic machinery.
- To understand the calibration of Venturimeter and Orificemeter.
- To determination the losses in flow trough pipe.
- To apply the knowledge of Reciprocating and Centrifugal pumps in daily life.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Understand the concept of flow measuring devices and determine the coefficient of discharge of Venturimeter and Orifice meter
CO2:	Apply the knowledge of Centrifugal pump and Reciprocating pump in real life situations and find out the performance of pumps.
CO3:	Evaluate the performance parameters of hydraulic turbines Pelton wheel and Francis turbine.
CO4:	Understand the concept of flow through pipes and determine the losses.
CO5:	Justify the Bernoulli's theorem

CONDUCT ANY 12 EXPERIMENTS

List of Experiments:

1. Calibration of Venturimeter.
2. Calibration of Orifice meter.
3. Performance Test on Single Stage Centrifugal Pump.
4. Performance Test on Multi Stage Centrifugal Pump.
5. Performance Test on Reciprocating Pump.
6. Determination of friction factor for a given pipe line.
7. Determination of loss of head due to sudden contraction in a pipeline.
8. Calibration of Turbine flow meter.
9. Performance Test on Pelton Wheel.
10. Determination of co-efficient of impact of jet on vane.

11. Performance Test on Francis Turbine.
12. Determination of coefficient of discharge of Rectangular/V Notch
13. Verification of Bernoulli's theorem.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech.I Sem (3rd semester)			
Course Code	**Mechanics of Solids & Metallurgy lab**				
Teaching	Total contact hours-42	L	T	P	C
Prerequisite(s): Engineering Physics and Engineering Chemistry		0	0	3	1.5

Course Objectives:

- To understand the testing methods to find the strength of different materials.
- To know the micro structure of different materials.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Determine the Young's Modulus for ductile materials and analyze the various points on stress strain diagram.
CO2:	Analyze& compare the hardness values for various materials.
CO3:	Understand various micro structures and relationship to properties.
CO4:	Compare the Micro structures of Ferrous & Non-Ferrous Alloys.
CO5:	Improving material properties by different heat treatment processes.

List of Experiments:

Any 6 experiments from each section A and B

(A) MECHNICS OF SOLIDS LAB:

1. Tension test to determine the % elongation, % reduction in cross sectional area of the specimen.
2. Bending test to determined young's modulus of elasticity of material of beam simply supported at ends.
   a) Simple supported beam.
   b) Cantilever beam.
3. Torsion test on mild steel specimen to determine modulus of rigidity.
4. Hardness test to be conduct on mild steel, carbon steel, brass and aluminium specimens.
   a) Brinells hardness test.
   b) Rockwell hardness test.
5. Test on springs to determine the stiffness and modulus of rigidity of the spring wire.
6. Compression test on wooden block.
7. Impact teston mild steel specimen.
   a) Izod test
   b) Charpy test .

8. Double shear test to determine shear strength of mild steel specimen.

(B) METALLURGY LAB:

1. To study effect of carbon % on Micro Structure of different types of steels
2. To study the effects of heat treatment. (annealing, normalizing, and hardening) on hardness and Microstructure of steels.
3. Determine the grain size in given specimens of steels.
4. Determine hardenability of steel specimen by Jominy End quench Test.
5. To Study the Micro structures of Non-Ferrous Alloy like Aluminum and brass.
6. To find out the hardness of various treated and untreated steels.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. I Sem (3rd semester)			
Course Code	**Computer Aided Design and Modelling Lab**				
Teaching	Total contact hours-48	L	T	P	C
Prerequisite(s): Engineering drawing, Basic Computer knowledge		0	0	3	1.5

Course Objectives:

- To learn the importance of CAD package and its basic commands.
- To learn the projections of regular solids in 2D CAD workspace.
- To draw the lateral surfaces of regular solids and interpenetration curves.
- To understand the isometric drawings and 3D surface models.
- To join the simple parts into the component.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Illustrate the importance of CAD package and its basic commands.
CO2:	Produce the orthographic projections of regular solids.
CO3:	Develop the lateral surfaces of regular solids and interpenetration curves
CO4:	Convert to Isometric drawings and 3D Surface Models.
CO5:	Connect simple parts using CAD Package

UNIT I

INTRODUCTION TO COMPUTER AIDED DRAFTING: Computer Aided Drafting, History, CAD software in use, Graphical user interface of AutoCAD, Draw commands, Modify commands, Drafting aids, Symbol library, View ports, View points , Absolute co-ordinate systems , Relative co-ordinate systems ,Relative polar co-ordinate systems.

ORTHOGRAPHIC PROJECTIONS OF PLANES: Regular planes(Rectangle, Triangle, Pentagon and Circle) perpendicular to one plane and parallel to the other plane, Regular planes(Rectangle, Triangle, Pentagon and Circle) perpendicular to one plane and inclined to the other plane.

UNIT II

ORTHOGRAPHIC PROJECTIONS OF SOLIDS: Right Regular solids(Cylinder, Pentagonal pyramid)in simple positions, Right Regular solids(Cylinder, Pentagonal pyramid) withaxis inclined to one of the reference planes and parallel to the other.

UNIT III

DEVELOPMENTS OF LATERAL SURFACES OF RIGHT SOLIDS: Prism, Cylinder, Pyramid, Cone.

INTERPENETRATIONS OF RIGHT REGULAR SOLIDS: Cylinder vs Cylinder, Conevs Cylinder

UNIT IV

ISOMETRIC DRAFTING: Introduction, Isometric planes, Isometric dimensioning, Isometric text, Isometric view of Cube with cylindrical hole.

3D SURFACE MODELLING: Introduction, 3D surface commands, 3D Cone, Cylinder, Prism, Pyramid.

UNIT V

3D SOLID MODELLING : Introduction, Solid modelling commands, 3D solids: Cylinder, Cone, Torus, Stepped Shaft, Gear and solid Journal bearing

ASSEMBLY DRAWING: Assembly of Stepped shaft, Gear and solid Journal bearing.

Text Books:

1. Engineering Drawing by N. D. Bhatt 53 Edition , Charotar Publishing House Pvt. Ltd.
2. Mastering AutoCAD 2021 and AutoCAD LT 2021 by Brian C Benton and George Omura, Sybex publications.

References:

1. Engineering Drawing by K. L. Narayana& P Kannaiah 3rd Edition, Scitech Publishers.
2. Mastering Auto CAD 2013 and Auto CAD LT 2013– George Omura, Sybex publications.

Regulation GRBT-20	GODAVARI INSTITUTE OF ENGINEERING & TECHNOLOGY (Autonomous)				
Course Code	**PROGRAMMING WITH PYTHON** Common to ME, ECE, MINING, PETROLEUM & AME				
Practice	Total contact hours: 48	L	T	P	C
Prerequisite(s): Knowledge of any programming language		0	1	2	2

Course Objective(s):

- This course is intended to teach adequate knowledge on different data structures technique.
- To develop solutions for problems demonstrating usage of control structures, modularity, I/O and other standard language constructs.

Course Outcome(s):

After successful completion of this course, a student will be able to-

CO-1: To learn and understand Python programming basics and paradigm

CO-2: Handle different data structures.

CO-3: Understand the use of control statements, function overloading, operator overloading in real time application

CO-4: Implement files using various file operations.

CO-5: Apply knowledge to handle exception handling and database connectivity

List of Programs:

1. Write a program that asks the user for a weight in kilograms and converts it to pounds. There are 2.2 pounds in a kilogram.
2. Write a program that asks the user to enter three numbers (use three separate input statements). Create variables called total and average that hold the sum and average of the three numbers and print out the values of total and average.
3. Write a program that uses a for loop to print the numbers 8, 11, 14, 17, 20, . . . , 83,86,89.
4. Write a program that asks the user for their name and how many times to print it. The program should print the user's name, the specified number of times.
5. Use a for loop to print a triangle like the one below. Allow the user to specify how high the triangle should be.

```
*
**
***
****
```

6. Write a program that asks the user to enter a word and prints out whether that word contains any vowels.
7. Write a program that asks the user to enter two strings of the same length. The program should then check to see if the strings are of the same length. If they are not, the program should print an appropriate message and exit. If they are of the same length, the program should alternate the characters of the two strings. For example, if the user enters abcde and ABCDE the program should print out AaBbCcDdEe.

8. Write a program that generates a list of 20 random numbers between 1 and 100 and perform the following.
   (a) Print the list.
   (b) Print the average of the elements in the list.
   (c) Print the largest and smallest values in the list.
   (d) Print the second largest and second smallest entries in the list
   (e) Print how many even numbers are in the list.

9. Write a program that asks the user for an integer and creates a list that consists of the factors of that integer.

10. Write a program that removes any repeated items from a list so that each item appears at most once. For instance, the list [1,1,2,3,4,3,0,0] would become[1,2,3,4,0].

11. Write a program that asks the user to enter a length in feet. The program should then give the user the option to convert from feet into inches, yards, miles, millimeters, centimeters, meters, or kilometers. Say if the user enters a 1, then the program converts to inches, if they enter a 2, then the program converts to yards, etc. While this can be done with if statements, itis much shorter with lists and it is also easier to add new conversions if you use lists.

12. Write a function called sum digits that is given an integer num and returns the sum of the digits of num.

13. Write a function called number_of_factors that takes an integer and returns how many factors the number has.

14. Write a function called is_sorted that is given a list and returns True if the list is sorted and False otherwise.

15. Write a function called primes that is given a number n and returns a list of the first n primes. Let the default value of n be 100.

Textbooks

1. Wesley J. Chun "Core Python Programming" Prentice Hall
2. Head First Python, 2nd Edition

Reference Books

1. Mark Lutz "Programming Python, 4th Edit O'ReillyMedia
2. David Beazley and Brian K. Jones"Python Cokboo'Reilly

Regulation GRBT-20	GODAVARI INSTITUTE OF ENGINEERING & TECHNOLOGY (Autonomous)	II B.Tech I Semester			
Course Code	**CONSTITUTION OF INDIA** **Common to CSE, CSC & CSM**				
Teaching	Total contact hours: 32	L	T	P	C
Prerequisite(s):	Basic knowledge of fundamental Rights, Indian Constitution	2	0	0	---

Course Objective(s):

- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
- To understand the central and state relation financial and administrative

Course Outcome(s):

After successful completion of this course, a student will be able to-

CO-1: Understand historical background of the constitution making and its importance for building a democratic India.

CO-2: Understand the functioning of three wings of the government ie., executive, legislative and judiciary.

CO-3: Understand the value of the fundamental rights and duties for becoming good citizen of India.

CO-4: Analyze the decentralization of power between central, state and local self- government.

CO-5: Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.

1. Know the sources, features and principles of Indian Constitution.
2. Learn about Union Government, State government and its administration.
3. Get acquainted with Local administration and Panchayati Raj.
4. Be aware of basic concepts and developments of Human Rights.
5. Gain knowledge on roles and functioning of Election Commission

UNIT-1

Introduction to Indian Constitution: Constitution meaning of the term, Indian Constitution-Sources and constitutional history, Features- Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

UNIT-2

Union Government and its Administration Structure of the Indian Union: Federalism, Centre State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions.

UNIT-3

State Government and its Administration Governor: Role and Position - CM and Council of ministers, State Secretariat: Organization, Structure and Functions.

UNIT-4

Local Administration: District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation Panchayati Raj: Functions PRI: Zila Panchayat, Elected officials and their roles, CEO Zila Panchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy.

UNIT-5

Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission: Functions of Commissions for the welfare of SC/ST/OBC and women

References:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice Hall of India Pvt. Ltd.
2. Subash Kashyap, Indian Constitution, National Book Trust
3. J.A. Siwach, Dynamics of Indian Government & Politics

e-Resources:

1. nptel.ac.in/courses/109104074/8
2. nptel.ac.in/courses/109104045/
3. nptel.ac.in/courses/101104065/

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	2	-	2	-	-	-	-
CO2	-	-	-	-	-	3	-	3	-	-	-	-
CO3	-	-	-	-	-	3	-	2	-	-	-	-
CO4	-	-	-	-	-	3	-	-	-	-	-	-
CO5	-	-	-	-	-	3	-	2	-	-	-	-

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. II sem (IV Semester)			
Course Code XXXXXXX	PROBABILITY & STATISTICS (Common to CE, MM, EEE, PET, AME, MECH)				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisite(s): Knowledge of Mathematics at 10+2 , Basic Statistics with Reasoning ability		3	0	0	3

Course Objective:

- Paraphrase a comprehensive set of descriptive statistical methods, in order to display data in a meaningful way.
- Integrate correlation analysis in order to estimate the nature and the strength of the linear relationship.
- Implement regression analysis to predict the value of one variable based on the value of the other variable.
- Exemplify probability theory in order to evaluate the probability of real world events.
- Apply discrete and continuous probability distributions to provide solutions for practical problems.
- Monitoring confidence interval estimates and hypotheses tests for population parameters.
- Execute comprehensive set of statistical tools in making practical decisions and creating reports in workplace situations; and in completing papers and research projects in other university and college courses.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Apply the knowledge of descriptive statistics and method of data science in practical engineering problems.
CO2:	Apply the Knowledge of Probability in practical Engineering problems.
CO3:	Demonstrate the knowledge of Probability distributions.
CO4:	Enhance knowledge in Sampling & Estimation techniques.
CO5:	Enhance Knowledge in Design of Experiments.

Syllabus:

Unit I: Descriptive Statistics and Methods for Data Science

Data science, Statistics Introduction, Population vs Sample, event, mutually exclusive, independent and exhaustive events. Measures of Central tendency, Measures of Variability (spread or variance) Skewness, correlation, correlation coefficient, rank correlation, regression coefficients, principle of least squares, method of least squares, regression lines.

UNIT II: Probability

Probability, axioms of probability, addition law and multiplicative law of probability, conditional probability, Baye's theorem, random variables (discrete and continuous), probability density functions, properties, mathematical expectation.

UNIT III: Probability Distributions

Probability distribution - Binomial, Poisson, Poisson approximation to the Binomial distribution and Normal distribution-their properties.

PROBABILITY & STATISTICS

UNIT IV: Estimation and Testing of Hypothesis, Large Sample Tests

Estimation- parameters, statistics, sampling distribution, point estimation, Formulation of null hypothesis, alternative hypothesis, the critical and acceptance regions, level of significance, two types of errors and power of the test. Large Sample Tests: Test for single proportion, difference of proportions, test for single mean and difference of means. Confidence interval for parameters in one sample and two sample problems.

UNIT V: Small Sample Tests

Student t-distribution (test for single mean and two means), testing of equality of variances (F-test), $\chi 2$ - test for goodness of fit, $\chi 2$ - test for independence of attributes. One-way ANOVA Classified data.

Text Books:

1. Miller and Freunds, Probability and Statistics for Engineers,7/e, Pearson, 2008.
2. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.

Reference Books:

1. S. Ross, a First Course in Probability, Pearson Education India, 2002.
2. W. Feller, an Introduction to Probability Theory and its Applications, 1/e, Wiley, 1968.
3. Probability and statistics for Engineering and Scientists : Ronald E.Walpole, Sharon L.Mayers and Keying Ye:Pearson.
4. Simon Haykin, Communication Systems, 4/e, Wiley Student Edition, 2006.

Web Links:

1. https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-151-probability-and-statistics-in-engineering-spring-2005/lecture-notes/
2. https://lecturenotes.in/subject/69/probability-and-statistics-ps

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	3	2	-	-	-	-	-	-	-	2
CO2	2	2	3	2	-	-	-	-	-	-	-	2
CO3	2	2	3	2	-	-	-	-	-	-	-	2
CO4	2	2	3	2	-	-	-	-	-	-	-	2
CO5	2	2	3	2	-	-	-	-	-	-	-	2

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. II Sem (4th semester)			
Course Code	**Kinematics of Machinery**				
Teaching	Total contact hours–55	L	T	P	C
Prerequisite(s): Engineering Mechanics.		3	0	0	3

Course Objectives:

- To explain about the mobility of mechanism and the inversions .
- To carry out the velocity and acceleration analysis of planar mechanism
- To understand the mechanisms with gears, cams and followers

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Explain about the mobility and inversions of a planar mechanism.
CO2:	Discuss mechanisms with lower pairs
CO3:	Determine the velocity and acceleration for the planar mechanisms
CO4:	Analyse the motion of the cams and followers.
CO5:	Analyse Gears and Gear Trains

Syllabus:

UNIT – I

MECHANISMS : Elements or Links – Classification – Rigid Link, flexible and fluid link – Types of kinematic pairs – sliding, turning, rolling, screw and spherical pairs – lower and higher pairs – closed and open pairs – constrained motion – completely, partially or successfully constrained and incompletely constrained .Gruebler's criteria , Grashoff's law , Degrees of freedom, Kutzbach criterian for planar mechanisms, Mechanism and machines – classification of machines – kinematic chain – inversion of mechanism – inversions of quadric cycle chain – single and double slider crank chains.

UNIT – II

LOWER PAIR MECHANISM: Exact and approximate copiers and generated types – Peaucellier, Hart and Scott Russell – Grasshopper – Watt T. Chebicheff and Robert Mechanisms and straight line motion, Pantograph. Conditions for correct steering – Davis Steering gear, Ackermans steering gear – velocity ratio; Hooke's Joint: Single and double – Universal coupling–application–problems.

UNIT – III

KINEMATICS: Velocity and acceleration – Motion of a link in machine – Determination of Velocity and acceleration diagrams – Graphical method – Application of relative velocity method - Four bar chain. Velocity and acceleration analysis of a given mechanism, Kleins construction - Determination of Corioli's component of acceleration.

PLANE MOTION OF BODY: Instantaneous center of rotation, centrodes and axodes – relative motion between two bodies – Three centres in line theorem – Graphical determination of instantaneous centre, diagrams for simple mechanisms and determination of angular velocity of points and links.

UNIT – IV

CAMS: Definitions of cam and followers – their uses – Types of followers and cams – Terminology – Types of follower motion: Uniform velocity, Simple harmonic motion and uniform acceleration and retardation. Maximum velocity and maximum acceleration during outward and return strokes in the above 3 cases.

ANALYSIS OF MOTION OF FOLLOWERS: Roller follower – circular cam with straight, concave and convex flanks.

UNIT – V

GEARS: Higher pairs, friction wheels and toothed gears–types – law of gearing, condition for constant velocity ratio for transmission of motion, Form of teeth: cycloidal and involute profiles. Velocity of sliding – phenomena of interferences – Methods of interference.Condition for minimum number of teeth to avoid interference, expressions for arc of contact and path of contact – Introduction to Helical, Bevel and worm gearing.

GEAR TRAINS: Introduction to gear Trains, Train value, Types – Simple and reverted wheel train – Epicyclic gear Train. Methods of finding train value or velocity ratio – Epi cyclic gear trains. Selection of gear box-Differential gear for an automobile.

Text Books:

1. Theory of Machines by R.S.Khurmi , JK GUPTA-S.CHAND.
2. Theory of Machines – S. S Rattan- TMH.
3. Theory of Machines by Thomos Beven- CBS Publishers & Distributors.

References:

1. Theory of Machines Sadhu Singh Pearsons Edn.
2. Theory of machines and Machinery /Vickers /Oxford .
3. Theory of Mechanisms and machines – Popov Eger P.
4. Theory of machines and Mechanisms – J. J. Uicker, G.R.Pennock & J.E. Shigley – Oxford publishers.

Useful Web-links : https://nptel.ac.in/courses/112/104/112104121/
https://www.classcentral.com/course/swayam-kinematics-of-mechanisms-and-machines-13022

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. II Sem (4th semester)			
Course Code	**Thermal Engineering**				
Teaching	Total contact hours– 55	L	T	P	C
Prerequisite(s):Thermodynamics		3	0	0	3

Course Objectives:

- Investigate thermodynamic analysis of IC Engines, steam power plants and various methods to improve efficiencies, and air compressors
- Predict various types of boilers and their performance.
- Classify various types nozzles and condensers and to find their efficiencies.
- To examine the performance evaluations of various Turbines.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Evaluate performance of IC Engine.
CO2:	Evaluate various efficiencies of air compressors.
CO3:	Define various types of boilers and principles of draught.
CO4:	Classify different types of Nozzle and Condensers.
CO5:	Analyze the thermal analysis of steam turbines.

Syllabus:

UNIT –I

I.C. ENGINES : Definition of Engine And Heat Engine - I.C Engine Classification - Parts of I.C. Engines - Working of I.C. Engines - Two Stroke & Four Stroke I.C. Engines-SI & CI Engines Valve and Port Timing Diagrams.

Testing and Performance : Parameters of Performance - Measurement of Fuel Consumption - Air Intake - Brake Power - Determination of Frictional Losses And Indicated Power - Performance Test - Heat Balance Sheet and Chart-Related problems.

UNIT –II

AIR COMPRESSORS: Reciprocating Compressors - Effect of Clearance volume in Compressors - Volumetric Efficiency - Isothermal efficiency and Isentropic efficiency of reciprocating Compressors - Single Stage and Multi Stage Compressors - Problems Related to Reciprocating Compressors - Working principles of Roots blower - Vane type Blower - Centrifugal Compressor - Axial Flow Compressors.

UNIT –III

BOILERS: Classification based on Working principles & Pressures of operation - L.P & H.P. - Boilers Mountings and Accessories - Principle of Draught types - Height and diameter of the chimney - Condition for maximum discharge through a chimney - Efficiency of a chimney - Artificial Draught.

UNIT –IV

STEAM NOZZLES: Function of nozzle - applications - types - Flow through nozzles - thermodynamic analysis - Assumptions - Condition for maximum discharge - Critical pressure Ratio - Supersaturated flow.
STEAM CONDENSERS: Requirements of steam condensing plant - Classification of Condensers - Working principle of different types - Vacuum efficiency and condenser efficiency.

UNIT –V

STEAM TURBINES: Classification of Steam Turbines -
Impulse Turbines: Mechanical details - Methods of reducing rotor speed - Velocity diagram - Power developed - axial thrust - blade or diagram efficiency - Condition for maximum efficiency.
Reaction Turbines-Mechanical details - Principle of operation - Thermodynamic analysis of a stage - Degree of reaction - Velocity diagram - Parson's reaction turbine - Condition for maximum efficiency - Difference between Impulse and reaction turbines.

Text Books:

1. Thermal Engineering, R.K. Rajput, Hyderabad, Lakshmi Publications Pvt. Ltd, 9 th Edition.
2. Thermal Engineering, R.S. Khurmi & J.K.Gupta, 15 th Edition, Hyderabad, S.Chand.
3. Thermal Engineering, P.L. Balleny, 20th Edition, Khanna Publishers, New Delhi.

References:

1. I.C. Engines, V. Ganesan, Noida, 4 th Edition, Tata McGraw Hill.
2. Thermal Engineering, Kothandaraman & Domkundwar, Dhanpat Rai & Co.
3. Steam & Gas Turbines and Power plant engineering, R. Yadav, 7th revised Edition, Central Publishing House, Allahabad.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. II Sem (4^{th} semester)			
Course Code	**Industrial Engineering & Management (Common for Mechanical & Automobile Engineering)**				
Teaching	Total contact hours- 56	L	T	P	C
Prerequisite(s): Production Technology.		3	0	0	3

Course Objectives:

- To understand the concepts of Industrial Engineering and Principles of Management.
- To understand the concept plant location and layouts.
- To understand the methods for improving productivity in manufacturing industries.
- To familiarize various Quality concepts, Quality Control.
- To understand the CPM and PERT networks.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Describe the various concepts of management techniques.
CO2:	Identify a suitable plant location and layout by considering various industrial aspects.
CO3:	Use work study concepts to improve productivity.
CO4:	Apply the suitable quality management techniques.
CO5:	Assess the project duration and crashing of any network problems.

Syllabus:

UNIT – I

INTRODUCTION: Industrial Engineering- Role of Industrial Engineer- IE Applications – Productivity – Scope of Industrial Engineering.

MANAGEMENT: Concepts, Origin, Importance, functions of management, F W Taylor's Scientific Management, McGregor's theory X and theory Y– Henry Fayol's Management Principles-Human Resource Management: Functions of HRM, Job-evaluation, merit rating.

UNIT – II

PLANT - FACILITY LOCATION & LAY-OUT: Factors governing plant location - Location Economics, types of sites, types of plant, Plant layout techniques.

PRODUCTION–Types of Production- Advantages and disadvantages - Aggregate Production Planning - Plant maintenance - Types - Preventive, predictive, breakdown – Reliability, Maintainability, and Availability concepts – Employee health and safety.

UNIT – III

OPERATIONS MANAGEMENT – WORK STUDY: Work study – Objectives of work study: Role of work study in improving productivity.

METHOD/MOTION STUDY: Procedure, objectives, applications, recording techniques: charts, diagrams, graphs and models – Micro-motion study: Procedure, objectives, applications, Therbligs.

TIME STUDY/WORK MEASUREMENT: Procedure, objectives, applications -Time study techniques: stop watch method, PMTS, work sampling – Concept of allowances, performance rating, estimation of standard time- Introduction to Ergonomics.

UNIT – IV

QUALITY MANAGEMENT: Introduction to quality - Statistical quality control (SQC): Control Charts, Numerical Examples on X Bar charts, R Charts, C Charts and P Charts –Acceptance Sampling techniques.

TOTAL QUALITY MANAGEMENT (TQM): DEMING cycle, DMAIC Cycle, Zero Defects, Quality Circles, ISO Quality Systems, 5S, Six Sigma.

MATERIALS MANAGEMENT: Inventory, basic EOQ model, Selective Inventory Control techniques –ABC, VED, FSN, XYZ – MRP- ERP- Supply Chain Management-Value Engineering – Value Analysis.

UNIT – V

PROJECT MANAGEMENT: Introduction to Network Techniques - CPM and PERT - Critical Path Analysis - Activity times and floats, Project completion times. PERT - three time estimates, critical path analysis of a PERT network, Probability of completion of project - Simple Numerical Examples on CPM & PERT, Project crashing.

Text Books:

1. Industrial Engineering and Management, OP Khanna, Khanna Publishers, 17th Edition.
2. Industrial Engineering and Production management, MartandTelsang, S Chand & Co New Delhi, 2nd edition.

References:

1. Industrial Engineering and Management, M Mahajan,2nd Edition.
2. Production and Operations Management – Paneerselvem – PHI.
3. Introduction to Work Study, I.L.O., 4th Revised Edn..
4. Handbook of Industrial Engineering: Technology and Operations Management by GavrielSalvendy, A Wiley-Interscience Publication,Third edition.

Useful Web-links : 1.https://nptel.ac.in/courses/112/107/112107143/
2.https://swayam.gov.in/explorer?searchText=Industrial+Engineering

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. II Sem (4^{th} semester)			
Course Code	**Numerical Modelling for Mechanical Engineers (Common for Petroleum, Mining & Mechanical Engineering)**				
Teaching	Total contact hours–58	L	T	P	C
Prerequisite(s):Mathematics – II, Mathematics - III		2	0	2	3

Course Objectives:

- To understand the use of conservation laws to develop mathematical models of physical systems.
- To master programming skills to develop own programs for the numerical methods.
- To develop well-structured and reliable computer programs.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Develop mathematical models for engineering problems from conservation laws
CO2:	Analyse engineering problems using experimental data
CO3:	Analyse engineering problems dealing with constrained optimization
CO4:	Compare results obtained through various numerical techniques
CO5:	Generate graphical representations of results and interpret graphical information

List of Exercises: -

1. Analysis of Behaviour of Real Gases.
2. Viscous Flow Through Pipes.
3. Analysis of Stresses.
4. Analysis of Spring Mass System.
5. Product Mix Problem.
6. Kinetic Analysis of System of Connected Particles.
7. Analysis of Damped Spring Mass System.
8. Analysis of Fracture Test Data of Stainless Steel Specimen.
9. Analysis of Tensile Test Data.
10. Work Done by Varying Force on a Block.
11. Non Linear Swinging Pendulum.
12. Structural Analysis of Bar under Axial Load.
13. Analysis of an Irrotational Flow of a Fluid.

Text Books:

1. "Numerical Methods for Engineers", S C Chapra, R P Canale, , 6th edition, McGraw Hill.
2. "A First Course in Mathematical Modelling", F R Giordano, W P Fox, S B Horton, , 5th edition, Cengage Learning.
3. "Numerical Methods for Engineers and Scientists", A Gilat, V Subrahmanyam, , 2nd edition, Wiley.

References:

1. "Introduction to Numerical Methods and MATLAB Programming for Engineers", T Young, M J Mohlenkamp,Ohio State University.

Useful online Links:

1. https://ocw.mit.edu/courses/mechanical-engineering/2-086-numerical computation-for-mechanical-engineers-fall-2012/.
2. https://nptel.ac.in/courses/103/106/103106118/

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. II Sem (4th semester)			
Course Code	**Production Technology Lab**				
Teaching	Total contact hours–42	L	T	P	C
Prerequisite(s): Engineering Workshop and Production Technology		0	0	3	1.5

Course Objective: To impart hands-on practical exposure on manufacturing processes and equipment.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Understand the fundamentals of pattern making, molding process./understand the pattern design and making using wood turning lathe.
CO2:	Gain knowledge in sand casting processes.
CO3:	Learn on Welding processes like MMAW. Gas welding and cutting , TIG , MIG welding and resistance process.
CO4:	Gain knowledge on sheet metal cutting and operations, extrusion.
CO5:	Understand the fabrication methods of plastics using injection and blow moulding.

List of Experiments:

I. METAL CASTING:

1. Pattern Design and making - for one casting drawing.
2. Sand properties testing - for strength and permeability
3. Mould preparation, Melting and Casting
4. Core making process

II. WELDING:

1. Gas welding
2. Gas cutting
3. Manual metal arc welding - Lap & Butt Joints
4. TIG Welding
5. MIG Welding
6. Resistance Spot Welding
7. Brazing and soldering

III METAL FORMING AND POWDER METALLURGY:

1. Blanking & Piercing operations and study of simple, compound and progressive dies.
2. Deep drawing and extrusion operations.
3. Bending and other operations

IV PROCESSING OF PLASTICS:

1. Injection Moulding
2. Blow Moulding

Text Books:

1. Manufacturing Processes for Engineering Materials - Kalpakjian S and Steven R Schmid- Pearson Publ , 5thEdn.
2. Manufacturing Technology -Vol I- P.N. Rao- TMH.
3. Fundamentals of Modern Manufacturing - Mikell P Groover- Wiley publ – 3rd Edition.

References:

1. Manufacturing Science – A.Ghosh & A.K.Malik – East West Press Pvt. Ltd.
2. Process and materials of manufacture- Lindberg- PHI.
3. Production Technology- R.K. Jain- Khanna.
4. Production Technology-P C Sharma-S. Chand.
5. Manufacturing Processes- H.S. Shaun- Pearson.
6. Manufacturing Processes- J.P. Kaushish- PHI.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. II Sem (4th semester)			
Course Code	**Thermal Engineering Lab**				
Teaching	Totalcontacthours–42	L	T	P	C
Prerequisite(s): Basic knowledge of Thermo Dynamics, Thermal Engineering		0	0	3	1.5

Course Objectives:

- To understand various types of Internal Combustion Engines parts, their working principles and their thermodynamic analysis.
- To understand effects of operating variables on engine parameters.
- To understand properties of different fuels.
- To understand various components, working, and performance of Refrigeration and Air-conditioning units.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Calculate various powers, efficiencies and energy balance for several types of Internal Combustion Engines and compressors.
CO2:	Classify various types of IC Engines, Air compressors & cycle of operations
CO3:	Demonstrate the effect of various operating variables on engine performance
CO4:	Estimate properties of various fuels and lubricants.
CO5:	Evaluate Coefficient of Performance of Refrigeration and Air-conditioning units

List of Experiments:

1. a. Valve Timing Diagram of Four Stroke Diesel Engine.
   b. Port Timing Diagram of Two Stroke Petrol Engine.
2. Performance Test On Single Stage Reciprocating Air Compressor.
3. a. Determination of viscosity using Red Wood Viscometer- I
   b. Determination of viscosity using Saybolt Viscometer
4. Determination of Flash and Fire point using Cleveland apparatus.
5. Performance Test on 4 Stroke Single Cylinder low Speed Diesel Engine.
6. Heat Balance Sheet on 4-Stroke Single Cylinder low Speed Diesel Engine.
7. Performance Test on 4 Stroke Single Cylinder High Speed Diesel Engine.
8. Economical Speed Test on 4-Stroke Single Cylinder High Speed Diesel Engine

9. Retardation Test on 4- Stroke, Single Cylinder High Speed Diesel Engine Test Rig.
10. Performance Test on Refrigeration unit.
11. Performance Test on Air conditioning unit.
12. Study of Steam Generators (Boilers).
13. Dis-Assembly and Assembly of an I.C Engine.

Open Ended Experiment

1. Computerized Research Based Four Stroke Single Cylinder Variable Compression Ratio (VCR) Engine With Water Cooled Eddy Current Loading Test Rig.

References:

1. I.C. Engines/V. Ganesan-TMH.
2. Heat engines, Vasandani & Kumar publications thermal.
3. I.C. Engines – M.L.Mathur & R.P.Sharma – Dhanpath Rai& Sons.
4. I.C. Engines–Applied Thermo sciences–C.R.Ferguson&A.T.Kirkpatrick-2 nd Edition-Wiley Publ.
5. I.C. Engines - J.B.Heywood /McGraw HIll.
6. Thermal Engineering – R.S.Khurmi & J.S.Gupta- S.Chand Publ.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. II Sem (4th semester)			
Course Code	**Computer Aided Machine Drawing**				
Teaching	Totalcontacthours–42	L	T	P	C
Prerequisite(s): Engineering Drawing, Computer aided drafting and modeling		0	0	3	1.5

Course Objectives:

- To understand the CAD software.
- To tabulate the conventional representation of materials and machine components.
- To draw the detachable joints, riveted joints and representation of welded joints.
- To produce the solid model of the shaft couplings.
- To join the components of engine, machine tool, valves and miscellaneous machines.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Illustrate the conventional representations of materials and machine components.
CO2:	Produce the detachable joints by any CAD package.
CO3:	Sketch 2D profile of riveted, welded and key joints.
CO4:	Develop the shaft couplings solid model in 3D CAD package.
CO5:	Connect the Engine parts, machine tool parts , valves and Miscellaneous parts to form assemblies.

Syllabus:

UNIT – I

The following contents are to be done by any 2D software package (AutoCAD/PRO-E etc…)
Conventional representation of materials and components:
DETACHABLE JOINTS: Drawing of thread profiles, hexagonal and square-headed bolts and nuts, bolted joint with washer and locknut.
RIVETED JOINTS: Single riveted lap joint, double riveted chain lap joint, single riveted single strap butt joint, single riveted double strap butt joint, double riveted double strap zig-zag butt joint.
WELDED JOINTS: Elementary welding symbols, Supplementary welding symbols
KEYS: Hollow saddle key, Flat saddle key, Taper sunk keys, Parallel keys.

UNIT –II

The following contents to be done by any 3D software package (CATIA / AutoCAD/Solid Edge etc…)
SHAFT COUPLING: Bushed pin-type flange coupling, Universal coupling, Oldhams coupling.
ASSEMBLY DRAWINGS: (One from the each sub topics using solid model software)
ENGINE PARTS: Stuffing Box, Piston, Eccentric, connecting rod
MACHINE TOOL PARTS AND ACCESSORIES: Single tool post, Lathe tail stock, Shaper tool head slide, Machine vice.

VALVES: Gate valve, Non-return valve.
MISCELLANEOUS PARTS: Plumber block, Screw jack, Pipe vice.

Text Books:

1. Machine Drawing –K.L.Narayana, P.Kannaiah& K. Venkata Reddy, 5th edition - New Age Publications.
2. Mastering Auto CAD 2021 and Auto CAD LT 2021 – Brian C Benton, George Omura, Sybex.
3. Machine Drawing (includes AutoCAD) – AjeetSingh, 2nd edition, McGraw Hill

References:

1. A text book of Machine Drawing – Dr. R. K. Dhawan, 2nd edition, S.Chand Publications.
2. Engineering drawing by N.D Bhatt ,Charotar publications.

Web Links:

1. http://nptel.ac.in/courses.php
2. http://mit.espe.edu.ec/courses/mechanical-engineering/

Regulation GRBT-20	**Godavari Institute of Engineering & Technology (Autonomous)**	B.Tech.			
Course Code	**ENGLISH FOR CAREER**				
Teaching	Total contact hours	L	T	P	C
Prerequisite(s): **Learner should be equipped with Functional Grammatical skills and interactive ability**					

Course Objective: This course aims

- **To achieve proficiency in formal English usage**
- **To improve both written and spoken communication in connection with professional needs**
- **To make them industry ready in terms of grooming, speaking in in-formal occasions**

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Understand the necessity to improve four language skills
CO2:	Acquire knowledge about public speaking ability
CO3:	Strengthen their grammatical skills in the language
CO4:	Improve necessary vocabulary and academic writing skills
CO5:	Improve academic writing skills

Syllabus:

Unit-1

Technical Communication: Report writing: Importance, structure, drafting of reports, Types of reports-formal-informal reports-Business Writing: Sales letters, notices, agenda and minutes of the meeting-Information Transfer

Unit-2

Communication Practice -Debating and Role Playing-Meaning-Do's and don'ts-Voice modulation-fluency-Keep it short and sweet-formal discussions-summarizing techniques- Group discussion-do's and don'ts -JAM sessions

Unit-3

Grammar In Use-Tense and aspect-Verb patterns-usage of progressive tense- Types and kinds of sentences -Question tags-Usage of Auxiliaries- Common errors

Unit-4

Vocabulary Building-Affixes- synonyms and antonyms-Phrasal verbs-Homonyms-Eponyms-Idioms-verbal Analogies-one word substitutes-Collocations

Unit-5

(a)Occupational competency- Interview skills- self introduction-performance management planning-strategic planning-Negotiation techniques-visual communication- - delegation-filling personal information-C.V.preparation-Mock Interviews

(b) LSRW Skills-Selected lessons from UNLOCK-2 published by Cambridge University Press, mobile etiquette, table manners, dressing style

Prescribed Text Books: UNLOCK SERIES from Cambridge University Press

Unlock Book-2: Reading and Writing

Listening and Speaking

Web references: https://www.englishclub.com/

http://www.world-english.org/

http://learnenglish.britishcouncil.org/

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-': No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	2	3	2	-	-	-	-
CO2	-	-	-	-	-	3	3	3	-	-	-	1
CO3	-	-	-	-	-	2	3	3	-	-	-	-
CO4	-	-	-	-	--	3	3	3	-	-	-	1
CO5	-	-	-	-	-	2	2	2	-	-	-	-

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. I Sem (5^{th} semester)			
Course Code	**Dynamics of Machinery**				
Teaching	Totalcontacthours-45	L	T	P	C
Prerequisite(s): Kinematics of Machinery		3	0	0	3

Course Objectives:

Students undergoing this course will be able to:

- Learn about gyroscopic effect and its importance in stabilization of Ships and Automotives.
- Recall basic concepts of Friction and understand its role in clutches, brakes and dynamometers.
- Learn about flywheel analysis along with Turning moment diagrams.
- Develop knowledge of analytical and graphical methods for calculating balancing of rotary and reciprocating masses.
- Understand basic concepts of vibrations and its significance on engineering design.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Analyze stabilization of sea vehicles, aircrafts and automobile vehicle.
CO2:	Investigate the frictional losses & torque transmission of mechanical systems.
CO3:	Design the flywheels and governors for suitable applications.
CO4:	Identify and Solve the unbalanced forces in reciprocating and rotary masses.
CO5:	Explain the concepts of free and forced vibrations of single degree freedom systems.

Syllabus:

UNIT–I

PRECESSION: Gyroscopes, effect of precession motion on the stability of moving vehicles such as motor car, motorcycle, aeroplanes and ships.

UNIT–II

FRICTION: Inclined plane, friction of screw and nuts, pivot and collar, uniform pressure, uniform wear, friction circle and friction axis, lubricated surfaces, boundary friction, film, lubrication.

CLUTCHES: Friction clutches- single disc or plate clutch, multiple disc clutch, cone clutch, centrifugal clutch.

BRAKES AND DYNAMOMETERS: Simple block brakes, internal expanding brake, band brake of vehicle. General description and operation of dynamometers: Prony, Rope brake, Epicyclic, Bevis Gibson and belt transmission,

UNIT–III

TURNING MOMENT DIAGRAMS: Dynamic force analysis of slider crank mechanism, inertia torque, angular velocity and acceleration of connecting rod, crank effort and turning moment diagrams– fluctuation of energy– flywheels and their design.

GOVERNERS: Function & its types, Watt, Porter and Proell governors, Spring loaded governors– Hartnelland Hartung with auxiliary springs. Sensitiveness, isochronism and hunting.

UNIT– IV

BALANCING: Balancing of rotating masses single and multiple–single and different planes, use of analytical and graphical methods. Primary, secondary, and higher balancing of reciprocating masses. Analytical and graphical methods, unbalanced forces and couples – examination of "V" multi cylinder in line and radial engines for primary and secondary balancing, locomotive balancing, hammer blow, swaying couple, variation of tractive effort.

UNIT–V

VIBRATIONS: Free vibration of spring mass system – oscillation of pendulums, centres of oscillation and suspension, transverse loads, vibrations of beams with concentrated and distributed loads. Dunkerly's methods, Raleigh's method, Whirling of shafts, Critical speeds, torsional vibrations, two and three rotor systems. Introduction to damped and forced vibrations.

Text Books:

1. Theory of Machines, S.S. Ratan, Mc.GrawHillPubl.
2. Theory of Machines, - Khurmi, S.Chand Publications.

References:

1. Theory of Machines,ThomasBevan,.CBS Publishers.
2. Theory of Mechanism and Machines, J.E.Shigley, Mc.Graw Hill Publ.

Useful Web-links:http://nptel.ac.in/courses.php.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	2	-	-	-	-	-	-
CO4	-	-	-	-	-	-	1	-	-	-	-	-
CO5	-	-	3	-	-	-	-	-	-	-	-	-

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. I Sem (5^{th} semester)			
Course Code	**Heat Transfer**				
Teaching	Total contact hours- 45	L	T	P	C
Prerequisite(s): Thermodynamics		3	0	0	3

Course Objectives:

Students undergoing this course will be able to:

- Understand the modes of heat transfer and thermo-physical properties.
- Understand the concepts of various experimental heat transfer correlations in engineering applications.
- Understand velocity and thermal boundary layers in convective heat transfer.
- Learn concepts of heat exchangers.
- Understand the radiation heat transfer.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Explain the basic concepts of heat transfer.
CO2:	Solve the problems involving steady state and transient heat conduction in simple geometries.
CO3:	Analyze the forced and free convective heat transfer through various systems.
CO4:	Analyze the performance of heat exchangers and evaporators using boiling and condensation principles.
CO5:	Illustrate the real time applications of radiation heat transfer.

Syllabus:

UNIT-I

INTRODUCTION: Modes and mechanisms of heat transfer –laws of heat transfer –applications of heat transfer.

CONDUCTION HEAT TRANSFER: Fourier equation – General heat conduction equation in cartesian, cylindrical and spherical coordinates. Steady, unsteady and periodic heat transfer – Initial and boundary conditions.

ONE DIMENSIONAL STEADY STATE HEATCONDUCTION: Homogeneous slabs, hollow cylinders and spheres – Overall heat transfer coefficient – Electrical analogy – Critical radius of insulation- Variable thermal conductivity – Systems with heat sources and heat generation.

UNIT -II

HEAT TRANSFERIN EXTENDED SURFACES: Long fin, fin with insulated tip and short fin-effectiveness and efficiency, application to error measurement of temperature.

ONE DIMENSIONAL TRANSIENT HEAT CONDUCTION: Systems with negligible internal resistance – Significance of biot and Fourier numbers - Chart solutions of transient conduction systems.

CONVECTIVE HEAT TRANSFER: Classification of convective heat transfer , dimensional analysis as a tool for experimental investigation – Buckingham Pi Theorem for forced and free convection, application for developing semi , empirical non- dimensional correlation for convective heat transfer – Significance of non-dimensional numbers – Concepts of continuity, Momentum and Energy Equations.

UNIT- III

FORCED CONVECTION

EXTERNAL FLOWS: Concepts about hydrodynamic and thermal boundary layer and use of empirical correlations for convective heat transfer-flat plates and cylinders.

INTERNAL FLOWS: Concepts about hydrodynamic and thermal entry lengths, division of internal flow based on this– Use of empirical relations for horizontal pipe flow and annulus flow.

FREE CONVECTION: Development of hydrodynamic and thermal boundary layer along a vertical plate – Use of empirical relations for vertical plates and pipes.

UNIT -IV

BOILING: Pool boiling – Regimes, calculations on nucleate boiling, critical heat flux and film boiling.

CONDENSATION: Film wise and drop wise condensation –Nusselt's theory of condensation on a vertical plate - Film condensation on vertical and horizontal cylinders using empirical correlations.

HEAT EXCHANGERS: Classification of heat exchangers –Overall heat transfer coefficient and fouling factor – Concepts of LMTD and NTU methods – Problems.

UNIT -V

RADIATION HEAT TRANSFER: Emission characteristics and laws of black ,body radiation – Irradiation – total and monochromatic quantities – Laws of Planck, Wien, Kirchoff, Lambert, Stefan and Boltzmann– Heat exchange between two black bodies – Concepts of shape factor – Emissivity – Heat exchange between grey bodies – Radiation shields – Electrical analogy for radiation networks.

Text Books:

1. Heat Transfer/JP HOLMAN/TMH/10th editon.
2. Heat Transfer/P.K.Nag,/TMH/3rd edition /2011.

References:

1. Heat and Mass Transfer/YunusACengel; Afshin J. Ghajar/McGraw-Hill/ 5th edition/ 2017.
2. Heat and Mass Transfer/ D.S. Kumar, S.K. Kataria & Sons./2013.
3. Heat and Mass Transfer/Arora and Domkundwar,Dhanpatrai& sons/2007.
4. Fundamentals of Engg. Heat and Mass Transfer/R.C.Sachdeva/New Age Science/2009.
5. Heat and Mass Transfer/R.K.Rajput/S. Chand Publishing/2019.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	3	-	3	2	-	1	-	-	3
CO2	3	3	1	3	-	3	3	1	-	1	-	1
CO3	3	3	-	3	-	3	2	-	-	-	-	-
CO4	3	3	-	3	-	3	2	1	-	1	-	2
CO5	3	3	-	3	-	3	2	-	-	1	-	2

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. I Sem (5th semester)			
Course Code	**Metal Cutting and Machine Tools**				
Teaching	Total contact hours–45	L	T	P	C
Prerequisite(s):Material Science, Strength of Materials.		3	0	0	3

Course Objectives:

Students undergoing this course will be able to:

- Learn the basics in mechanics of metal cutting.
- Demonstrate the fundamentals of machining processes and machine tools.
- Develop knowledge and importance of metal cutting parameters.
- Develop fundamental knowledge on tool materials, cutting fluids and tool wear mechanisms.
- Train in knowing the fundamental parts of various machine tools and their kinematic schemes.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Explain the cutting tool geometry, chip formation and cutting forces.
CO2:	Describe the various parts and operations of machine tools viz. lathe, shaper, planer, drilling, boring, milling, grinding and broaching machine.
CO3:	Identify various machine tools viz. lathe, shaper, planer, drilling, boring, milling and grinding machine for various applications.
CO4:	Discuss various principles and applications of jigs and fixtures .
CO5:	Explain the working principles of various Non Traditional Machining.

Syllabus:

UNIT-I

FUNDAMENTALS OF MACHINING: Elementary treatment of metal cutting theory – Elements of cutting process – Geometry of single point tool, tool signature, chip formation and types of chips – Built up edge and its effects - Chip breakers, mechanics of orthogonal cutting – Merchant's circle, cutting forces, cutting speed, feed, depth of cut, metal removal rate, tool life, heat generation in metal cutting, coolants, tool materials, machinability, economics of metal cutting.

UNIT –II

LATHE MACHINES: Engine lathe – Working principle, specification of lathe – Types of lathe – Work holders and tool holders –Lathe operations- Problems on taper turning and thread turning, lathe attachments.. Turret and Capstan lathes – Tool layout. Principal features of automatic lathes –

Classification – Single spindle and multi-spindle automatic lathes – Tool layout, Machining time calculations.

SHAPING, SLOTTING AND PLANING MACHINES: Working principle– Principal parts – Specifications, Operations performed, Machining time calculations**.**

UNIT – III

DRILLING AND BORING MACHINES: Working principle, specifications, types, operations performed–Tool holding devices – Twist drill,– Deep hole drilling machine, Machining time calculations. Boring Machines – Fine Boring Machines – Jig boring machine.

MILLING MACHINES: Working principle – Specifications – Classification of milling Machines – Principal features of horizontal, Vertical and universal milling Machine, Machining operations, types of cutters, geometry of milling cutters – Methods of indexing - Accessories of milling machines, Machining time calculations.

UNIT –IV

FINISHING PROCESSES: Theory of grinding – Classification of grinding machines, cylindrical and surface grinding machines, tool and cutter grinding machines - Types of abrasives, specification and selection of a grinding wheel. Dressing and truing of grinding wheels, Lapping, Honing.

JIGS & FIXTURES: Principles of jigs and fixtures design - Classification of jigs & fixtures, principles of location and clamping, types of clamping devices.

UNIT - V

INTRODUCTION TO NON TRADITIONAL MACHINING: Classification of machining processes, Principle, Applications, Advantages and disadvantages of Ultra Sonic Machining (USM), Abrasive Jet Machining (AJM), Electrochemical machining (ECM), , Electro Discharge Machining (EDM), Electron Beam Machining (EBM), Laser Beam Machining (LBM), Plasma Arc Machining(PAM).

Text Books:

1. A Course in Workshop Technology, B.S. Raghu Vamshi, DhanpatRai& Co., Vol. II, 10th Ed., 2012.
2. Production Technology: Manufacturing Processes, Technology and Automation, R.K. Jain, KhannaPublishers, 6th ed., 2004.

References:

1. Manufacturing Technology: Metal Cutting and Machine Tools, P.N Rao, McGraw Hill Education, Vol.2, 3rd ed., 2013.
2. Advanced Machining Processes, V. K. Jain, Allied Publishers Pvt. Ltd., New Delhi, 2007
3. Manufacturing Processes for Engineering Materials, Serope Kalpakjian, Steven R.Schmid, Pearson Education, 14th ed., 2016.
4. Machining Technology: Machine Tools and Operations Hardcover ,Helmi A. Youssef & Hassan El- Hofy – 9 May 2008.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	
CO2	-	1	2	-	-	-	2	-	-	-	-	2
CO3	2	3	1	-	-	-	-	-	2	-	-	2
CO4	2	3	-	-	-	-	-	-	-	-	-	1
CO5	1	3	-	-	-	-	-	-	-	-	-	-

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. I Sem (5 semester)			
Course Code	**Environmental Pollution and Control (Open Elective - I)**				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisite(s): Basics of Air, Water, Soil and Noise Pollutants, Knowledge of Environmental Engineering-I.		3	-	-	3

Course Objectives:

The objective of this course is:

a. ***Impart knowledge on fundamental aspects of air pollution & control, noise pollution, and solid waste management.***
b. ***Provide basic knowledge on sustainable development.***
c. ***Introduces some basics of sanitation methods essential for protection of community health.***
d. ***Differentiate the solid and hazardous waste based on characterization.***

Unit – I

Air Pollution: Air pollution Control Methods–Particulate control devices – Methods of Controlling Gaseous Emissions – Air quality standards.

Noise Pollution: Noise standards, Measurement and control methods – Reducing residential and industrial noise – ISO14000.

Unit – II

Industrial wastewater Management: – Strategies for pollution control - Volume and Strength reduction – Neutralization – Equalization – Proportioning – Common Effluent Treatment Plants - Recirculation of industrial wastes – Effluent standards.

Unit – III

Solid Waste Management: solid waste characteristics – basics of on-site handling and collection – separation and processing - Incineration- Composting-Solid waste disposal methods – fundamentals of Land filling.

Unit – IV

Hazardous Waste: Characterization - Nuclear waste – Biomedical wastes – Electronic wastes - Chemical wastes – Treatment and management of hazardous waste-Disposal and Control methods.

Unit – V

Sustainable Development: Definition- elements of sustainable developments-Indicators of sustainable development- Sustainability Strategies- Barriers to Sustainability–Industrialization and sustainable development – Cleaner production in achieving sustainability- sustainable development.

Course Outcomes

After completion of the course, a successful student is able to

1. Identify the air pollutant control devices
2. Have knowledge on the NAAQ standards and air emission standards
3. Differentiate the treatment techniques used for sewage and industrial wastewater treatment methods.

4. Understand the fundamentals of solid waste management, practices adopted in his town/village and its importance in keeping the health of the city.
5. Appreciate the methods of environmental sanitation and the management of community facilities without spread of epidemics.
6. Appreciate the importance of sustainable development while planning a project or executing an activity.

Text Books:

1. Environmental Engineering, by Ruth F. Weiner and Robin Matthews – 4th Edition Elesevier, 2003.
2. Environmental Science and Engineering by J.G. Henry and G.W. Heinke – Pearson Education.
3. Environmental Engineering by Mackenzie L Davis & David A Cornwell. McGraw Hill Publishing.

References:

1. Air Pollution and Control by M.N. Rao & H.N. Rao
2. Solid Waste Management by K. Sasi Kumar, S.A. Gopi Krishna. PHI New Delhi.
3. Environmental Engineering by Gerard Kiley, Tata McGraw Hill.

Web-Resources: www.nptel.com

CO-PO Mapping:
(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High],'-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	2	-	-	-	-	-	-	-
CO2	-	-	-	2	-	-	-	-	-	-	-	-
CO3	-	-	-	-	3	-	-	-	-	-	-	-
CO4	-	-	-	-	-	1	-	-	-	-	-	-
CO5	-	-	-	3	-	-	-	-	-	-	-	-

GODAVARI INSTITUTE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)
Approved by AICTE, Accredited by NBA & NAAC 'A' Grade, Recognized under 2(f) and 12(b) of UGC, Permanently Affiliated to JNTUK, Kakinada.
GRBT-20

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. I Sem (OPEN ELECTIVE-I)			
Course Code	FUNDAMENTALS OF UTILIZATION OF ELECTRICAL ENERGY				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s): Power Systems		3	0	0	3

Course Objectives:

The objectives of the course are to make the student learn about

1. To understand selection of drives for industrial application.
2. To understand the heating and welding methods for industrial applications.
3. To understand the concepts of Electrolysis processes and illumination engineering.
4. To identify the various types of Industrial loads
5. To understand electric traction system and drives.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Identify most appropriate heating or welding techniques for suitable applications
CO2:	understand various level of luminosity produced by different illuminating sources
CO3:	Identify a suitable motor for electric drives and industrial applications
CO4:	Identify the various types of Industrial loads
CO5:	Understand electric traction system and drives.

UNIT – I

Electric Heating: Advantages and methods of electric heating–Resistance heating, induction heating and dielectric heating.

UNIT – II

Electric Welding: Electric welding–Resistance and arc welding–Electric welding equipment– Comparison between AC and DC Welding

UNIT – III

Illumination Fundamentals: Introduction, terms used in illumination–Laws of illumination–Polar curves– Integrating sphere–Lux meter–Sources of light

Various Illumination Methods: Discharge lamps, MV and SV lamps – Comparison between tungsten filament lamps and fluorescent tubes

UNIT – IV

Selection of Motors: Choice of motor, type of electric drives, starting and running characteristics– Speed control–Temperature rise–Applications of electric drives–Types of industrial loads– continuous–Intermittent and variable loads–Load equalization.

UNIT – V

Electric Traction: System of electric traction and track electrification– Review of existing electric traction systems in India– Special features of traction motor– Mechanics of train movement– Speed–time curves for different services – Trapezoidal and quadrilateral speed time curves.

Text Books:

1. Utilization of Electric Energy – by E. Openshaw Taylor, Orient Longman.
2. Art & Science of Utilization of electrical Energy – by Partab, DhanpatRai& Sons.

Reference Books:

1. Utilization of Electrical Power including Electric drives and Electric traction – by N.V.Suryanarayana, New Age International (P) Limited, Publishers, 1996.
Generation, Distribution and Utilization of electrical Energy – by C.L. Wadhwa, New Age

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlafion)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01	✓	✓										
C02								✓				
C03					✓							
C04	✓		✓									
C05												✓

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. I Sem (5 semester)			
Course Code	**MICROPROCESSOR AND ITS INTERFACING (Open Elective-1)**				
Teaching	Totalcontacthours-45	L	T	P	C
Prerequisite(s): Knowledge of Computer Architectures and Switching Theory& Logic Design		3	-	-	3

COURSE OBJECTIVES:
The student will be able to

1. Learn 8086 Architecture, Register Organization, Different addressing modes and concepts of Memory Interfacing
2. Understand the basic concepts of 8086 programming and Interfacing.
3. Learn basic concepts of 8086 microprocessor with real world.
4. Learn architecture of AVR Microcontroller, Importance of Bit addressability, function of Special registers and basic concepts of Assembly Language program
5. Learn the concepts of Embedded C Programming and Interfacing of AVR Microcontroller with real world through different device.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	Understand architectural difference between Microprocessor and Microcontroller and its need for development of products and product development procedure
CO2	Discuss the concepts of programming in Assembly Language
CO3	Apply the concepts of Interfacing of 8086 microprocessor with outside world.
CO4	Understand the architecture of AVR microcontroller
CO5	Analyze concepts of Input/output port Interfacing of microcontroller and apply the concept of interfacing AVR micro controller with outside.

Syllabus

UNIT- I

8086 MICROPROCESSORS: Architecture 8086 details and Pin diagrams, register organization of 8086, Signal description of 8086, physical memory organization, general bus operation, I/O addressing capability, Minimum mode, Maximum mode of 8086 system and timings diagrams.

UNIT II

PROGRAMMING WITH 8086 MICROPROCESSOR and INTERFACING: Addressing mode of 8086, Instruction set of 8086, Assembly language programming, Introduction to stack, stack structure of 8086, interrupts and interrupt service routines, interrupt cycle of 8086, non-mask able interrupt and mask able interrupts, interrupt programming.

UNIT III

8086 INTERFACING: Architecture of 8255, PIO 8255 modes of operation of 8255, Stepper motor interfacing, Seven Segment Display Interfacing. Intel 8259 Priority Interrupt Controller. Intel 8257 DMA

UNIT IV

AVR ARCHITECTURE AND ASSEMBLY LANGUAGE PROGRAMMING: AVR architecture, General Purpose Registers and Special Purpose Registers, Status Registers, Program Counter and Stack Pointer and Stack Memory organization, Addressing Modes, Assembly Language Instruction Set, Delay Calculation and Directives, Bit-Addressability, Look-Up Table and processing, Macros.

UNIT V

Embedded C Programming: Compiler, Cross-Compilers, Intel and Motorola Hex file, Object File, Basics of Embedded C and C data types for AVR, I/O Programming in Embedded C, Delay calculation in Embedded C. LED interfacing and blinking, AVR Serial Port Programming, AVR Interrupt Programming. Interfacing Push-Buttons.

TEXT BOOKS:

1. Ray and Burchandi, "Advanced Microprocessors and Interfacing", Tata McGraw–Hill
2. M.A.Mazidi,S.Naimi and S.Naimi,"The AVR Microcontroller and Embedded Systems Using Assembly and C", 1st Edition Pearson Publications, 2013.

REFERENCES:

1. N.Sentil Kumar, M.Saravanan, S.Jeevananthan, "Microprocessors and Microcontrollers"Oxford University Press, 2010.
2. Krishna Kant, "Microprocessors and Microcontrollers", PHI Publications, 2010.
3. Dhananjay V. Gadre ,"Programming and Customizing The AVR Microcontroller ", TATA McGraw Hill publications, 2012.

CO-PO mapping:
1: Slight (Low) 2:Moderate(Medium) 3:Substantial(High) -: No correlation

Course Code :		Microprocessor and Microcontroller											
Course Designed by		Department of Electronics and Communication											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1	3	3	3	2	-	-	-	-	-	-	-	3
	CO 2	3	3	3	1	-	-	-	-	-	-	-	3
	CO 3	1	3	3	2	-	-	-	-	-	-	-	3
	CO 4	3	3	3	2	-	-	-	-	-	-	-	3
	CO 5	3	3	3	1	-	-	-	-	-	-	-	3
Category		General Humanities		Basic Sciences		Engineering Sciences And Technical			Professional Subjects				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

Regulation GRBT-20	GODAVARI INSTITUTE OF ENGINEERING & TECHNOLOGY (Autonomous)	III B.Tech I Semester			
Course Code 201CS504	**FOUNDATIONS OF OPERATING SYSTEMS** Open Elective-1: CSE, CSE (AI/ML), CSE (Cyber Security)				
Teaching	Total contact hours: 48	L	T	P	C
Prerequisite(s): Computer Organization and Architecture		3	0	0	3

Course Objective(s):

1. To make aware of different types of Operating System and their services.
2. To learn different process scheduling algorithms and synchronization techniques to achieve better performance of a computer system.
3. To know virtual memory concepts.
4. To learn secondary memory management

Course Outcome(s):

After successful completion of this course, a student will be able to-

CO-1: Describe the general architecture of computers
CO-2: Describe, contrast and compare differing structures for operating systems
CO-3: Analyze theory and implementation of processes, resource control (Concurrency etc.), physical and virtual memory, scheduling, I/O and files
CO-4: Illustrate Memory Management Techniques and Page Replacement Algorithms.
CO-5: Demonstrate Mass Storage Structures and Disk structure

UNIT-1

Computer System and Operating System Overview: Overview of computer operating system, operating system structure, operating system operations, protection and security, services, systems call, operating system generation.

UNIT-2

Process Management: Process concept- process scheduling, operations, Process scheduling criteria and algorithms, and their evaluation, Multi Thread programming models, Inter process communication.

UNIT-3

Concurrency: Process synchronization, the critical- section problem, Peterson's Solution, synchronization hardware, semaphores, classic problems of synchronization, monitors.

UNIT-4

Memory Management: Swapping, contiguous memory allocation, paging, structure of the page table, segmentation.

Virtual Memory Management: Virtual memory, demand paging, page-Replacement algorithms, Allocation of Frames, Thrashing

UNIT-5

Mass-Storage Structure: Overview of Mass-storage structure, Disk structure, disk attachment, disk scheduling (FCFS, SCAN, CSCAN, SSTF)

Text Books

1. Operating System Concepts- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley.
2. Operating Systems – Internal and Design Principles Stallings, Sixth Edition–2005, Pearson education.

Reference Books

1. Operating systems- A Concept based Approach-D.M.Dhamdhere, 2nd Edition, TMH
2. Operating System A Design Approach-Crowley, TMH.
3. Modern Operating Systems, Andrew S Tanenbaum 3rd edition PHI.

Web References:

1. http://nptel.ac.in/courses/106108101 (Prof. P.C.P. Bhatt, IISc Bangalore)

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High]; '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	-	-	-	-	-	-	-	-	-	-	1
CO2	2	-	1	2		-	-	-	-	-	-	-	3	2
CO3	3	3	-	-	3	-	-	-	-	-	-	-	2	2
CO4	1	-	-	2	-	-	-	-	-	-	-	-	3	2
CO5	1	-	2	-	1	-	-	-	-	-	-	-	2	1

AUTOMOBILE ENGINEERING GRBT20

III Year – I Semester		L	T	P	C
		3	0	0	3
OPEN ELECTIVE-1	BASIC AUTOMOBILE ENGINEERING				

Course Objectives:

To make the student able to

- Categorize working of different automobile structures and layouts.
- Distinguish different types of automobile engines and different components in it.
- Correlate different transmission elements and control systems.
- Distinguish the functions of Control systems.
- Integrate Electric Power train Systems in Automobiles.

Course Outcomes:

On completion of the course, the students will be able to-	
CO1:	Compare different types of automobiles and their components.
CO2:	Differentiate working principles of different types of automobile engines.
CO3:	Illustrate working of different transmission elements and control systems.
CO4:	Demonstrate Automobile Control systems.
CO5:	Illustrate various Eco Friendly Vehicles.

UNIT-I

Introduction to Automobiles:

Functions and characteristics of different types of automobiles and their power sources. Specifications, Performance Parameters, Quality standards, Trends in automobile design.

UNIT-II

Automobile Engines and their Systems:

Engine Specifications with regard to power, speed, torque, no. of cylinders and arrangement, lubrication and cooling etc. Reciprocating Engines, Rotary Engines.

Engine Lubrication systems, Engine cooling system, Engine fuel systems, Engine intake & exhaust systems.

Principles of Ignition system and starting system.

UNIT-III

Transmission Systems:

Clutches, principle of operations, types, cone clutch, single plate clutch, multi plate clutch, magnetic and centrifugal clutches, fluid fly wheel-gear boxes, types, sliding mesh, constant mesh, synchro-mesh gear boxes, over drive, torque converter. Propeller shaft, Torque tube drive, universal joint & slip joint, Hotch-kiss drive, differential rear axles-types-wheels and tyres.

AUTOMOBILE ENGINEERING GRBT20

UNIT-IV

Introduction to Control Systems:

Steering geometry-camber, castor, king pin rake, combined angle toe-in, center point steering. Mechanical, hydraulic, pneumatic & vacuum brakes-brief description.

Rigid axle suspension and independent suspension, Shock absorbers, Different types of springs used in automobile suspension.

UNIT-V

Electric & Hybrid Vehicles:

Principles of Battery Electric Vehicles and its Components, Principles of Hybrid Electric Drive Trains and its Architecture.

TEXT BOOKS:

1. Automotive Mechanics, William H Crouse and Donald L Anglin, Tata McGraw – Hill Publishing Co. Ltd. 2004, 10th Edition.
2. Automobile Engineering – R.B. Gupta.
3. Automobile Engineering (Vol. 1) – Dr. Kirpal Singh
4. Automobile Engineering (Vol. 2) – Dr. Kirpal Singh
5. Automobile Engineering – KK Ramalingam

REFERENCES:

1. Automobile Engineering – G.B.S. Narang.
2. IC Engines –V. Ganeshan / TMH
3. IC Engines – ML Mathur & RP Shrma
4. IC Engines –Domkundvar
5. BP Obert IC Engines & Air Pollution – Harper & Row pub.
6. Bosch Gasoline Engines Management – Bosch Pub.
7. Bosch Diesel Engine Management – Bosch Pub.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	1	-	-	-	-	-	-
CO2	3	2	-	-	-	1	-	-	-	-	-	-
CO3	3	2	-	1	-	1	-	-	-	2	-	-
CO4	3	2	-	-	-	-	-	1	2	-	1	1
CO5	2	2	-	-		-	3	-	-	-	-	-

Department of Mining Engineering *Open Electives*

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B. Tech. I Sem. (5th Semester)			
Course Code	**Elements of Mining Technology** (Open Elective-I)				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisites: Nil		3	0	0	3

Course Objectives

1. To introduce the concept of different methods of mining.
2. To impart the knowledge of classification of coal seams.
3. To explain the concepts of drilling methods.
4. To impart the knowledge of different explosives and blasting used in mining.
5. To elaborate the concept of latest technologies for mining industry.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Know the various Elements of Mining and stages/phases in Mining
CO2:	Know the concepts of Mining Methods.
CO3:	Know the Drilling methods.
CO4:	Understand the explosives and blasting practice in mines.
CO5:	Understand the application of latest technologies in mining industry

Syllabus

UNIT-I

Introduction to Mining; Types of Mines, Contribution of Mining activities to civilization; Definitions of terms; Status of Mining Industries in the state and in the country; Stages of Mining - Pre-mining, mining, and post-mining - ancillary mining operations; Types of entries to mineral deposits - Shaft, Incline, Decline, Adit - applicable conditions- limitations, compare shaft vs incline.

UNIT-II

Concepts and Definition of terms commonly used in coal and non-coal mining; Classification of the mineral deposits basing on various factors - shallow, deep, very deep, steeply inclined, moderately inclined, inclined vein, massive deposits. Classification of coal seams - Thick, moderately thick, thin seams, I, II, III-degree gassy seams. Classification of methods of working coal-opencast, underground-Bord and Pillar/ longwall-Advancing and retreating.

UNIT-III

Drilling methods: percussive, rotary, rotary-percussive; Tools used for drilling; Feed mechanism – Screw feed and hydraulic feed mechanism; Mud flushing –sludge and core, Core recovery methods; Reasons for deviation of bore holes. Single tube, double tube and wire line core barrel.

UNIT-IV

Explosives - Uses of explosives in mining industry, characteristics, and classification of explosives – tools, applicability; Initiation of explosives – fuses – safety fuse, cortexfuse. Detonators – types, composition. Different types of blasting practice in mines; Dangers and precaution measures of blasting. Dealing with misfires.

UNIT-V

Applications of Unmanned Aerial Vehicle, Drones, Remote Sensing and Geographical Information System for mining Industry.

Textbook(s)

1. Elements of Mining Technology: Vol-I; D.J. Deshmukh
2. Explosives and Blasting practice; G.K. Pradhan

Reference(s)

1. Elements of Mining Technology Vol-II; D.J. Deshmukh
2. Principles and Practices of Modern Coal Mining: R. D. Singh, New Age International, 1997.
3. Modern Coal Mining Technology: S. K. Das, Lovely Prakashan Publishers,1994.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B. Tech. I Sem. (5th Semester)			
Course Code 201PT565	**Fundamentals of Petroleum Engineering** (Open Elective-I)				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisites		3	0	0	3

Course Objectives

The objectives of this course are to

- Impart knowledge on transition from petroleum science to petroleum engineering.
- Explain the role of petroleum engineers in upstream, midstream and downstream sectors.
- Learn the fundamental concepts of upstream, midstream and downstream sectors.
- Impart Knowledge on the transportation of crude oil & its products and natural gas.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Understand overview of petroleum industry.
CO2:	Understand Exploration and Production of petroleum industry
CO3:	Understand Gathering of Oil & Gas and Storage
CO4:	Understand Midstream of petroleum industry
CO5:	Understand Downstream of petroleum industry

Syllabus

UNIT-I
Introduction
Introduction Petroleum Industry- Upstream Sector – Midstream Processing-Downstream Processing- Indian and World Scenario of Petroleum and Natural Gas- Petroleum Trade-Geopolitics.

UNIT II
Upstream Sector-1
Exploration & Production – Indian and World Scenario of Petroleum and Natural Gas Resources. The Reservoir –Reservoir fluids- Hydrocarbon Phase diagrams- Onshore and Offshore Reservoirs – Reservoir Drives.

UNIT III
Upstream Sector-2
Drilling Rigs- Rig Components-Drill and drill bits- Drilling fluids-Well Completions. Production System: Sketches of Well - Well head- Christmas tree and Casing and various other parts-

Cementing-Safety Systems. Subsea Wells: Drilling & Completion and Production. Artificial Lift: Principles and operation of Rod Pumps –Gas Lift –Electrical submersible pumps. Well Workover and Intervention- Well Stimulation. Basic concepts in Matrix Acidizing and Hydro-fracturing.

UNIT-IV

Gathering of Oil & Gas and Storage

Well tubing-Separation of Reservoir Fluids- Manifolds and Gathering – Production Separators – Gas Treatment and Compression - Oil & Gas Storage, Metering and Export.

Midstream Processing

Transportation of Crude Oil & its Products and Natural Gas- - World and Indian pipeline scenario- Safety aspects of pipelines- Environmental issues.

UNIT V

Downstream Processing

Crude Oil Refining: Classification and Composition – Constituents - Products and their specifications– Pre- treatment of crude oil- Refinery distillation- Safety in refinery operations.

Text Book(s)

1. Oil and Gas Production Handbook: An Introduction to Oil & Gas Production, Havard Devold, ABB ATPA Oil and Gas, 2006.
2. Introduction to Petroleum Engineering, John R. Fanchi and Christiansen, R.L., John Wiley & Sons, 2017.

Reference(s)

1. Petroleum engineering handbook: Howard.B. Bradley,SPE,1987
2. Petroleum engineering hand book: Larry .W.lake, SPE, volume II, 2006.
3. Petroleum engineering handbook: Production operations engineering, volume IV, Joe Dunn Clegg, 2009.

Regulation GRBT20	Godavari Institute of Engineering & Technology (Autonomous)	B.Tech. III – I			
CourseCode	**Principles of Management (Common to all Branches)**				
Teaching	**Total contact hours - 45**	L	T	P	C
Prerequisite(s):Basic Knowledge of Business Environment		3	0	0	3

Course Objectives:

- To help the students gain understanding of the functions and responsibilities of managers.
- To provide them tools and techniques to be used in the performance of the managerial job.
- To enable them to analyse and understand the environment of the organization.
- To help the students to develop cognizance of the importance of management principles.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Understand the concepts related to management and different schools of management thoughts.
CO2:	Apply the concepts of planning for effective management.
CO3:	Identify common organizational structures and the advantages and disadvantages
CO4:	Understand the complexities associated with management of human resources in the organizations and integrate the learning in handling these complexities and recognize the importance of employee motivation and how to promote it.
CO5:	Analyze effective application of communication in managerial decisions.

UNIT I

Fundamentals of Management: The concept- meaning, nature and scope, importance of management. principles and functions of management- thoughts of management- managerial roles and skills- levels of management.

UNIT II

Planning&Decision Making: Nature and importance of planning- steps in planning process- Types of plans.Types of decisions – steps in decision making process– decision tree analysis – Management by Objective (MBO).

UNIT III

Organizing: Nature and purpose of organizing- Principles of organizing- Organization structures- line and staff organizations - Delegation of authority- span of control-centralization- decentralization of authority.

UNIT IV

Staffing and Coordination: Importance of staffing, recruitment, selection, training and development concepts - factors in selecting lower, middle and upper-level managers.Need for coordination, Principles and techniques of coordination

UNIT V

Motivation ,Communication and Controlling: Motivation- significance of motivation, theories of motivation, Leading-Leadership styles, theories, Communication- process of communication, types of communication, barriers, overcoming barriers to communication, effective communication and its requirements.Importance of controlling, steps in controlling process, requirements of effective control, tools and techniques of control

References:

1. Harold Koontz, "Essentials of Management", 8th Ed., Tata McGraw- Hill Education, New Delhi,2014
2. Ricky W. Griffin, "Management", Cengage Learning, New Delhi, 2014
3. Heinz Weilrich, Mark V.Cannice& Harold Koontz, Management a Global and Entrepreneurial
4. Dilip Kumar Battacharya, Principles of Management, Pearson, 2012.
5. Kumar, Rao, Chhaalill "Introduction to Management Science" Cengage Publications, New Delhi
6. V.S.P.Rao, Management Text and Cases, Excel, Second Edition, 2012.
7. K.Anbuvelan. Principles of Management, University Science Press, 2013.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. I Sem (5^{th} semester)			
Course Code	**Fuels Combustion and Emission Control (Professional Elective-1)**				
Teaching	Total contact hours – 45	L	T	P	C
Prerequisite(s): Thermodynamics, Thermal Engineering		3	0	0	3

Course Objectives:

Students undergoing this course will be able to:

- Describe classification of fuel and their analysis
- Learn principles of combustion
- Outline thermodynamics of combustion and equilibrium compositions of gaseous fuels.
- Discuss the chemical and dynamic structure of laminar and turbulent flames propagation
- Identify emissions from combustion and their controlling measures.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Differentiate between various fuels
CO2:	Examine various properties of fuels and their analysis.
CO3:	Identify the various factors responsible for laminar and turbulent flame propagation.
CO4:	Use different principles of flame stabilization and ignition to design combustor.
CO5:	Categorize emissions associated with combustion and identify their control techniques.

Syllabus:

UNIT-I

FUELS: Detailed classification – Conventional and Unconventional Solid, Liquid, gaseous fuels and nuclear fuels – Origin of Coal – Analysis of coal. Coal – Carburisation, Gasification and liquification – Lignite, properties of coal, action of heat on coal, oxidation of coal, hydrogenation of coal, efficient use of solid fuels, manufactured fuels, agro fuels, solid fuel handling, properties related to combustion, handling and storage.

UNIT -II

PRINCIPLES OF COMBUSTION: Chemical composition – Flue gas analysis – dew point of products – Combustion stoichiometry. Chemical kinetics – Rate of reaction – Reaction order – Molecularity, Zeroth, first, second and third order reactions – complex reactions – chain reactions. Theories of reaction Kinetics – General oxidation behaviour of HC's.

UNIT- III

THERMODYNAMICS OF COMBUSTION: Enthalpy of formation – Heating value of fuel – determination of heating value of fuels-Adiabatic flame Temperature –chemical equilibrium, Equilibrium composition of gaseous mixtures. Combustion analysis- problems.

UNIT –IV

LAMINAR AND TURBULENT FLAMES PROPAGATION AND STRUCTURE: Flame stability – Burning velocity of fuels – Measurement of burning velocity – factors affecting the burning velocity. Flame Propagation – Solid, Liquid & Gaseous Fuels Combustion – Flame Temperature – Theoretical, Adiabatic & Actual – Ignition Limits – Limits of Inflammability.

UNIT –V

EMISSION CONTROLS: Emissions, Emission index, Design of engine, optimum selection of operating variables for control of emissions, EGR, Thermal reactors, secondary air injection, catalytic converters, catalysts, fuel modifications.

Text Books:

1. Fuels and combustion / Sharma and Chander Mohan/ Tata McGraw Hill.
2. Combustion / Sarkar / Mc. Graw Hill, Third edition, 2009.

References:

1. Combustion Fundamentals / Roger A Strehlow / McGraw Hill.
2. Combustion Engineering and Fuel Technology / Shaha A.K./ Oxford and IBH.
3. Principles of Combustion / KannethK.Kuo/ Wiley and Sons.
4. An Introduction to Combustion / Stephen R. Turns/ Mc. Graw Hill International Edition.
5. Combustion Engineering / Gary L. Berman & Kenneth W. Ragland/ Mc. GrawHill International Edition, 06 Dec 2007.

.CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	3	-	2	1	-	-	-	-	-
CO2	2	2	-	3	-	-	2	-	-	-	-	-
CO3	2	2	2	3	-	2	2	-	-	-	-	-
CO4	3	3	-	3	-	2	2	-	-	-	-	-
CO5	2	2	2	2	-	-	3	-	-	-	-	-

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. I Sem (5th semester)			
Course Code	**Tribology (Professional Elective-1)**				
Teaching	Total contact hours-45	L	T	P	C
Prerequisite(s):Fluid Mechanics		3	0	0	3

Course Objectives:

Students undergoing this course will be able to:

- Know the importance of tribology in Design, friction, wear and lubrication aspects of machine components.
- Select proper grade lubricant for specific application.
- Understand the principles of lubrication, lubrication regimes, theories of hydrodynamic and the advanced lubrication techniques.
- Introduce the concept of lubrication and its importance in tribology.
- Understand the principles of Elasto - Hydrodynamic and Gas Lubrication.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Describe the viscosity and laws of fluid flow with reference to lubrication.
CO2:	Examine hydrodynamic and hydrostatic properties of lubricants.
CO3:	Explain the journal and slider bearings under different load carrying conditions.
CO4:	Describe the oil flow through bearings under different pressures and with thermal equilibrium conditions.
CO5:	Discuss the concepts of Elasto– Hydrodynamic, Gas Lubrication and its applications in tribology.

Syllabus:

UNIT – I

INTRODUCTION: Lubricants, types of lubricants, nature of surfaces and contact, surface topography- Friction and wear mechanisms and effect of lubricants, methods of fluid film formation- Selection of rolling element bearings Nominal life, static and dynamic capacity - Equivalent load- Probabilities of survival, cubic mean load – Bearing mounting details - Preloading of bearings, condition monitoring using shock pulse method.

UNIT – II

HYDRODYNAMIC BEARINGS: Fundamentals of fluid film formation – Reynold's equation; Hydrodynamic journal bearings – Sommerfeld number –Performance parameters – Optimum bearing with maximum load capacity – Friction – Heat generated and heat dissipated. Hydrodynamic thrust bearings: Raimondi and Boyd solution for hydrodynamic thrust bearings – Fixed and tilting pads, single and multiple pad bearings – Optimum condition with largest minimum film thickness.

UNIT – III

HYDROSTATIC BEARINGS: Thrust bearings – Pad coefficients – Restriction – Optimum film thickness – Journal bearings – Design procedures- Aerostatic bearings: thrust bearings and journal bearings, design procedure - Dry rubbing bearings Porous metal bearings and oscillatory journal bearings, qualitative approach only.

UNIT – IV

LUBRICATION: Choice of lubricant type, oil, grease and solid lubricants, additives- Lubrication systems and their selection – Selection of pump, filters, piping design, oil changing and oil conservation.

UNIT – V

ELASTO - HYDRODYNAMIC LUBRICATION: Basic concept, Elasto-hydrodynamic lubrication between two contacting bodies, different regimes in EHL contacts.

GAS LUBRICATION: Introduction, merits and demerits, applications, externally pressurized gas bearings, porous gas bearings, and Dynamic characteristics of gas lubricated bearing.

Text Books:

1. Fundamentals of Tribology – S.K. Basu, S.N. Sengupta& B.B. Ahuja – PHI, 2015.
2. Engineering Tribology – Prasanta Sahoo – PHI, 2013.

References:

1. Principles and Applications of Tribology - Bharat Bhushan - John Wiley and Sons, 2013.
2. Tribology Handbook – Neale M J – Neumann Butterworths, 2016.
3. Introduction to Tribology – Bharat Bhushan ¬ – John Wiley and Sons Ltd, 2013.
4. Hydrostatic and Hybrid Bearing Design – Rowe W W& O' Dionoghue – Butterworths & Co. Publishers Ltd., 2012.
6. Engineering Tribology, J. A. Williams, Oxford Univ. Press, 2005.
7. Engineering Tribology - Stachowiak - Elsevier Science (publisher) 4th edition- 2014.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-		-	2	-	-	-	-	-	-
CO3		1	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	1	-	-	-	-	-
CO5	-	-	2	-	-	-	-	-	-	-	-	-

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. I Sem (5th Semester)			
Course Code	**Industrial Robotics (Professional Elective-1)**				
Teaching	Total contact hours-45	L	T	P	C
Prerequisite(s): Engineering Mathematics, Engineering Mechanics, Kinematics of Machinery, Dynamics of Machinery.		3	0	0	3

Course Objectives:

Students undergoing this course will be able to:

- Understand the fundamentals of robotics, their anatomy and applications in various fields.
- Study various types of drives and end effectors used in the industrial robots.
- Gain knowledge on forward and inverse kinematics of basic industrial robotic configurations.
- Understand the concept of differential motion analysis and sensors.
- Learn about trajectory planning and robot programming methods used in industrial robots.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Discuss the fundamentals of robotics, their anatomy, applications in various fields and safety aspects.
CO2:	Explain about different types of drives and end effectors used in the robot.
CO3:	Solve the problem in forward and inverse kinematics using homogeneous representation of transformations.
CO4:	Explain differential motions and sensors used in robots.
CO5:	Explain path and trajectory planning, different robot programming methods, industrial applications of Robots.

Syllabus:

UNIT-I

INTRODUCTION TO ROBOTICS: Industrial automation and Robotics, CAD/CAM and Robotics –An overview of Robots – Definition – Robot anatomy – Coordinate systems, Terminology, degrees of freedom, work envelopes, Pitch, yaw, roll, joint notations, pay load- Robot parts and their functions-Classification by coordinate systems and control system. Function line diagram representation of Robotic arms, Applications of robots in various fields. Safety considerations in using Robots.

UNIT-II

ROBOT DRIVES: Pneumatic Drives-Hydraulic Drives-Mechanical Drives-Electrical drives-D.C. servo motors, stepper motors, A.C. servo motors-Salient features, applications and comparison.

ROBOT END EFFECTORS: Grippers-Mechanical grippers, pneumatic and hydraulic grippers, magnetic grippers, vacuum grippers – Two fingered and three fingered grippers – Internal grippers and external grippers – Challenges of end effectors, Selection and design considerations.

UNIT-III

MOTION ANALYSIS: Translation and Rotation Representation, homogeneous representation, Coordinate transformation, Singularity – problems.

MANIPULATOR KINEMATICS: Specifications of matrices, D-H notation joint coordinates and world coordinates, Forward and inverse kinematics – problems.

UNIT-IV

DIFFERENTIAL MOTIONS: Forward and Inverse Dynamics, Jacobians, Lagrange – Euler and Newton – Euler formulations – Problems.

SENSORS: Sensors – Types of sensors – contact, position, displacement and velocity sensors, force and torque sensors – proximity and range sensors, acoustic sensors – Robot vision systems – sensing and digitizing – image processing and analysis.

UNIT-V

PATH AND TRAJECTORY PLANNING: General considerations in path description and generation. Trajectory planning and avoidance obstacles, path planning, skew motion, joint integrated motion – straight line motion.

ROBOT PROGRAMMING AND APPLICATIONS: Robot programming methods - Lead Through Programming, Robot Programming Languages; Applications of Robots – Material handling – Machine loading and unloading, Assembly, Inspection, Welding, Spray painting, Mobile roto, Microbots – Recent developments in Robotics.

Text Books:

1. Industrial Robotics -Technology Programming and Applications, M. P. Groover, McGraw Hill, 2017.
2. Robotic Engineering - An Integrated Approach, Klafter R.D., Chmielewski T.A and Negin M., Prentice Hall.

References:

1. Introduction to Robotics Mechanics and Control, Craig J.J., Pearson Education, 2008.
2. Robotics Technology and Flexible Automation, Deb S.R., Tata McGraw Hill Book Co.,1994.
3. Robotics for Engineers, Koren Y., McGraw Hill Book Co., 1992.
4. Robotics Control, Sensing, Vision and Intelligence, Fu.K.S.,Gonzalz R.C. and Lee C.S.G., McGraw Hill Book Co., 1987.
5. Robotics and Image Processing, Janakiraman P.A., Tata McGraw Hill, 1995.
6. Robotics and Industrial Automation, Rajput R.K., S.Chand and Company, 2008.
7. Industrial Robots and Computer Integrated Manufacturing, Surender Kumar, Oxford and IBH Publishing Co. Pvt. Ltd., 1991.
8. Robotics and Control, R. K. Mittal and Nagrath, Tata McGraw-Hill Education, 3rd Edition, 2017.

Web Links:

1. https://onlinecourses.nptel.ac.in/noc19_me74/preview
2. https://onlinecourses.nptel.ac.in/noc21_de13/preview

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	-	-	-	-	-	-	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	2	-	-	1	-	-	-	-	-
CO4	-	2	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	2	-	-	1	-	-	-	-	-

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. I Sem (5th Semester)			
Course Code	**Advanced Materials (Professional Elective-1)**				
Teaching	Total contact hours–45	L	T	P	C
Prerequisite(s):Metallurgy & Material Science		3	0	0	3

Course Objectives:

Students undergoing this course will be able to:

- Understand the basics of polymers and composites- classifications and their properties and applications.
- Learn the polymer composites and their manufacturing methods.
- Understand the concept of composite laminates and their mechanical behaviour.
- Learn about functionally graded materials and shape memory alloys.
- Learn the fundamentals of shape memory alloys, Nano materials and biomaterials.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Discuss the composites and their classification.
CO2:	Describe polymer composites and their manufacturing methods.
CO3:	Analyze the mechanical behaviour of composite laminates.
CO4:	Investigate properties and applications of functionally graded materials and shape memory alloys.
CO5:	Explain the properties, applications of Nano materials and bio materials.

Syllabus:

UNIT-I

INTRODUCTION TO COMPOSITE MATERIALS: Introduction, classification- Polymer matrix composites, metal matrix composites, ceramic matrix composites, Carbon Fibre composites, Carbon–Carbon composites, and fibre reinforced composites and nature-made composites, Properties of Composites in comparison with standard materials and applications

REINFORCEMENTS: Classification of Reinforcement- Fibres, Filled, Whiskers, Flake, Particulates, Directly Solidified Eutectics.

UNIT-II

POLYMER COMPOSITES: Manufacturing methods - autoclave, tape production, moulding methods, filament winding, hand layup, Pultrusion, RTM and their applications.

METAL MATRIX COMPOSITES & CERAMIC COMPOSITES- Processing methods and their applications.

UNIT-III

MACROMECHANICAL ANALYSIS OF A LAMINA: Introduction, generalized Hooke's law, reduction of Hooke's law in three dimensions to two dimensions, Types of Laminates-Symmetric

Laminates, Anti symmetric laminate, Balanced Laminate, Quasi-Isotropic Laminates. Relationship of compliance and stiffness matrix to engineering elastic constants of an orthotropic lamina.

UNIT-IV

FUNCTIONALLY GRADED MATERIALS: Types of functionally graded materials-Classification different systems-Preparation-properties and applications of functionally graded materials.

SHAPEMEMORY ALLOYS: Introduction-Shape memory effect-Classification of shape memory alloys composition-Properties and applications of shape memory alloys.

UNIT-V

NANO MATERIALS: Introduction-properties at Nano scales-Advantages & disadvantages-Applications in comparison with bulk materials (Nano – structure, wires, tubes, composites). Special Nano materials: carbon nanotubes, fullerenes, nanowires, porous silicon. Piezoelectric materials, Electro active polymer (EAP) ,Magnetostrictive material.

INTRODUCTION TO BIO-MATERIALS: Introduction to basic concepts of Bio-Materials Science, Salient properties, Property requirement of biomaterials, Concept of biocompatibility.

Text Books:

1. Engineering Mechanics of Composite Materials / Isaac and M Daniel/Oxford University Press.
2. An introduction to Materials in Medicine, Biomaterials Science: Edited byRatner, Hoffman, Schoet and Lemons, Third Edition: Elsevier Academic Press, 2012.

References:

1. Mechanics of Composite Materials / R. M. Jones/ McGraw Hill Company, New York.
2. Mechanics of Advanced Materials and Structures by J N Reddy.
3. Analysis and performance of fibre Composites /B. D. Agarwal and L. J. Broutman /Wiley-Interscience, New York, 1980.
4. Mechanics of Composite Materials - Second Edition (Mechanical Engineering) /AutarK.Kaw / CRC Press.
5.Nano materials /A.K. Bandyopadyay/New age Publishers.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	2	-	-	-	-	-	-	-	-	-	-
CO2	-	-	2	-	-	-	-	-	-	-	-	-
CO3	-	-	2	-	-	-	-	-	-	-	-	-
CO4	-	2	-	-	-	-	-	-	-	-	-	-
CO5	-	2	-	-	-	-	-	-	-	-	-	-

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. I Sem (5th semester)			
Course Code	**Theory of Machines Lab**				
Teaching	Total contact hours-45	L	T	P	C
Prerequisite(s): Engineering mechanics, Theory of machines		0	0	3	1.5

Course Objectives:

Students undergoing this course will be able to:

- Understand the principles of gyroscope and governors.
- Determine the coefficient of friction for various belts.
- Determine the moment of inertia of flywheel.
- Determine the static and dynamic balancing of rotating mass systems.
- Determine the frequency of free and forced vibrations of spring mass systems.

Course Outcomes:

On Completion of the course, the students will be able to	
CO1:	Assess the gyroscopic effect and angular displacement of cam follower.
CO2:	Analyze the characteristic curves of different governors.
CO3:	Illustrate about different types of gears and four bar mechanism.
CO4:	Evaluate simple and compound screw jack.
CO5:	Analyze different types of vibration systems and spring mass systems.

List of Experiments:

1. Study and analysis of gyroscopic effect of a rotating disc.
2. Plot the displacement, velocity and acceleration curves for given cam profile.
3. Identify and compare the jump speeds of various cam follower pairs.
4. Determination of characteristics curves for given governor.
   a. Watt Governor
   b. Porter Governor
   c. Hartnell Governor
5. Analysis of natural and forced damped vibration of a spring mass system.
6. Calculating the efficiency of Simple and Compound Screw Jack.
7. Determining the moment of inertia of a Flywheel.

8. Determining the whirling speeds of different shafts.
9. Determining the co-efficient of friction for flat and V-Belts.
10. Study of Gear terminology, various types of tooth profiles and their applications.
11. Displacement, Velocity and acceleration Diagrams for a given Four Bar Mechanism.
12. Balancing of rotating massses.

CO-PO Mapping:

1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	3	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	2	-	-	-	-	-
CO5	-	-	3	-	-	-	-	-	-	-	-	-

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. I Sem (5th semester)			
Course Code	**Machine Tools Lab**				
Teaching	Total contact hours-45	L	T	P	C
Prerequisite(s): Material Science, Production Technology		0	0	3	1.5

Course Objectives:

Students undergoing this course will be able to:

- Understand terminology and geometry of tools and various operations on lathe.
- Understand various milling operations.
- Understand operations carried out on drilling, boring and broaching machines.
- Understand operations carried out on grinding machines.
- Familiarize different machine tools used in production floor.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Perform step and taper turning, thread cutting, knurling and boring operations on cylindrical work pieces using lathe machine.
CO2:	Produce prismatic parts with desired surface finish using surface grinding machine and tool angles using tool and cutter grinder machine.
CO3:	Perform indexing to machine spur gears on milling machine.
CO4:	Execute sequence of operations on slotting and shaping machines to generate keyways and splines on the given work piece.
CO5:	Carry out drilling and tapping operations to produce desired hole pattern on the given job.

The following experiments will be carried out:

1. Plain turning and Step turning operation using lathe machine.
2. Taper turning operation using different methods.
3. Threading and knurling operations using lathe machine.
4. Multi Start Thread Cutting using Lathe Machine.
5. Production of key ways using Slotting Machine.
6. Production of flat surface from the given work piece using shaping machine.
7. Gear cutting using Milling Machine.
8. Drilling & Tapping operation using Radial Drilling Machine.

9. Finishing of the given surface using surface grinding machine.
10. Grinding of Tool angles using Tool and Cutter Grinder.
11. Boring operation on Lathe Machine.
12. Estimation of MRR and Machining time on various machining process.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	-	-	-	-	-	-	-	-	-	-
CO2	-	1	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	2	-	-	-	-	-	-	-	-
CO4	-	-	-	-	2	-	-	-	-	-	-	-
CO5	-	-	-	-	2	-	-	-	-	-	-	-

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. I Sem (5th Semester)			
Course Code	**Modelling and Simulation of Mechanical Systems**				
Teaching	Total contact hours-45	L	T	P	C
Prerequisite(s): Engineering Mechanics, Kinematics of Machines and Dynamics of Machines.		0	1	2	2

Course Objectives:

Students undergoing this course will be able to:

- Perform Kinematic analysis of moving particles and Mechanisms.
- Observe the effect of slider and angular plane on the coefficient of friction between them.
- Perform static and dynamic force analysis over a planar mechanism.
- Perform kinematic analysis over gears and disc cam.
- Perform dynamic analysis of a spring-mass-damper system subjected to various types of loads.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Explain the Kinematic analysis of moving particles and Mechanisms.
CO2:	Explain the coefficient of friction between a slider and an angular plane.
CO3:	Synthesize the planar mechanisms and perform static and dynamic force analysis.
CO4:	Model and perform kinematic analysis over gears and disk cams.
CO5:	Model and perform dynamic analysis of a spring-mass-damper system subjected to various types of loads.

Any one of Matlab, Scilab, Python be used for programming and simulation of the following experiments.

Syllabus:

1. Analysis of a Particle: Bullet fired into the air its position, velocity and accelerations for various firing angles.

2. Friction: Determination of the co-efficient of friction between the slider and the inclined plane (sliding Friction)

3. Introduction to Kinematics
   Kinematics, Chains, Mechanisms, Mobility, Planer and spatial mechanisms, Types of mechanism motion, Kinematic synthesis.

4. Mathematical concepts in Kinematics
   Complex numbers and operations, Vector and Point Representations, Linear simultaneous Equations, Matrices, and Matrix operations, Intermediate and Total Spatial Motion.

5. Kinematic Analysis of Planer Mechanisms
   Slider-Crank Mechanism Analysis – Displacement Equations, Velocity equations, Acceleration Equations and Centrode Generation.

6. Static Force Analysis and modeling
   Static loading in planar space, Four-bar mechanism analysis, Planar mechanism static force analysis and modeling (in SimMechanics)

7. Dynamic Force Analysis of Planar Mechanisms
   Dynamic loading in planar space, Four-bar mechanism analysis, planer mechanism dynamic force analysis and modeling (in SimMechanics)

8. Design and Kinematic analysis of Gears.

9. Design and Kinematic analysis of disk cams.

10. Dynamic analysis of Spring-mass-damper system subjected to various types of loads.

Text Books:

1. Kinematics and Dynamics of Mechanical Systems: Implementation in MATLAB and SimMechanics, Kevin Russell, QiongShen, Raj S. Sodhi, CRC Press Inc.,
2. Kinematics, Dynamics, and Design of Machinery, Kenneth J. Waldron, Gary L. Kinzel, Sunil K. Agrawal, John Wiley & Sons Inc., 2016Wiley Publishers.

References:

1. Theory of Machines, Thomas Bevan, CBS Publishers.
2. Engineering Mechanics: Combined Statics & Dynamics, Russell Hibbeler, Pearson Education.

Web Links: https://in.mathworks.com/academia/courseware/teaching-mechanical-engineering-with-matlab-and-simulink.html.

CO-PO Mapping:
(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	-	3	-	2	1	-	-	-	-	-
CO2	1	2	-	3	-	-	2	-	-	-	-	-
CO3	2	2	2	2	-	2	2	-	-	-	-	-
CO4	2	3	-	3	-	2	2	-	-	-	-	-
CO5	1	2	2	2	-	-	3	-	-	-	-	-

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech II Semester			
Course Code	**INTELECTUAL PROPERTY RIGHTS & PATENTS**				
Teaching	Total contact hours- 30	L	T	P	C
Prerequisite(s): Basic knowledge of Real Property and Personal Property Intellectual Property and Patents and Trand marks.		3	0	0	0

Course Objectives:

1. To realize the importance of Intellectual property rights, which plays a vital role in advanced Technical and Scientific disciplines
2. Imparting IPR protections and regulations for further advancement, so that the students can familiarize with the latest developments

Course outcomes:

On Completion of the course, the students will be able to-	
CO1:	Laws and patents pave the way for innovative ideas which are instrumental for inventions to seek Patents
CO2:	Student get an insight on Copyrights, Patents and Software patents which are instrumental for further advancements
CO3:	Enhance technical skills to get patents and understand copyright laws.
CO4:	Analyze the Laws relating to the Trade Marks.
CO5:	Explore the Trade Secrets & Cyber Law and Cyber Crime.

UNIT I

Introduction to Intellectual Property Rights: Introduction to Intellectual Property Law – Evolutionary past – Intellectual Property Law Basics - Types of Intellectual Property - Innovations and Inventions of Trade related Intellectual Property Rights – Agencies Responsible for Intellectual Property Registration – Infringement - Regulatory – Over use or Misuse of Intellectual Property Rights - Compliance and Liability Issues.

UNIT II

Copyrights: Introduction to Copyrights – Principles of Copyright – Subject Matters of Copyright – Rights Afforded by Copyright Law –Copyright Ownership – Transfer and Duration – Right to prepare Derivative Works –Rights of Distribution – Rights of performers – Copyright Formalities and Registration – Limitations – Infringement of Copyright – International Copyright Law- Semiconductor Chip Protection Act.

UNIT III

Patent Rights and Laws: Introduction to Patent Law – Rights and Limitations – Rights under Patent Law – Patent Requirements – Ownership and Transfer – Patent Application Process and Granting of Patent – Patent Infringement and Litigation – International Patent Law – Double Patenting – Patent Searching – Patent Cooperation Treaty – New developments in Patent Law-Invention Developers and Promoters.

UNIT IV

Trade Marks: Introduction to Trade Mark – Trade Mark Registration Process – Post registration procedures – Trade Mark maintenance – Transfer of rights – Inter parties Proceedings – Infringement – Dilution of Ownership of Trade Mark – Likelihood of confusion – Trade Mark claims – Trade Marks Litigation – International Trade Mark Law.

UNIT V

Trade Secrets and Cyber Laws: Introduction to Trade Secrets – Maintaining Trade Secret – Physical Security – Employee Access Limitation – Employee Confidentiality Agreement –Trade Secret Law – Unfair Competition – Trade Secret Litigation – Breach of Contract – Applying State Law. Introduction to Cyber Law – Information Technology Act - Cyber Crime and – Data Security – Confidentiality – Privacy – International aspects of Computer and Online Crime.

Text Books:

1. Deborah E.Bouchoux: "Intellectual Property". Cengage learning , New Delhi
2. Kompal Bansal &Parishit Bansal "Fundamentals of IPR for Engineers", BS Publications (Press)
3. Cyber Law. Texts & Cases, South-Western's Special Topics Collections

Reference:

1. Richard Stim: "Intellectual Property", Cengage Learning, New Delhi.
2. R. Radha Krishnan, S. Balasubramanian: "Intellectual Property Rights", Excel Books. New Delhi.
3. M. Ashok Kumar and Mohd. Iqbal Ali: "Intellectual Property Right" Serials Publications.
4. Prabhuddha Ganguli: ' Intellectual Property Rights" Tata Mc-Graw – Hill, New Delhi

Web Links:

1. www.nptel.com
2. www.mooks.com

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	--	-	-	--	-	-	-	-	-	1	-
CO2	--	-	2	-	--	3	-	3	-	-		-
CO3	-	-		1	-	-	-	3	-	-	1	--
CO4	-	-	2	-	-	3	-		-	-	1	-
CO5	-	-	2	-	-	-	-	3	-	-	-	-

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. IISem (6th Semester)			
Course Code	**Design of Machine Members**				
Teaching	Total contact hours-45	L	T	P	C
Prerequisite(s): Engineering Mechanics, Mechanics of Solids.		3	0	0	3

(Use of approved design data book is permitted in the end semester examination)

Course Objectives:

Students undergoing this course will be able to:

- Learn about the basic stresses in machine elements and manufacturing considerations in Machine design.
- Learn about the strength of various machine elements.
- Learn about the design of riveted and welded and bolted joints of machine components.
- Learn about the design principles in the cotter joints and levers.
- Learn about the design and various applications of springs.

Course Outcomes:

On Completion of the course, the students shall be able to-	
CO1:	Describe the concepts of basic machine elements.
CO2:	Identify the preferred sizes, codes and selection of proper material for design of machine element
CO3:	Design the machine element under static and dynamic loading conditions.
CO4:	Choose the temporary and permanent joints required to assemble the machine elements.
CO5:	Suggest the required spring for the given application.

Syllabus

UNIT-I

INTRODUCTION: General considerations in the design, Engineering Materials and their properties – Selection –Manufacturing considerations in design, Introduction to tolerances and fits, BIS codes of steels.

STRESSES IN MACHINE MEMBERS: Simple stresses – Combined stresses – Torsional and bending stresses – Impact stresses – Stress strain relation – Various theories of failure – Factor of safety – Design for strength and rigidity – Preferred numbers. The concept of stiffness in tension, bending, torsion and combined situations.

UNIT-II**STRENGTH OF MACHINE ELEMENTS:** Stress concentration – Theoretical stress concentration factor– Fatigue stress concentration factor– Notch sensitivity – Design for fluctuating stresses – Endurance limit – Good man's line – Solderberg's line – modified Good man's line.

UNIT- III

RIVETED JOINTS: Types of riveted joints, Design of riveted joints, Boiler shell riveting, eccentric loading.

WELDED JOINTS: Design of transverse and parallel fillet welded joints. Eccentric loading of welded joints.

UNIT- IV

BOLTED JOINTS: Forms of Screw threads, Stresses in Screw fasteners, Design of bolts with pre-stresses – Design of joints under eccentric loading

COTTER AND KNUCKLE JOINTS: Cotter joints-Socket and spigot, Sleeve and cotter, Jib and cotter joints- Knuckle joints.

UNIT- V

MECHANICAL SPRINGS: Stresses and deflections of helical springs – extension -compression springs– Springs for fatigue loading, energy storage capacity – Helical torsion springs – Co-axial springs, leaf springs.

LEVERS: Design of levers – Hand levers-Foot lever – Cranked lever – Bell cranked lever of a lever safety loaded valve- rocker arm.

Text Books:

1. Design of Machine Elements, V.B. Bhandari 4/e, Tata McGraw Hill, 2017.
2. Machine Design: An Integrated Approach,Norton, R. L, 5/e, Pearson, 2013.

References:

1. Machine design, R.S. Khurmi and J. K. Gupta, 25/e, S.Chand Publishers, 2014.
2. Machine Design,T.V. Sundaramoorthy&N.Shanmugam, 6/e, SciTech Publishers, 2010.
3.Mechanical Engineering Design,Shigley, J.E and Mischke, C. R. 8/e, Tata McGraw Hill, 2008.
4. Design data hand book, S. Md. Jalaludeen.
5. Faculty of Mechanical Engineering, Design Data: Data Book of Engineers, PSG College of Engineering, 2012.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	-	2	2	-	-	-	-	-
CO2	3	3	3	2	-	2	2	-	-	-	-	-
CO3	3	3	3	2	-	2	2	-	-	-	-	-
CO4	3	3	3	2	-	2	2	-	-	-	-	-
CO5	3	3	3	2	-	2	2	-	-	-	-	-

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. II Sem (6th semester)			
Course Code	**Engineering Metrology and Instrumentation**				
Teaching	Total contact hours- 45	L	T	P	C
Prerequisite(s): Production Technology and Metal Cutting and Machine Tools		3	0	0	3

Course Objectives:

Students undergoing this course will be able to:

- Understand selection of fits and tolerances in manufacturing industry.
- Develop the basic knowledge on linear and angular measurements and their standards of measurements.
- Learn about different techniques to measure surface finish, flatness, gear and screw thread parameters.
- Understand principle and operation of comparators and machine tool alignment tests.
- Understand the construction and working principle of measuring instruments of displacement, temperature, speed, flow, pressure, stress and strain.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Examine the tolerances, limits and fits of engineering components.
CO2:	Describe linear, angular measuring instruments comparators and limit gauges.
CO3:	Discuss surface roughness, gear and screw thread measurements.
CO4:	Explain instruments for measurement of displacement, temperature, pressure, speed and flow parameters.
CO5:	Use instruments for measurement of stress and strain, fluid flow, torque and power.

Syllabus

UNIT-I

SYSTEMS OF LIMITS AND FITS: Introduction - limits, fits – tolerances, deviations, Unilateral and bilateral tolerance system, hole and shaft basis systems- interchangeability and selective assembly -International standard system of tolerances.

LIMIT GAUGES AND GAUGE DESIGN: Taylor's principle – design of go and no go gauges - plug, ring, snap, gap, taper, profile and position gauges.

COMPARATORS: Working principle and uses - Types, mechanical, optical, electrical and electronic, pneumatic comparators.

UNIT-II

Introduction: Elements of measurement system, errors, sources and types of errors, calibration and characteristics.

LINEAR MEASUREMENTS: Line standards, end standards - slip gauges, dial indicators, micrometers, vernier calipers.

MEASUREMENT OF ANGLES AND TAPERS: Bevel protractor, angle slip gauges, angle dekkor, spirit levels, sine bar, rollers and spheres used to measure angles and tapers.

FLATNESS MEASUREMENT: Measurement of flatness of surfaces- straight edges, surface plates, auto collimator.

UNIT – III

SURFACE ROUGHNESS MEASUREMENT: Differences between surface roughness and surface waviness –Numerical assessment of surface finish, Centre line average, Root mean square method, Method of measurement of surface finish – Profilograph, Talysurf, ISI symbols for indication of surface finish.

GEAR MEASUREMENT: Nomenclature of gear tooth, tooth thickness measurement with gear tooth vernier& flange micro meter, pitch measurement, rolling gear tester, involute profile checking.

SCREW THREAD MEASUREMENT: Elements of screw parameters – errors in screw threads-measurement of effective diameter, two wire and three wire methods.

MACHINE TOOL ALIGNMENT TESTS: Requirements of alignment tool tests -instruments used - Alignment tool tests on lathe, drilling and Milling machines.

UNIT – IV

MEASUREMENT OF DISPLACEMENT: Working principle of transducers, types, LVDT, piezo electric, inductive, capacitance, resistance transducers.

MEASUREMENT OF TEMPERATURE: Classification, principles of measurement – expansion, electrical resistance, thermistor, thermocouple, pyrometers, temperature indicators.

MEASUREMENT OF PRESSURE: Working principle of Bourdon pressure gauges, bellows – diaphragm gauges and Low pressure measurement - thermal conductivity gauges, McLeod pressure gauge.

MEASUREMENT OF SPEED: Mechanical tachometers – electrical tachometers – stroboscope, non-contact type of tachometers, principles of seismic instruments.

UNIT – V

FLOW MEASUREMENT: Magnetic, ultrasonic, turbine flow meter, hot wire anemometer, laser Doppler anemometer (LDA).

STRESS STRAIN MEASUREMENTS: Working principle of Electrical strain gauges – method of usage of resistance strain gauge for bending compressive and tensile strains, strain gauge rosettes.

MEASUREMENT OF FORCE, TORQUE AND POWER: Principle and working of Elastic force meters, load cells, torsion meters, dynamometers, proving ring.

Text Books:

1. Engineering Metrology, R.K.Jain, Khanna Publishers, New Delhi 2018.
2. Mechanical Measurement and Control, Dr. D.S.Kumar, Metropolitan book co, NewDelhi 2019.

References:

1. Measurement systems: Application and Design TataDoeblin Earnest, O.Adaptation, Manik, Dhanesh, McGraw– Hill, New Delhi, Fifth edition, 2007.
2. Experimental Methods for Engineers, J.P.Holman, McGraw- Hill,New Delhi Eight edition,2011.
3. Text book of Metrology,M. Mahajan, DhanapatiRai publications, New Delhi 2007.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	2	-	-	-	-	-	-	-	-	-
CO2	-	2	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	1	-	-	-
CO4	-	2	-	-	-	-	-	-	-	-	-	-
CO5	1	-	-	-	-	-	-	-	-	-	-	-

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. II Sem (6th Semester)			
Course Code	**CAD/CAM**				
Teaching	Totalcontacthours-45	L	T	P	C
Prerequisite(s): Production Technology, Metal Cutting and Machine Tools, Computer Aided Machine Drawing.		3	0	0	3

Course Objectives:

Students undergoing this course will be able to:

- Study the computer hardware components.
- Understand geometric modeling and manipulation methods.
- Familiarize with the part programming of NC and CNC machines.
- Understand the concepts of Group Technology, CAQC.
- Understand the concepts of FMS and CIM.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Explain the basic concepts of CAD and Computer graphics.
CO2:	Solve the mathematical models to represent various geometries.
CO3:	Compose the part programs for engineering components.
CO4:	Explain the concepts of Group Technology and Computer Aided Quality Control.
CO5:	Discuss the elements of Flexible Manufacturing Systems and Computer Integrated Manufacturing .

Syllabus:

UNIT – I

Computers in industrial manufacturing, product cycle, CAD / CAM Hardware, basic structure, CPU, memory types, input devices, display devices, hard copy devices, storage devices.

COMPUTER GRAPHICS: Raster scan graphics coordinate system, database structure for graphics modeling, transformation of geometry, 3D transformations, mathematics of projections, clipping, hidden surface removal.

UNIT -II

GEOMETRIC MODELING: Requirements, geometric models, geometric construction models, curve representation methods, surface representation methods, modeling facilities desired.

DRAFTING AND MODELING SYSTEMS: Basic geometric commands, layers, display control commands, editing, dimensioning, solid modeling.

UNIT – III

PART PROGRAMMING FOR NC MACHINES: NC, NC modes, NC elements, CNC machine tools, structure of CNC machine tools, features of Machining center, turning center.

NC PART PROGRAMMING: fundamentals, NC part programming for simple profiles. Computer Aided Part Programming, Numerical Control, Direct Numerical Control, Computer Numerical Control and their comparison, Adaptive Control.

UNIT –I V

GROUP TECHNOLOGY: Part family, coding and classification, production flow analysis, types and advantages. Computer aided processes planning – importance, types **COMPUTER AIDED QUALITY CONTROL:** Terminology used in quality control, use of computers in Quality control. Inspection methods- contact and noncontact types, computer aided testing.

UNIT – V

FLEXIBLE MANUFACTURING SYSTEMS: Introduction to FMS– Development of manufacturing systems – Benefits – Major elements – Types of flexibility – FMS application.

COMPUTER INTEGRATED MANUFACTURING SYSTEM: Types of manufacturing system, material handling systems, material requirement planning, computer control systems, human interactions with manufacturing systems, CIM benefits.

Text Books:

1. CAD/CAM, EZimmers & M.P Groover, Pearson,1st edition.
2. CAD/CAM: Principles and Applications, P N Rao, Tata McGraw Hill Private Limited, 3rd Addition.

References:

1. CAD / CAM Theory and Practice, Ibrahim Zeid& R. Sivasubrmnin, Mcgrw Higher Ed, 1st edition.
2. Automation, Production systems & Computer integrated Manufacturing, M.P Groover, Pearson,4th edition.
3. Principles of Computer Aided Design and Manufacturing, FaridAmirouche, Prentice Hall, , 2nd edition.
4. Computer Numerical Control Concepts and programming, Warren S Seames, Delmar Cengage Learning, 4th edition.
5. Product manufacturing and cost estimation using CAD/CAE, KuangHua Chang, Elsevier, 1st edition.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	-	-	1	1	-	-	-	-	-	-
CO2	2	-	2	-	2	2	-	-	-	-	-	1
CO3	2	1	2	-	3	-	-	-	-	-	-	1
CO4	-	-	-	-	-	-	-	-	2	-	-	-
CO5	1	-	-	-	-	-	-	1	2	-	-	-

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. II Sem (6th semester)			
Course Code	**Refrigeration and Air-Conditioning (Professional Elective-2)**				
Teaching	Total contact hours- 45	L	T	P	C
Prerequisite(s): Thermodynamics and Thermal Engineering		3	0	0	3

Course Objectives:
Students undergoing this course will be able to:

- Learn the fundamental concepts of refrigeration and air conditioning.
- Study various refrigeration cycles and evaluate their performance using Mollier charts.
- Compare properties, applications and environmental issues of different refrigerants.
- Understand the basic concepts of air conditioning processes and its applications.
- Study the various equipments of refrigeration air conditioning systems.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Describe the concepts and applications of refrigeration systems.
CO2:	Compare & contrast the performance of vapor compression and absorption refrigeration systems.
CO3:	Explain steam jet refrigeration system, refrigerants and their components.
CO4:	Design air conditioning systems as per human comfort conditions.
CO5:	Suggest suitable air conditioning equipments as per the given applications.

Syllabus:

UNIT-I
INTRODUCTION TO REFRIGERATION: Necessity and applications – unit of refrigeration and COP.–Mechanical refrigeration – types of ideal cycles of refrigeration.
Air refrigeration: Bell-Coleman cycle - open and dense air systems – refrigeration systems used in air-crafts- problems.

UNIT- II
VAPOUR COMPRESSION REFRIGERATION: Simple vapour compression refrigeration cycle – COP – representation of cycle on T-s and P-h charts – effect of sub-cooling and super heating – cycle analysis – use of p-h charts – numerical problems.
VAPOR ABSORPTION SYSTEM: Calculation of maximum COP – description and working of NH3 – water system and Li Br –water (Two shell & Four shell) System, principle of operation three fluid absorption system.

UNIT- III

STEAM JET REFRIGERATION SYSTEM: Working Principle and basic components. Principle and operation of (i) Thermoelectric refrigerator (ii) Vortex tube.

REFRIGERANTS: Desirable properties – classification of refrigerants -azeotrops– nomenclature – secondary refrigerants –effect on ozone depletion– lubricants.

REFRIGERATION EQUIPMENTS: Compressors- Types of compressors. Condensers – Types of condensers. Evaporators – Types of Evaporators. Expansion Devices – Types of expansion devices.

UNIT – IV

INTRODUCTION TO AIR- CONDITIONING: Psychometric Properties & Processes– Relations– Characterization of Sensible heat and latent heat loads – Heat load concepts: RSHF, GSHF –Problems. Requirement of the human comfort – Concept of Effective Temperature – Comfort Chart – Comfort Air-Conditioning, Need for ventilation, Consideration of Infiltrated air.

UNIT – V

AIR-CONDITIONING EQUIPMENTS AND APPLICATIONS: Humidifiers–Dehumidifiers – Air filters–fans and blowers, grills and registers, ducts–supply ducts–outlets–return outlets. A/C SYSTEMS- Summer A/C, Winter A/C, Year round A/C, Central A/C, Unitary A/C systems.

Text Books:

1. A Course in Refrigeration and Air Conditioning, S.C. Arora & Domkundwar, DhanapatRai Publications, New Delhi.
2. Refrigeration and Air Conditioning, C.P. Arora, Tata McGraw Hill.

References:

1. A Text book of Refrigeration and Air-Conditioning, R S Khurmi, S C Chand Publications.
2. Refrigeration and Air Conditioning, Manohar Prasad, New Age Publishers.
3. Refrigeration and Air Conditioning, Wilbert F. Stoecker, Jerold W. Jones, McGraw Hill, 1982.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	-	1	2	-	-	-	-	2
CO2	3	2	2	2	-	1	2	-	-	-	-	2
CO3	3	2	2	2	-	1	2	-	-	-	-	2
CO4	3	2	2	2	-	1	2	-	-	-	-	3
CO5	3	2	2	2	-	1	2	-	-	-	-	3

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. II Sem (6th Semester)			
Course Code	**Mechatronics (Professional Elective-2)**				
Teaching	Totalcontacthours-45	L	T	P	C
Prerequisite(s): Basic Electrical and Electronics Engineering		3	0	0	3

Course Objectives:

Students undergoing this course will be able to:

- Understand the elements and techniques involved in mechatronics systems.
- Learn the concepts of actuators and their uses.
- Understand the applications of microprocessors and microcontrollers in mechanical systems.
- Understand the architecture and system interface of analog and digital convertors.
- Understand the concept of PLC system and its programming, and its significance.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Discuss the key elements of mechatronic system.
CO2:	Outline various sensors and actuators for an engineering application.
CO3:	Describe various microprocessors and microcontrollers.
CO4:	Use appropriate microprocessor and microcontroller for interfacing sensors, actuators and other mechatronic elements.
CO5:	Construct PLC program and implementation of real life systems.

Syllabus:

UNIT- I

INTRODUCTION: Mechatronics systems – Elements & levels of mechatronics system, mechatronics design process - System, measurement systems, control systems, microprocessor-based controllers, advantages and disadvantages of mechatronics systems.

SENSORS AND TRANSDUCERS: Types, static and dynamic characteristics of sensor - Potentiometers – LVDT – Capacitance sensors – Strain gauges – Eddy current sensor – Hall effect sensor – Temperature sensors – Light sensors.

UNIT –II

ACTUATORS: Hydraulic and pneumatic systems, components, control valves, electro- pneumatic, hydro-pneumatic, electro-hydraulic servo systems.

MECHANICAL ACTUATING SYSTEMS: Basic principles and elements.

ELECTRICAL ACTUATING SYSTEMS: Types of stepper and servo motors – Construction – Working Principle – Advantages and Disadvantages.

UNIT- III

MICROPROCESSORS AND MICRO-CONTROLLER: Introduction – Architecture of 8085 – Pin Configuration – Addressing Modes –Instruction set – Timing diagram of 8085 – Concepts of 8051 microcontroller – Block diagram.

UNIT -IV

SYSTEM INTERFACING: Introduction – Architecture of 8255, keyboard interfacing, LED display interfacing, analog to digital convertor and digital to analog convertor interface – Temperature Control – Stepper Motor Control – Traffic Control interface.

UNIT -V

PLC AND MECHATRONIC SYSTEM DESIGN : Introduction – Basic structure – Input and output processing – Programming – Mnemonics – Timers, counters and internal relays – Data handling – Selection of PLC. Design process-stages of design process – Traditional and mechatronics design concepts – Case studies of mechatronics systems – Pick and place robot – Engine management system – Automatic car park barrier.

Text Books:

1. Mechatronics: Intigrated Mechanical Electronic Systems by G.K. Vijayaraghavan, K.P. Ramachandran and M.S Balasundaram Wlley publishers.
2. Mechatronics, W.Bolton, 5th Edition, Pearson Education India, 2011.

References:

1. Mechatronics, Bradley D.A, Dawson D, Buru N.C and Loader A.J, Chapman and Hall, 1993.
2. Mechatronics CRC Press, Clarence W, de Silva, First Indian Re-print, 2013.
3. Mechatronics Systems Design, DevadasShetty and Richard A. Kolk, PWS publishing company, 2007.
4. Microprocessors & Microcontrollers, Krishna Kant, Prentice Hall of India, 2007.
5. Introduction to Mechatronics and Measurement systems, Michael B.Histand and Davis G.Alciatore, McGraw Hill International edition, 2007.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	1	-	2	2	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	2	2	1	1	-	-	-	-
CO4	-	-	3	-	-	-	-	-	-	-	1	1
CO5	-	3	3	2	-	-	-	-	-	-	-	-

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. II Sem (6^{th} semester)			
Course Code	**Advanced Foundry and Welding Technology (Professional Elective-2)**				
Teaching	Total contact hours- 45	L	T	P	C
Prerequisite(s): Production Technology		3	0	0	3

Course Objectives:
Students undergoing this course will be able to:

- Understand the process of mould and core making.
- Understand melting and solidification of castings and their control.
- Understand principles of advanced casting and welding techniques.
- Understand automation and process control techniques in foundry and welding industries.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Discuss moulding, core making, melting and solidification practices used in foundry.
CO2:	Explain the principle and procedure of advanced casting methods.
CO3:	Describe principle and procedure of advanced arc welding processes.
CO4:	Describe principle and procedure of high energy beam and solid state welding processes.
CO5:	Discuss automation and process control aspects of casting and welding techniques.

Syllabus:

UNIT-I
MOULDING AND MELTING: Properties and testing of moulding sands, moulding sand additives, core sands, machine moulding and core making, special moulding processes based on inorganic and organic binders; Cupola, electric arc and electric induction furnaces – melting practice and melt control
SOLIDIFICATION OF CASTINGS: Ferrous and non-ferrous castings – solidification structure, alloying and inoculation; heat treatment of castings

UNIT-II
ADVANCED CASTING TECHNIQUES: Investment casting, ceramic mold casting, continuous casting, die casting, squeeze casting, stir casting, centrifugal casting, vacuum casting, evaporative pattern casting, and semi solid metal casting

UNIT-III
ADVANCED ARC WELDING TECHNIQUES: Advancements in GTAW - pulsed GTAW, hot wire and cold wire GTAW, dual gas GTAW; plasma arc welding, multi-cathode GTAW, activated

TIG process; Advancements in GMAW – pulsed GMAW, cold metal transfer welding, pulsed flux cored wire welding, magnetically impelled arc welding and, high deposition rate welding.

UNIT-IV

HIGH ENERGY BEAM WELDING PROCESSES: Laser welding – energy sources, welding modes, hybrid laser welding techniques and applications; Electron beam welding –principle, welding modes, control, recent improvements and applications.

SOLID STATE WELDING PROCESSES: Pressure welding, ultrasonic welding, explosive welding, diffusion bonding, friction welding, friction stir welding, electromagnetic pulse welding – principle, procedure, and, applications.

UNIT –V

FOUNDRY MECHANIZATION AND MODERNIZATION: Areas of modernization, equipment for modernization, pollution control, plant layout for foundries; casting design and simulation – introduction, software packages.

WELDING AUTOMATION AND CONTROL: Simple mechanization, dedicated and special purpose automation, robotic welding and control systems, practical considerations.

Text Books:

1. Principles of Foundry Technology, Jain P.L, Tata McGraw Hill, 2009.
2. Advanced Welding Processes – Technologies and process control, John Norrish, Woodhead publishing, 2006.

References:

1. Welding Engineering and Technology, Parmar R.S., 2nd edition, Khanna Publishers, 2015.
2. Principles of Metal Casting, Heine R.W., Carl L., Rosenthal P.C., 2nd edition, McGraw Hill Education, 2017.
3. Welding, Brazing and Soldering, Handbook ASM - Volume 6, ASM International, 1993.
4. Casting, Handbook ASM - Volume 15, ASM International, 2008.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	2	1	-	-	-	-	2
CO2	3	2	-	-	-	2	1	-	-	-	-	2
CO3	3	2	-	-	-	2	1	-	-	-	-	2
CO4	3	2	-	-	-	2	1	-	-	-	-	2
CO5	3	2	-	-	-	2	1	-	-	-	-	2

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B. Tech. II Sem. (6th semester)			
Course Code	**Non Destructive Evaluation (Professional Elective-2)**				
Teaching	Total contact hours-45	L	T	P	C
Prerequisite(s)	Engineering Physics, Production Technology	3	0	0	3

Course Objectives:

Students undergoing this course will be able to:

- Understand the basics of destructive and non-destructive evaluation methods.
- Learn about the principles and techniques of various NDE methods such as Visual, Penetrant Testing, Magnetic Particle Testing, Eddy Current.
- Learn the advantages, limitations and applications of Ultrasonic testing method.
- Learn the basic principle and techniques of Radiography test.
- Identify the appropriate NDE methods.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Discuss the significance, scope of NDT techniques and principles of visual and liquid penetrant inspection techniques
CO2:	Explain the principle and procedure of magnetic particle inspection
CO3:	Describe the principle and operation of ultrasonic inspection technique
CO4:	Explain principle and operation of radiographic inspection technique
CO5:	Discuss eddy current inspection procedure and industrial applications of non-destructive testing techniques

Syllabus:

UNIT – I

INTRODUCTION TO NON-DESTRUCTIVE TESTING: Introduction to Material Testing, classification of material testing, comparison between destructive testing and NDT –Discontinuities, origin and classification of discontinuities – Importance of NDT, scope and limitations of NDT – Visual inspection, unaided and aided, visual inspection aids.

LIQUID PENETRANT TEST: Basic Principle – Liquid penetrant system, types and properties of liquid penetrant and developers – Test Procedure – Interpretation of results – Effectiveness and Limitations of Liquid Penetrant Testing – Applications of Liquid Penetrant Testing.

UNIT – II

MAGNETIC PARTICLE TESTING: Theory of magnetism – Magnetization of Materials, different methods of Magnetization – Demagnetization of Materials – Magnetic Particle Test principle, equipment, test procedure – Interpretation and evaluation of test indications – Effectiveness and Limitations of Magnetic particle testing, Applications.

UNIT – III

ULTRASONIC TESTING: Basic principles of sound wave propagation, types of sound waves, sound field – Principle of ultrasonic testing – Ultrasonic transducers, piezoelectric materials, various types of transducers/probe – Equipment for ultrasonic testing – Pulse-echo method, transmission method, resonance method – Different ultrasonic inspection techniques – Data representation, A/Scan, B/scan, C/scan– applications and limitations.

UNIT – IV

RADIOGRAPHY TESTING: Basic Principle – Sources of X and Gamma Rays and their interaction with Matter – Imaging, film and film less techniques – Types and use of filters and screens – geometric factors, inverse square law – Characteristics of films, graininess, density, speed, contrast, characteristic curves, penetrameters – Exposure charts – Radiographic equivalence– Fluoroscopy, Xero-Radiography, Computed Radiography, Computed Tomography.

UNIT – V

EDDY CURRENT TESTING: Generation of eddy currents – Properties of eddy currents – Eddy Current Test System, Sensing elements, Probes, Instrumentation, Types of arrangement – Interpretation/Evaluation of test results – Applications, effectiveness and limitations.

INDUSTRIAL APPLICATIONS OF NDT: Comparison and selection of NDT methods –Span of NDT Activities and its industrial applications.

Text Books:

1. Practical Non-Destructive Testing, Baldev Raj, T. Jayakumar, M.Thavasimuthu, Narosa Publishing House, 3rd Edition, 2019.
2. Non-destructive test and evaluation of Materials, J Prasad, GCK Nair, TMH Publishers, 2nd ed.,2011.

References:

1. Non Destructive Evaluation of Materials,ASM Handbook: Aquil Ahmed and Leonard J Bond, ASM International, Volume 17, 2018.
2. Ultrasonic Nondestructive testing of Materials, Karl Langenberg, Klaus Mayer, CRC Press; 4th edition,2017.
3. Non-destructive testing, Warress, JMC Gonmade, AIRWALK PUBLICATIONS, 1 edition, 2017.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	-	-	-	-	-	3	-	-
CO2	3	-	-	-	-	-	-	-	2	3	-	-
CO3	3	-	-	-	2	-	-	-	2	3	-	-
CO4	3	-	-	-	2	-	-	-	2	3	-	-
CO5	2	2	-	-	-	-	-	-	-	3	1	1

4 Years B.Tech. (Mechanical Engineering) Course Structure: (2021-22)

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. II Sem (6th semester)			
Course Code	**SOLID WASTE MANAGEMENT (Open Elective-II)**				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisite(s): Basics of Waste and Environmental Engineering		3	0	0	3

Course Objective:

a. ***To impart the knowledge the methods of collection and optimization of collection routing of municipal solid waste.***
b. ***To acquire the principles of treatment of municipal solid waste***
c. ***To know the impact of solid waste on the health of the living beings***
d. ***To learn the criterion for selection of landfill and its design***
e. ***To plan the methods of processing such as composting the municipal organic waste.***

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	Understand the Objects of Solid waste management
CO2	Understand the elements of Solid waste management
CO3	Design the Transportation facility in Solid waste management
CO4	Characterise the solid waste and design a composting facility
CO5	Know the criteria for selection of landfill

Syllabus:

Unit – I

Introduction to Solid Waste Management: Goals and objectives of solid waste management, Classification of Solid Waste - Factors Influencing generation of solid waste - sampling and characterization –Future changes in waste composition, major legislation, monitoring responsibilities.

Unit – II

Basic Elements in Solid Waste Management: Elements and their inter relationship – principles of solid waste management= onsite handling, storage and processing of solid waste
Collection of Solid Waste: Type and methods of waste collection systems, analysis of collection system - optimization of collection routes– alternative techniques for collection system.

Unit – III

Transfer and Transport: Need for transfer operation, compaction of solid waste - transport means and methods, transfer station types and design requirements.
Separation and Transformation of Solid Waste: unit operations used for separation and transformation: shredding - materials separation and recovery, source reduction and waste minimization.

Unit – IV

Processing and Treatment: Processing of solid waste – Waste transformation through combustion and composting, anaerobic methods for materials recovery and treatment – Energy

recovery – biogas generation and cleaning– Incinerators.

Unit – V

Disposal of Solid Waste: Methods of Disposal, Landfills: Site selection, design and operation, drainage and leachate collection systems –designated waste landfill remediation.

Text Books:

1. George Techobanoglous "Integrated Solid Waste Management", McGraw Hill Publication, 1993.

References:

1. Vesilind, P.A., Worrell, W., Reinhart, D. "Solid Waste Engineering", Cenage learning, New Delhi, 2004
2. Charles A. Wentz; "Hazardous Waste Management", McGraw Hill Publication, 1995.

Web-Resources: www.nptel.com

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	-	2	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	3	-	-	-	-	-	-	-	-	-
CO5	3	-	-	2	-	-	-	-	-	-	-	-

GODAVARI INSTITUTE OF ENGINEERING & TECHNOLOGY GRBT-20
(AUTONOMOUS)
Approved by AICTE, Accredited by NBA & NAAC 'A' Grade, Recognized under 2(f) and 12(b) of UGC, Permanently Affiliated to JNTUK, Kakinada.
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

Regulation GRBT-20	**Godavari Institute of Engineering & Technology (Autonomous)**	**III B.Tech. II Sem (OPEN ELECTIVE-II)**			
Course Code	**CONCEPTS OF POWER SYSTEM ENGINEERING**				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s): Basic Science		3	0	0	3

Course Objectives:

The objectives of the course are to make the student learn about

1. To understand about hydro-electric power plants
2. To understand about Thermal power plants
3. To understand about Nuclear power plants
4. To understand about Solar Photovoltaic Systems
5. To understand about Biomass

Course Outcomes:

After successful completion of the course, a successful student will be able to-	
CO1:	Understand about hydro-electric power plants
CO2:	Understand about Thermal power plants
CO3:	Understand about Nuclear power plants
CO4:	Understand about Solar Photovoltaic Systems
CO5:	Understand about Biomass

GODAVARI INSTITUTE OF ENGINEERING & TECHNOLOGY GRBT-20

(AUTONOMOUS)
Approved by AICTE, Accredited by NBA & NAAC 'A' Grade, Recognized under 2(f) and 12(b) of UGC, Permanently Affiliated to JNTUK, Kakinada.
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

UNIT-I

Hydroelectric Power Stations:

Selection of site, general layout of a hydroelectric power plant with brief description of major components and principle of operation

UNIT-II

Thermal Power Stations

Layout of a thermal power plant, path of coal, steam, water, air, ash and flue gasses, ash handling system- Description of components.

Introduction transmission lines: Short, medium and long transmission lines.

UNIT-III

Nuclear Power Stations

Nuclear fission- Nuclear fuels, chain reaction- Nuclear reactor Components: Moderators, Control roads, Reflectors and Coolants. Types of Nuclear reactors - description of PWR, BWR and FBR.

UNIT-IV

Solar Photovoltaic Systems: Balance of systems – IV characteristics – System design: storage sizing – PV system sizing.

UNIT-V

Biomass Energy: Basic concepts, properties and types, biomass conversion, biofuels, advantages and disadvantages.

Text Books:

1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagar and A.Chakraborti, DhanpatRai& Co. Pvt. Ltd., 1999.
2. Principles of Power Systems by V.K Mehta and Rohit Mehta S.CHAND& COMPANY LTD., New Delhi 2004.

Reference Books:

1. Elements of Power Station design and practice by M.V. Deshpande, Wheeler Publishing.
2. Electrical Power Systems by C.L.Wadhawa New age International (P) Limited, Publishers 1997.
3. Electrical Power Generation, Transmission and Distribution by S.N.Singh., PHI, 2003.
4. Gas turbine performance, by PP Wals, P.Fletcher, Blackwell Publisher, 2004.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlafion)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01	✓	✓										
C02	✓							✓				
C03	✓				✓							
C04	✓		✓									
C05							✓					

Regulation GRMT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. II Sem (6 semester)			
Course Code	**INTERNET OF THINGS AND IT'S APPLICATIONS (Open Elective-2)**				
Teaching	Totalcontacthours-45	L	T	P	C
Prerequisites: Knowledge of Logic Gates, Relays, Registers, Counter, Sensors, Microprocessors, Micro controllers, Serial & Parallel communication		3	-	-	3

Course Objectives:

1. To understand the basic concepts of Internet of things
2. To develop understanding with layered Wired and Wireless protocols.
3. To develop understanding with Arduino board and Arduino IDE.
4. To develop understanding with Data analytics and supporting services.
5. To develop understanding with Big data services and Sensors.

Course Outcomes:

On Completion of the course, the students will be able to	
CO1:	Learn the Architecture of iot,Sensors, Actuators, ARM processors.
CO2:	Learn the various Communication protocols present in a network.
CO3:	Apply the practical knowledge to Arduino board
CO4:	Analyze the Machine learning and various network services.
CO5:	Learn the importance of Big data and Virtualization concepts.

Syllabus

UNIT – I

FUNDAMENTALS OF IOT: Evolution of Internet of Things, Enabling Technologies, IoT Architectures, oneM2M, IoT World Forum (IoTWF) and Alternative IoT models, Simplified IoT Architecture and Core IoT Functional Stack, Fog, Edge and Cloud in IoT, Functional blocks of an IoT ecosystem, Sensors, Actuators, & Smart Objects .

IoTPlatfortri overview: Overview of IoT supported Hardware platforms such as: ARM Cortex Processors, Arduino and Intel Galileo boards.

UNIT – II

IOT COMMUNICATION PROTOCOLS: Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.49, 802.15.4e, 802.11ah and Lora WAN, Network Layer: IP versions, Constrained Nodes and Constrained Networks, Application Transport Methods: Supervisory Control and Data Acquisition, Application Layer Protocols: CoAP and MQTT.

UNIT – III

DESIGN AND DEVELOPMENT ENVIRONMENT: Design Methodology, Embedded computing logic, Microcontroller, System on Chips, IoT system building blocks, Arduino, Nodemcu Board details, IDE programming.

UNIT – IV

DATA ANALYTICS AND SERVICES: Structured Vs Unstructured Data and Data in Motion Vs Data in Rest, Role of Machine Learning — No SQL Databases, Hadoop Ecosystem, Apache Kafka, Apache Spark, Edge Streaming Analytics, Xively Cloud for IoT, Python Web Application.

UNIT – V

CASE STUDIES / INDUSTRIAL APPLICATIONS: IoTapplications in home, Agriculture 3.0, buildings, security, Industries, Home appliances, other IoT electronic equipments. Use of Big Data and Visualization in IoT.

Text Book:

1. IoT Fundamentals: Networking Technologies, Protocols arid Use Cases for Internet of Things,David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, Cisco Press, 2017.

Reference Books:

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, DavidBoyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.
2. Internet of Things with Arduino and Bolt by AshwinPajankar.

Web Links:

1. https://thingspeak.com
2. https://www.blynk.cc/getting-started
3. http://www.arduino.cc
4. https://coap.technology

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	3	-	1	1	1	-	-	-	1	3
CO2	2	1	1	-	-	-	1	2	-	2	-	-
CO3	2	-	3	2	1	2	2	-	3	-	2	-
CO4	1	2	-	-	-	2	3	3	2	1	-	3
CO5	3	-	-	2	-	1	-	2	-	2	-	-

Regulation GRBT-20	GODAVARI INSTITUTE OF ENGINEERING & TECHNOLOGY (Autonomous)	III B.Tech II Semester			
Course Code 201CS604	**FUNDAMENTALS OF DATABASES** Open Elective-II: CSE, CSE (AI/ML), CSE (Cyber Security)				
Teaching	Total contact hours: 48	L	T	P	C
Prerequisite(s):---Basic knowledge of Data structures, Proportional logic		3	0	0	3

Course Objective(s):

1. To impart students with theoretical knowledge of databases and database management systems in information technology applications.
2. To instruct the student with practical skills in the use of databases and database management systems
3. To apprehend the logical design, physical design and implementation of relational databases are covered.

Course Outcome(s):

After successful completion of this course, a student will be able to-

CO-1: Obtain the knowledge about Database Management System

CO-2: Accord a description of the Database Management structure and comprehend the applications of Databases.

CO-3: Realize the advantages and disadvantages of the different models.

CO-4: Perceive the constraints and controversies associated with relational database.

CO-5: Explain the concept of data planning and Database design and Identify the various functions of Database Administrator

UNIT-1

Introduction: Data base System Applications, data base System VS file System, Advantages of a DBMS View of Data, Data Abstraction, instances and Schemas, data Models, the ER Model, Relational Model, Other Models, Database Languages: DDL, DML, DCL.

UNIT-2

ER Model: Data base design and ER diagrams, Beyond ER Design Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Concept Design with the ER Model.

UNIT-3

Basic SQL Query: Basic SQL querying (select and project) using where clause, arithmetic & logical operations, Set, Comparison Operators, NULL values, Comparison using Null values, sub queries, grouping, aggregation, ordering, implementation of different types of joins.

UNIT-4

SQL and PL/SQL: Creating tables with relationship, implementation of key and integrity constraints, views. Introduction to PL/SQL

Schema Refinement (Normalization): Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency (1NF, 2NF and 3NF).

Unit-5

Introduction to NoSQL: NoSQL Data Model Design, Feature Set, areas of applicability, Types of NoSQL – Key-Value, Document Type, Graph based

Text Books

1. Database System Concepts 6e By Abraham Silberschatz, Henry Korth and S Sudarshan
2. Database Management Systems, 3/e Raghuram Krishnan, Johannes Gehrke, TMH

Reference Books

1. Introduction to Database Systems, 8/e C J Date, PEA
2. The Database book principles & practice using Oracle/MySqlNarainGehani, University Press.
3. Oracle Database 11g. The complete reference (oracle press)

Web References:
https://nptel.ac.in/courses/106105175

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High]; '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	-	3	-	-	-	-	1	-	3	-	2	-
CO2	2	2	-	2	-	-	-	2	2	-	2	-	1	2
CO3	1	1	-	2	2	2	-	-	1	-	2	3	-	1
CO4	2	-	3	1	1	-	-	-	-	3	1	-	-	1
CO5	2	1		2	-	-	1	-	-	-	-	-	1	1

An Autonomous Institution
NBA Accredited & NAAC 'A+'

AUTOMOBILE ENGINEERING **GRBT20**

III Year – II Semester		L	T	P	C
		3	0	0	3
OPEN ELECTRIVE-2	**HYBRID AND ELECTRIC VEHICLES**				

Course Objectives:

1. Understanding various aspects of hybrid and electric drive trains such as their configuration, types of electric machines that can be used, energy storage devices, etc.
2. Get exposed to research and development challenges involved in various types of fuel cells.

Course Outcomes:

On Completion of the course, the students shall be able to-	
CO1:	Grade hybrid electric technology and electronic drive trains
CO2:	Construction of hybrid electric vehicles
CO3:	Demonstrate electric vehicle components
CO4:	Construction of Electric vehicle technology
CO5:	Operate fuel cell technology and Identification of fuel cell based vehicles

Syllabus

UNIT I –ELECTRIC DRIVETRAINS

Basic concept of electric traction, introduction to various electric drive-train topologies. Electric Propulsion unit: Introduction to electric components used in electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives.

UNIT II – HYBRID ELECTRIC TECHNOLOGY

Impact of modern drive-trains on energy supplies. Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis, Plug-in hybrid electric vehicles.

UNIT III – HYBRID VEHICLE TECHNOLOGY

Sizing the drive system: Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics, selecting the energy storage technology, supporting subsystems. Energy Management Strategies in hybrid and electric vehicles. Case Studies: Design of a Hybrid Electric Vehicle (HEV), Design of a Battery Electric Vehicle (BEV).

UNIT IV – ARCHITECTURE OF HYBRID ELECTRIC VEHICLES

Principles of Hybrid Electric Drive trains, Architectures – Electrical distribution, Hybrid control Strategies – Parallel Hybrid, Series Hybrid - Practical Models – Toyota Prius, Honda Insight. Heavy Vehicles - Hybrid Electric Heavy Duty Vehicles.

UNIT V – FUELCELL TECHNOLOGY

Structures, Operations and properties of Fuel cells – (Phosphoric Acid Fuel cell, Proton Exchange membrane Fuel cell, Direct Methanol fuel cell, Alkaline Fuel Cells, Solid Oxide Fuel Cell, Molten Carbonate Fuel Cell)

FUEL CELL BASED VEHICLES STRUCTURE

PEMFC: Operating principle DMFC: Operating principle – Methanol crossover.

TEXT BOOKS

1. Basu .S, *"Recent Trends in Fuel cell Science and Technology"*, Anamaya Publishers, New Delhi.,2007.
2. Viswanathan, B. and Aulice Scibioh, M., *"Fuel Cells Principles and Applications"*, Universities Press (India) Pvt. Ltd., Hyderabad, 2006.

REFERENCES

1. Larminie, J. and Dicks, A., *"Fuel Cell Systems Explained"* John Wiley & Sons, Ltd., New York, 2001.
2. Ali Emadi, Mehrdad Ehsani, John M. Muller, *"Vehicular Electric Power Systems"*, Marcel Dekker, Inc., 2004.

CO-PO Mapping:
(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	-	1	-	-	-	-	-	-	-	-
CO2	1	3	-	2	-	2	-	2	2	-	-	-
CO3	1	-	2	3	-	-	3	-	1	-	-	1
CO4	-	1	-	3	-	2	-	-	2	-	-	-
CO5	-	1	-	-	-	-	3	-	-	-	-	1

Department of Mining Engineering *Open Electives*

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B. Tech. II Sem. (6th Semester)			
Course Code	**Open Pit Slope Analysis and Design** (Open Elective-II)				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisites: Nil		3	0	0	3

Course Objectives

1. To impart the knowledge on slopes, slope failures and factors that influence slopes.
2. To discuss the geotechnical parameters required for stability studies of a slope.
3. To elaborate the shear strength of intact rock mass and jointed rock mass.
4. To explain the impacts of water in slope stability.
5. To inculcate various methods and techniques used to assess the slope stability.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Classify various modes of slope failure.
CO2:	Comprehend and analyse the geotechnical parameters required for slope stability analysis.
CO3:	Interpret the shear strength of intact rock mass and jointed rock mass.
CO4:	Analyse the flow of water in slope stability.
CO5:	Summarize various methods and techniques used to assess the slope stability.

Syllabus

UNIT-I
Introduction
Types and formation of slopes in surface mines; Mechanism of common modes of slope failure; Factors influencing stability of slopes and planning of slope stability investigations.

UNIT-II
Geotechnical Information
Geotechnical data required for high wall slope stability studies; Collection of geological data and their interpretation for stability studies of high wall slopes.

UNIT-III

Slope Stabilization methods

Construction and Stabilization of Slopes, Construction and Stabilization of dumps, Construction of gabion wall, wire netting, preventing landslides, preventing debris from falling.

UNIT-IV

Slope Monitoring Instruments

Conventional slope monitoring system; Automatic deformation system; Sub-lateral movement monitoring system; Real-time monitoring system.

UNIT-V

Analysis and Design of Pit Slopes and Waste Dumps

Slope stability assessment methods and techniques; Analysis and design criteria and methodology for high wall slopes and backfill and waste dumps; Introduction to Slope Stability Software.

Textbook(s)

1. Hoek and Bray, Rock Slope Engineering, The Institution of Mining and Metallurgy, 1981.
2. G.B. Mishra, Surface Mining, Dhanbad Publishers, 1978.

Reference(s)

1. R.T. Deshmukh, Opencast Mining, M. Publications, Nagpur, 1996.
2. S. K. Das, Surface Mining Technology, Lovely Prakashan, Dhanbad, 1994.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B. Tech. II Sem.(6th Semester)			
Course Code 201PT665	**Basic Concepts in Petroleum Drilling Engineering** (Open Elective-II)				
Teaching	Total contact hours-48	L	T	P	C
Prerequisites		3	0	0	3

Course Objectives

The objectives of this course are to

- Understand the different types of drilling.
- Impart knowledge on drilling rig components.
- Illustrate mud circulating system.
- Identify well borehole problems

Course Out comes

On Completion of the course, the students shall be able to-	
CO1:	Understand overview of drilling and rig components
CO2:	Understand selection of drill string and drill bit
CO3:	Understand mud circulation system
CO4:	Understand basics of casing and cementing
CO5:	Understand borehole problems

Syllabus

UNIT-I

Overview of Drilling

Drilling planning approaches, drilling team, types of drilling, power systems.

Hoisting System

Derrick & substructure, steel derricks, making a connection, tripping operation, draw-works.

Travelling Assembly

Crown block, travelling block & hook, drilling line, static crown load.

UNIT-II
Drill String
Drill string, drill string components, and design, stretch of drilling pipe, drill pipe maintenance

Drill Bits
Types of bits, standard classification of bits, failure mechanism of bits, bit selection and evaluation

UNIT-III
Drilling Mud Engineering
Introduction, functions, types of mud, fundamental properties of mud, mud circulation, mud conditioning system

Unit-VI
Casing & Cementing
Casing, functions, types, casing policy, casing design basics, cementing, functions of cement, cement classes, casing accessories, setting casing, single stage and two stage cementing.

Unit-V
Borehole Problems
Introduction, pipe sticking, differential sticking, mechanical sticking, and key seating; sloughing shale, lost circulation zones.

Text Book(s)

1. Neal Adams and Tommie Charrier, "Drilling Engineering: A Complete Well Planning Approach" PennWell Pub. Co., (1985).
2. Formulas and Calculation for Drilling, Production and workover, Norton J. Lapeyrouse, 2nd

GODAVARI INSTITUTE OF ENGINEERING & TECHNOLOGY GRBT20
(AUTONOMOUS)
Approved by AICTE, Accredited by NBA & NAAC 'A' Grade, Recognized under 2(f) and 12(b) of UGC, Permanently Affiliated to JNTUK, Kakinada

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	B.Tech – III - II			
Course Code	**OPERATIONS MANAGEMANT (Common to all Branches)**				
Teaching	Total contact hours--45	L	T	P	C
Prerequisite(s):Basic knowledge of business production and operations system.		3	0	0	3

Course objectives:

1. It aims to provide students with a critical understanding of the scope and strategic importance of Operations management.
2. To make the students to know about role of operations managersand an appreciation of the interaction of operations with the organisation, employees and customers.
3. To impart the knowledge in the minds of the students how to maximize efficiency while producing goods.

Course outcomes:

On Completion of the course, the students will be able to-	
CO1:	Identify the elements of operations management and various transformation processes to enhance productivity and competitiveness.
CO2:	Analyze and evaluate various facility alternatives and their capacity decisions, develop a balanced line of production & scheduling and sequencing techniques in operation environments.
CO3:	Develop aggregate capacity plans and MPS in operation environment.
CO4:	Plan and implement suitable materials handling principles and practices in the operations.
CO5:	Plan and implement suitable quality control measures in Quality Circles to TQM.

UNITI

Introduction to Operation Management: Nature & Scope of Operation/ Production Management, Relationship with another functional areas, Recent trend in Operation Management, Manufacturing & Theory of Constraint, Types of Production System, Just in Time (JIT) & lean system.

UNIT II

Product Design & Process Selection :Stages in Product Design process, Value Analysis, Facility location & Layout: Types, Characteristics, Advantages and Disadvantages, Work measurement, Job design.

UNIT III

Forecasting & Capacity Planning: Methods of Forecasting, Overview of Operation Planning, Aggregate Production Planning, Production strategies, Capacity Requirement Planning, MRP, Scheduling, Supply Chain Management, Purchase Management, Inventory Management.

UNIT IV

Productivity Concept : Factors affecting Productivity – Job Design – Process Flow Charts – Work study-Methods Study – Work Measurement – Engineering and Behavioral Approaches.

UNIT V

Quality Management: Quality- Definition, Dimension, Cost of Quality, Quality Circles-Continuous improvement (Kaizen), Statistical Quality Control, Variable & Attribute, Process Control, Control Charts -Acceptance Sampling Total Quality Management (TQM)

References:

1. Krajewski&Ritzman (2004). Operation Management -Strategy and Analysis. Prentice Hall of India.
2. Panner Selvem, Production and Operation Management, Prentice Hall of India.
3. Chunnawals, Production & Operation Management Himalaya, Mumbai
4. Charry, S.N (2005). Production and Operation Management- Concepts, Methods Strategy. John Willy& Sons Asia Pvt Limited.
5. K Aswathappa& Sridhar Bhatt, Production & Operations Management, Himalaya, Mumbai

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. II Sem (6^{th} semester)			
Course Code	**Heat Transfer Lab**				
Teaching	Total Contact hours-45	L	T	P	C
Prerequisite(s): Thermodynamics, Fluid Mechanics and Heat Transfer.		0	0	3	1.5

Course Objectives:

Students undergoing this course will be able to:

- Understand the various modes of heat transfer and their applications in real life problems.
- Understand the concepts of overall heat transfer coefficient in various geometries using conduction heat transfer.
- Learn the estimation of heat transfer in free and forced convection.
- Learn the heat transfer rate of boiling and condensation.
- Learn the concepts of radiation heat transfer.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Evaluate the conduction, convection and radiation heat transfer through experiments.
CO2:	Analyze the problems involving steady state and transient heat conduction in simple geometries.
CO3:	Evaluate heat transfer coefficients for natural convection and forced convection.
CO4:	Estimate the LMTD of heat exchanger.
CO5:	Evaluate the Stefan Boltzmann constant and emissivity of different bodies in radiation.

List of Experiments:

1. Determination of overall heat transfer co-efficient of a composite slab.
2. Determination of heat transfer rate through a lagged pipe.
3. Determination of thermal conductivity of a metal rod.
4. Determination of heat transfer coefficient in natural convection.
5. Determination of heat transfer coefficient in forced convection.
6. Determination of effectiveness of parallel and counter flow heat exchangers.
7. Determination of emissivity of a given surface.
8. Determination of Stefan Boltzmann constant.
9. Determination of heat transfer rate in drop and film wise condensation.
10. Determination of critical heat flux.

11. Demonstration of heat pipe.
12. Study of two – phase heat transfer flow.
13. Determination of thermal conductivity of an insulating powder.
14. Determination of the heat transfer coefficient, fin efficiency and temperature distribution of a pin-fin in natural convection.
15. Determination of the heat transfer coefficient, fin efficiency and temperature distribution of a pin-fin in forced convection.
16. Determination of heat transfer coefficient of horizontal tube in natural convection.

CO-PO Mapping:
(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	2	-	1	1	-	-	-	-	2
CO2	3	3	-	2	-	2	1	-	-	-	-	2
CO3	3	3	-	2	-	1	1	-	-	-	-	2
CO4	3	3	-	2	-	2	1	-	-	-	-	2
CO5	3	3	-	2	-	1	1	-	-	-	-	2

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. II Sem (6^{th} semester)			
Course Code	**Metrology and Instrumentation Lab**				
Teaching	Total Contact hours-45	L	T	P	C
Prerequisite(s): Production Technology, Metal Cutting and Machine Tools, Metrology and Instrumentation.		0	0	3	1.5

Course Objectives:

Students undergoing this course will be able to:

- Understand the working of linear and angular measuring instruments.
- Understand the use of various measuring instruments like sine bar, bevel protractor and spirit level.
- Learn the alignment tests using slip gauges and dial indicators.
- Learn the calibration process of measuring instruments.
- Measure the parameters of temperature, pressure, fluid flow and displacement by using different instruments.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Measure the linear and angular dimensions of components using vernier calipers, outside micrometers , bevel protractor, sine bar and transducers etc.
CO2:	Assess the accuracy and errors of measuring instruments.
CO3:	Check the machine tool alignment using dial indictors and spirit level.
CO4:	Calibrate instruments to measure fluid flow, temperature, speed, pressure and displacement.
CO5:	Get basic idea about working principle and applications of devices for measurement of force and torque; strain and stress and temperature.

Note: The students have to conduct at least 8 experiments from each lab.

METROLOGY LAB

List of Experiments:

1. Measurement of lengths, heights, diameters using vernier callipers, micrometers.
2. Measurement of gear parameters using gear tooth vernier.
3. Measurement of cylinder bore using inside micrometer, bore gauge.
4. Machine tool alignment test on the lathe.
5. Machine tool alignment test on drilling machine.
6. Machine tool alignment test on milling machine.

7. Angle and taper measurements with bevel protractor, Sine bar.
8. Use of spirit level in finding the straightness of a bed and flatness of a surface.
9. Measurement of screw thread parameters using Optical Projector / Toolmaker Microscope.

INSTRUMENTATION LAB

List of Experiments:

1. Calibration of transducer for temperature measurement.
2. Calibration of LVDT transducer for displacement measurement.
3. Calibration of strain gauge.
4. Calibration of thermocouple.
5. Calibration of capacitive transducer.
6. Calibration of photo and magnetic speed pickups.
7. Calibration of resistance temperature detector.
8. Calibration of a rotameter.
9. Calibration of Mcleod gauge for low pressure.

CO-PO Mapping:
(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	2	-	-	-	-	-	-	-	-
CO2	-	-	1	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	1	-	-	-	-	-
CO4	-	-	-	1	-	-	-	-	-	-	-	-
CO5	-	-	-	1	-	-	-	-	-	-	-	-

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. II Sem (6^{th} semester)			
Course Code	**Computer Aided Manufacturing Lab**				
Teaching	Total Contact hours-45	L	T	P	C
Prerequisite(s): Metal Cutting and Machine Tools, CAD/CAM		0	0	3	1.5

Course Objectives:
Students undergoing this course will be able to:

- Use different part programming tool for the machining of parts.
- Understand part classification and coding systems for the implementation of group technology.
- Understand the features of various computer aided process planning systems.
- Use programming and simulation tools to understand operation of robotic manipulators.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Create manual part programs and simulations to machine parts through various machining processes
CO2:	Crate part programs using computer assisted and CAD/CAM programming tools to machine parts through various machining process
CO3:	Develop a database of part families using part classification and coding systems
CO4:	Develop retrieval and generative types of computer aided process planning systems
CO5:	Create programs and simulate robotic manipulators for assembly and material handling operations

List of Experiments:

1. Write a manual part program and simulate for the drilling operation.
2. Write a manual part program and simulate for the turning operation.
3. Write a manual part program and simulate for the milling operation.
4. Write a manual part program and simulate for the canned cycles.
5. Write a part program using computer assisted part programming tools.
6. Write a part program using CAD/CAM part programming tools.
7. Create part families using part classification and coding system.
8. Develop simple retrieval type of computer aided process planning system.

9. Develop simple generative type of computer aided process planning system.

10. Write a program and simulate a robotic manipulator.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	-	2	-	-	-	3	2	2	2
CO2	3	3	2	-	2	-	-	-	3	2	2	2
CO3	3	3	2	-	2	-	-	-	3	2	2	2
CO4	3	3	2	-	2	-	-	-	3	2	2	2
CO5	3	3	2	-	2	-	-	-	3	2	2	2

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. II Sem (6th Semester)			
Course Code	**Finite Element Analysis**				
Teaching	Totalcontacthours-48	L	T	P	C
Prerequisite(s): Mechanic of solids, Heat Transfer		0	1	2	2

Course Objectives:
Students undergoing this course will be able to:

- Understand basic concepts of structural and heat transfer analysis, and concept of beams, trusses, and finite element analysis.
- Understand the static structural analysis through finite element analysis software.
- Understand the transient structural analysis through finite element analysis software.
- Learn the steady state heat conduction analysis through finite element analysis software.
- Learn the steady state heat convective analysis through finite element analysis software.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Summarize structural analysis, heat transfer analysis, concept of beams, trusses and steps involved in finite element analysis.
CO2:	Simulate the deformation of cantilever beam, stepped bar, 2d truss, 3d truss and 2d –plate through static structural analysis.
CO3:	Simulate the deformation of corner bracket through transient structural analysis
CO4:	Examine the temperature distribution in composite wall, composite bars and circular rod through steady state heat transfer analysis.
CO5:	Examine the conduction and convective heat transfer phenomenon in a rectangular plate with a circular hole under steady state conditions.

FINITE ELEMENT ANALYSIS AND STRUCTURAL ANALYSIS: Introduction FEA, Introduction to structural analysis, Difference between Static structural and Transient structural analysis, Types of Structural Members: beams, columns and tension structures, frames, and trusses, Fundamental Concepts and Principles of Structural Analysis.
TYPES OF BEAMS: According to end support, according to shape of cross section and according to equilibrium condition.
TYPES OFTRUSSES: Simple truss, planar truss and space frame truss.
DEFORMATION AND ITS TYPES: Introduction, elastic deformation and plastic deformation.

List of Exercises: -

1. Point load on center of a cantilever beam.
2. Structural analysis on the stepped bar.
3. Structural analysis on simple 2d truss.
4. Structural analysis of complex 2d truss.
5. Bending moment on center of a cantilever beam.

6. Uniformly distributed load on a cantilever beam.
7. Deflection of beam when two ends are fixed with point load and udl.
8. 2d plane stress analysis (plate with center hole).
9. Analysis of a pressure vessel by 2d plane strain condition.
10. Transient structural analysis of corner bracket.
11. Modeling and structural analysis of 3d truss.

HEAT TRANSFER ANALYSIS: Introduction, Steady state heat Conduction,1-D Steady State Heat Conduction: Through Plane and Composite Walls, Through Hollow and Composite Cylinders, Through Hollow and Composite Spheres. One dimensional unsteady heat conduction.

List of Exercises: -

1. Temperature distribution of composite wall through steady state heat transfer analysis.
2. Steady state heat transfer analysis of thermally loaded composite bars.
3. Steady state heat transfer analysis of circular rod.
4. Conduction and convective heat transfer in a rectangular plate with a circular hole under steady state conditions.

References:

1. Engineering Mechanics,8th edition,S. S. Bhavikatti,New Age International Private Limited, 2021.
2. Strength Of Materials,Fourth edition, S. S. Bhavikatti, Vikas Publishing House,2013.
3. https://courses.ansys.com/index.php/courses/stress-analysis/
4. https://courses.ansys.com/index.php/courses/mechanical-strain/
5. https://sites.google.com/site/onlinefiniteelement/home.
6. Heat and Mass Transfer, third edition, P.K Nag, McGraw Hill Education India Pvt. Ltd, 2011.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	2	-	-	-	-	-	-	-	2
CO2	2	2	3	2	-	-	-	-	2	-	-	2
CO3	2	2	3	-	-	-	-	-	2	-	-	2
CO4	2	2	3	-	-	-	-	-	-	-	-	2
CO5	2	2	3	-	-	-	-	-	2	-	-	2

Regulation GRBT-20	GODAVARI INSTITUTE OF ENGINEERING & TECHNOLOGY (Autonomous)	III B.Tech II Semester			
Course Code	QUANTITATIVE APTITUDE AND REASONING				
Teaching	Total contact hours- 32	L	T	P	C
Prerequisite(s): Mathematics		2	0	0	0

Course Objective(s):

1. Practice assigning variables to quantities to get desirable relationship between quantities.
2. Apply general mathematical models to solve a variety of problems.
3. Practicetothinklogicallyinordertodescriberelationshipinthegivendatatofinddesiredquantity.
4. Solveproblemsusingappropriatemethodsthroughlogicalrelationshipsandreasoning.
5. Improve their speed and accuracy in solving problems by using quicker methods.

Course Outcome(s):
On completion of the course, the students will be able to-

CO-1: Critically evaluate various real-life situations by resorting to analysis of key issues and factors.
CO-2: Represent mathematical information symbolically, visually, numerically, and verbally.
CO-3: Demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.
CO-4: Improve speed and accuracy in solving problems by using quicker methods
CO-5: Identify recurring and missing patterns in a sequence, which in turn help sin enhancing deductive ability.

UNIT-1:

Business Mathematics

Averages, Mixtures and Allegations: Definition of Average, Rules of Average, Problems on Average, Problems on Weighted Average, Finding average using assumed mean method, Problems on mixtures, Allegation rule, Problems on Allegation.
Ratio and Proportion: Definition of Ratio, Properties of Ratios, Comparison of Ratios, Problems on Ratios, Compound Ratio, Problems on Proportion, Mean proportional and Continued Proportion.
Variation: Direct variation, Inverse variation, Joint variation, Problems on Variations.
Percentages: Introduction, Converting a percentage into decimals, Converting a Decimal into a percentage, Percentage equivalent of fractions, Problems on percentages.
Profit and Loss: Problems on Profit and Loss percentage, Relation between Cost Price and Selling price, Discount and Marked Price, Two different articles sold at same Cost Price, Two different articles sold at same Selling Price, Gain% or Loss% on Selling Price.
Simple Interest: Definition and formula for amount in simple interest, Problems on interest and amount, Problems when rate of interest and time period are numerically equal,
Compound Interest: Definition and formula for amount in compound interest, Difference between simple interest and compound interest for 2 years on the same principle and time period.

UNIT-2:

Time Measurement

Time and Distance: Relation between speed, distance and time, Converting kmph into m/s and vice versa, Problems on average speed, relative speed, trains, boats and streams, circular tracks, races and games of skill.

Time and Work: Problems on Unitary method, Relation between Men, Days, Hours and Work, work and wages, Problems on Man-Day-Hours method, Problems on alternate days, Problems on Pipes and Cisterns.

UNIT-3:

Statistics & Geometry

Permutations and Combinations: Definition of permutation, Problems on Permutations, Definition of Combinations, Problems on Combinations.

Probability: Definition of Probability, Problems on coins, dice, deck of cards, years.

Data Interpretation: Problems on tabular form, Problems on Line Graphs, Bar Graphs, Pie Charts.

Data Sufficiency: Different models in Data Sufficiency, Problems on data redundancy.

Mensuration: Formulas for Areas, Formulas for Volumes of different solids, Problems on Areas, Problems on Volumes, Problems on Surface Areas.

UNIT-4:

Basic Reasoning& Logic

Number and Letter Series: Difference series, Product series, Squares series, Cubes series, Alternate series, Combination series, miscellaneous series, Place values of letters.

Odd Man Out: Problem son numbers, Odd man out, letter Oddman out, verbal Oddman out Coding and **Decoding:** Coding using same set of letters, Coding using different set of letters, Coding into a number, Problems on R-model.

Direction Sense: Solving problems by drawing the paths, finding the net distance travelled, finding the direction, shadows, Problems on direction sense using symbols and notation.

Blood Relations: Defining the various relations among the members of a family, Solving Blood Relation puzzles, solving the problems on Blood Relations using symbols and notations.

Deductions: Finding the conclusions using Venn diagram method, finding conclusions using syllogism method

UNIT-5:

Advanced Reasoning

Analytical Reasoning Puzzles: Problem son Linear arrangement, problems on facing N-S and E-W directions, Circular arrangement, problems on towards the center and outwards, Double line-up, Problem son Selections, group reasoning and Comparisons.

Text Book:

1. Dr.R.S.Agarwal.A Modern Approach to Quantitative Aptitude and Logical Reasoning. S.Chand Publishing.

Reference Books:

1. AbhijitGuha (2014). Quantitative Aptitude for Competitive Exams (5th Ed.). McGraw Hill Education.
2. Arun Sharma (2014). Quantitative Aptitude and Logical Reasoning for the CAT (6th Ed.). McGraw Hill Education.
3. R V Praveen (2016). Quantitative Aptitude and Reasoning (3rd Ed.). PHI Learning Private Limited.
4. Jaikishan.Premkishan.TestofReasoninginAllCompetitiveExams.ArihantPublications.

Web References:

1. https://www.mygreatlearning.com/academy/learn-for-free/courses/crash-course-on-quantitative-aptitude-and-logical-reasoning

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High]; '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	-	-	-	-	-	-	-	-	-	-	1
CO2	2	-	1	2		-	-	-	-	-	-	-	1	1
CO3	3	3	-	-	3	-	1	-	-	-	-	-	1	2
CO4	2	-	3	2	-	-	-	-	-	-	-	-	1	1
CO5	2	3	3	1	-	-	-	-	-	-	-	-	1	1

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech. I Sem (7^{th} semester)			
Course Code	**Design of Transmission Elements (Professional Elective –3)**				
Teaching	Total contact hours-45	L	T	P	C
Prerequisite(s): Engineering Mechanics, Mechanics of Solids, Design of Machine Members.		3	0	0	3

(Use of approved design data book is permitted in the end semester examination)

Course Objectives:

Students undergoing this course will be able to:

- Learn about the types of shafts, keys, coupling joints and their suitability.
- Learn about the Design and selection of journal and ball bearings to suit requirements.
- Learn about the Procedures to design the engine components like piston, connecting rod, and cylinder.
- Learn about the Procedures to design the various types of gears.
- Learn about the concepts of flexible elements.

Course Outcomes:

On Completion of the course, the students shall be able to-	
CO1:	Find required sizes of shaft, keys and couplings for the given application.
CO2:	Identify a suitable bearing for the given application.
CO3:	Design of gear for a given application.
CO4:	Design of suitable I.C. engine parts for a given application.
CO5:	Suggest suitable flexible elements required to transmit the desired power.

Syllabus:

UNIT-I

KEYS AND COUPLINGS: Purpose of key, different types of keys, Design – Square and flat keys, Kennedy keys and splines, purpose of shaft couplings, different types of couplings – Design of rigid couplings - muff coupling, split muff coupling and flanged coupling, Design of Flexible couplings - bushed-pin flexible coupling, Oldham's coupling and Universal coupling**.**

SHAFTS: Design of solid and hollow shafts for strength and rigidity – design of shafts for combined bending and axial loads – shaft sizes – BIS code. Use of internal and external circlips, gaskets and seals (stationary & rotary)

UNIT-II

BEARINGS: Classification of bearings- applications, types of journal bearings – lubrication – bearing modulus – full and partial bearings – clearance ratio – heat dissipation of bearings, bearing materials – journal bearing design – ball and roller bearings – static loading of ball & roller bearings, bearing

UNIT- III

DESIGN OF ENGINE PARTS: Connecting Rod-Thrust in connecting rod – Stress due to whipping action on connecting rod ends – Cranks and crank shafts, strength and proportions of over hung and centre cranks – Crank pins, crank shafts. Pistons– forces acting on piston – construction design and proportions of piston, cylinder– cylinder liners.

UNIT-IV

SPUR & HELICAL GEAR DRIVES: Spur gears- helical gears – load concentration factor – dynamic load factor, surface compressive strength – bending strength – design analysis of spur gears – estimation of centre distance, module and face width, check for plastic deformation, check for dynamic and wear considerations**.**

UNIT-V

DESIGN OF FLEXIBLE ELEMENTS: Belts and their construction - Flat belts versus V- belts, Open and cross belt arrangement, Ratio of belt tensions-Centrifugal tension-Effect of centrifugal tension, Design of flat belts and V-belts, Selection of wire rope and Pulleys, Introduction to Chain drive - its merits and demerits, Constructional features of a chain drive.

Text Books:

1. Design of Machine Elememts, V.B. Bhandari, 4/e, Tata McGraw Hill, 2017.
2. Machine Design: An Integrated Approach, Norton, R. L.,5/e, Pearson, 2013.

References:

1. Machine design,R.S. Khurmi and J. K. Gupta, 25/e, S.Chand Publishers, 2014.
2. Machine Design, T.V. Sundaramoorthy&N.Shanmugam, 6/e, SciTech Publishers, 2010.
3. Mechanical Engineering Design, Shigley, J.E and Mischke, C. R. 8/e, Tata McGraw Hill, 2008.
4.Design data hand book, S. Md. Jalaludeen.
5. Design Data: Data Book of Engineers, Faculty of Mechanical Engineering, PSG College of Engineering, 2012.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	-	2	2	-	-	-	-	-
CO2	3	3	3	2	-	2	2	-	-	-	-	-
CO3	3	3	3	2	-	2	2	-	-	-	-	-
CO4	3	3	3	2	-	2	2	-	-	-	-	-
CO5	3	3	3	2	-	2	2	-	-	-	-	-

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech. I Sem (7^{th} semester)			
Course Code	**Mechanical Vibrations (Professional Elective-3)**				
Teaching	Totalcontacthours-45	L	T	P	C
Prerequisite(s): Engineering Mechanics, Dynamics of Machinery.		3	0	0	3

Course Objectives:

Students undergoing this course will be able to:

- Gain the knowledge on single degree of freedom undamped vibrations.
- Apply damped and forced vibration characteristics to equation of motion.
- Analyze the two degree of freedom vibration systems.
- Learn about vibration measuring instruments and whirling of shafts.
- Solve the multi degree of freedom vibration equations using numerical methods.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Analyse the undamped single degree of freedom vibrations
CO2:	Derive the equations related to damped and forced vibrations
CO3:	Apply the damped and forced vibration equations to two degree of freedom systems
CO4:	Identify the vibration measuring instruments and learn whirling of shafts
CO5:	Solve the Multi degree of freedom vibration system using numerical methods

Syllabus:

UNIT-I

INTRODUCTION: Definitions, Types of vibrations, Simple Harmonic Motion (S.H.M.), Work done by harmonic force, Principle of super position applied to SHM, Beats, Fourier series and harmonic analysis.

UN-DAMPED (SINGLE DEGREE OF FREEDOM) FREE VIBRATIONS: Derivation of equations of motion of spring-mass system; Newton's method, Energy method, Rayleigh's method. Natural frequencies of simple systems, Springs in series and parallel, Torsional and transverse vibrations, Effect of mass of spring and Problems.

UNIT-II

DAMPED FREE VIBRATIONS (SINGLE DEGREE OF FREEDOM): Types of damping, Analysis with viscous damping - Derivations for over, critical and under damped systems, Logarithmic decrement and Problems.

FORCED VIBRATIONS (SINGLE DEGREE OF FREEDOM): Introduction, Analysis of forced vibration with constant harmonic excitation - magnification factor, rotating and reciprocating

unbalances, excitation of support (relative and absolute amplitudes), force and motion transmissibility, Energy dissipated due to damping and Problems.

UNIT-III

SYSTEMS WITH TWO DEGREES OF FREEDOM: Principle modes of vibrations, Normal mode and natural frequencies of systems (without damping) – Simple spring mass systems, masses on tightly stretched strings, double pendulum, torsional systems, combined rectilinear and angular systems, geared systems and Problems. Undamped dynamic vibration absorber and Problems.

UNIT-IV

VIBRATION MEASURING INSTRUMENTS: Seismic Instruments Vibrometers, Accelerometer, Frequency measuring instruments and Problems.

WHIRLING OF SHAFTS: Whirling of shafts with and without damping, critical speed of shafts, secondary critical speed and Problems.

UNIT- V

NUMERICAL METHODS FOR MULTI DEGREE FREEDOM OF SYSTEMS: Introduction, Maxwell's reciprocal theorem, Influence coefficients, Rayleigh's method, Dunkerley's method, Stodola method, Holzer's method, Orthogonality of principal modes, method of matrix iteration and Problems.

Text Books:

1. Mechanical Vibrations by G.K. Grover.
2. Mechanical Vibrations /Rao V. Dukkipati , J Srinivas/ PHI.

Reference Books:

1. Mechanical Vibrations / SS Rao / Pearson.
2. Mechanical Vibrations by Shcam Series.
3. Vibration Analysis by Nakra.
4. Elements Of Vibration Analysis 2nd Edition by MeirovitchL , McGraw Hill, March 2014.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	-	2	1	-	-	-	-	-	-	-
CO2	2	3	-	2	1	-	-	-	-	-	-	-
CO3	2	3	-	2	1	-	-	-	-	-	-	-
CO4	2	3	-	2	1	-	-	-	-	-	-	-
CO5	2	3	-	2	1	-	-	-	-	-	-	-

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech. I Sem (7th semester)			
Course Code	**Automobile Engineering (Professional Elective-3)**				
Teaching	Total contact hours – 45	L	T	P	C
Prerequisite(s): Thermal Engineering-I.		3	0	0	3

Course Objectives:
Students undergoing this course will be able to:

- Study basic components of an Automobile systems.
- Impart knowledge on the construction and operating principle of automobile engine and auxiliary systems.
- Understand the Vehicle Noise, Vibrations, Harshness, Comfort and Safety Systems.
- Analyze the feasibility of alternate fuels / power source and emission control.
- Learn about steering, suspension and braking system in an Automobile.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Describe various functional components of an Automobile.
CO2:	Explain engine auxiliary systems used in SI and CI engine.
CO3:	Examine ignition and electrical systems in Automobiles.
CO4:	Compare manual transmissions systems with automatic transmission systems.
CO5:	Illustrate the working of steering, braking and the suspension systems.

Syllabus:

UNIT-I
INTRODUCTION: Components of a four-wheeler automobile, types of automobiles, Chassis types, power unit, power transmission, rear wheel drive, front wheel drive, Four wheel drive, Advantages and disadvantages, types of automobile engines, cylinder liners-dry and wet, naturally aspirated engines, turbo charging and super charging.
LUBRICATION SYSTEM: Necessity, functions of lubrication, properties of lubricants and grading, lubrication systems and types, oil filters, oil pumps, crankcase ventilation, waste oil disposal methods.

UNIT -II
S.I. ENGINE FUEL SYSTEM: Fuel supply systems, Mechanical and electrical fuel pump, filters, simple carburetor and its functions, modern carburetors – Zenith &Solex, Air Filters, Gasoline Direct Injection (GDI), Multipoint Fuel Injection system (MPFI), Selection of fuel injection system.

C.I. ENGINE FUEL SYSTEM: Requirements of diesel injection systems, types of injection systems, fuel pump- types, fuel injectors-types, Common Rail Direct Injection System (CRDI).
COOLING SYSTEM: Cooling requirements, air cooling, liquid cooling, Types, cooling thermo, and forced circulation System, Radiators-Types, Cooling Fan, water pump, thermostat, antifreeze solutions.

UNIT- III
IGNITION SYSTEM: Function of an ignition system, battery ignition system, auto transformer, contact breaker points, condenser and spark plug, magneto coil ignition system, electronic ignition system (CDIS & TACIS), Ignition Timings- Ignition advance and its necessity, Centrifugal Spark Advance Mechanism, Vacuum advance mechanism.
ELECTRICAL SYSTEM: Charging system, cut-off relay, starting system, Bendix drive, Horn, wiper, Fuel gauge, oil pressure gauge, and Engine temperature indicator electrical circuit of automobile.

UNIT -IV
TRANSMISSION SYSTEM: Types of clutches -single plate, multi plate, and centrifugal clutches, fluid fly wheel, gear box- types, sliding mesh, constant mesh, synchromesh, over drive, torque converter, Propeller shaft – Hotchkiss drive, Torque tube drive, universal joint, differential, rear axles.

UNIT -V
STEERING SYSTEM: Steering geometry – camber, castor, king pin rake, combined angle toe-in, toe out, center point steering. Steering gears – types, steering linkages, Stub axle, power steering.
SUSPENSION SYSTEM: Elements of suspension systems – rigid axle suspension system, torsion bar, shock absorber, Independent suspension systems (Wishbone, Macpherson Strut).
BRAKING SYSTEM: Types - Mechanical, hydraulic, pneumatic & vacuum suspended servo-brake system, brake fluids and properties.

Text Books:

1. Automobile Engineering, Kirpal Singh, Volume-I & Volume-II, Tata McGraw Hill, New Delhi, 2012.
2. Automobile Engineering, V.M Domkundwar, Dhanpatrai& Co,1/e, New Delhi, 2008.

References:

1. Automobile Mechanics, Dr. N. K. Giri, 5/e, Khanna Publications, 2014
2. Automotive Mechanics, Heitner J, 2/e, CBS Publications, 2000.
3. Automotive Mechanics, William H Crouse, McGraw Hill Education (India)Private Limited, 10th edition.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	3	-	2	-	-	-	-	-	-
CO2	3	3	-	3	-	2	-	-	-	-	-	-
CO3	3	3	-	3	-	3	-	-	-	-	-	-
CO4	3	3	-	2	-	2	-	-	-	-	-	-
CO5	3	3	-	2	-	2	-	-	-	-	-	-

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech. I Sem (7th Semester)			
Course Code	**Advanced Manufacturing Processes (Professional Elective-3)**				
Teaching	Total contact hours-45	L	T	P	C
Prerequisite(s): Production Technology, Metal Cutting and Machine Tools.		3	0	0	3

Course Objectives:

Students undergoing this course will be able to:

- Understand Surface Treatments methods for different applications.
- Learn about Non-Traditional Machining techniques.
- Understand working principle of Electric Discharge Machining and WEDM.
- Study the concepts of IBM,LBM,EDM and PAM.
- Learn the concepts and methods of powder metallurgy.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Explain about surface treatment and coating methods.
CO2:	Describe working principles of mechanical energy based non-traditional machining processes.
CO3:	Discuss different electro chemical and discharge machining processes and also their applications.
CO4:	Describe working principles and applications of IBM, LBM, EBM and PAM.
CO5:	Explain various manufacturing techniques of powder metallurgy.

Syllabus

UNIT – I

NON-TRADITIONAL MACHINING: Classification of unconventional machining processes and their capabilities, Ultrasonic Machining(USM), Abrasive jet machine(AJM),Water jet machining(WJM).Mechanism of material removal, Process Parameters –Effects on material removal rate and surface Finish.

ELECTRO CHEMICAL MACHINING: Principle of working, equipment, performance characterization, Applications.

UNIT - II

ELECTRICAL DISCHARGE MACHINING (EDM), WIRE EDM: Mechanism of material removal, Process Parameters –Effects on material removal rate and surface finish, Electro discharge grinding.

UNIT – III

ION BEAM MACHINING: Principle of working, equipment, Material removal rate, Process parameters, performance characterization, applications.

LASER BEAM MACHINING: Principle of working, equipment, Material removal rate, Process parameters, performance characterization, applications.

PLASMA ARC MACHINING: Principle of working, equipment, Material removal rate, Process parameters, performance characterization, applications.

ELECTRON BEAM MACHINING: Principle of working, equipment, Material removal rate, Process parameters, performance characterization, applications.

UNIT – IV

POWDER METALLURGY: Introduction, steps – Production of metal powders and characterization, compaction methods, sintering – stages, applications, advantages and disadvantages of PM.

UNIT – V

SURFACE TREATMENT AND COATING METHODS: Scope, Cleaners, Methods of cleaning, Surface coating types - Ceramic and organic methods of coating, Electro forming, Chemical vapour deposition, thermal spraying, Ion implantation, diffusion coating, diamond coating and cladding, economics of coating.

Text Books:

1. Manufacturing Engineering and Technology, Kalpakijian, Adisson Wesley, 7th edition 2018.
2. Process and Materials of Manufacturing, R. A. Lindburg, 4th edition, PHI 2015.

References:

1. Advanced Machining Processes, V.K.Jain, Allied Publications.
2. Introduction to Manufacturing Processes, John A Schey, McGraw Hill.
3. Mechanics of Composite Materials, Second Edition (Mechanical Engineering), By Autar K. Kaw, CRC Publisher, 2006.
4. Powder Metallurgy: Science, Technology and Applications, P. C. Angelo, R. Subramanian, PHI Learning Pvt. Ltd,2008.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	2	-	-	-	-	-	-	-	-	-	-
CO2	-	2	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	3	-	-	-	-	-	-
CO4	-	-	-	-	-	3	-	-	-	-	-	-
CO5	-	2	-	-	-	-	-	-	-	-	-	-

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech. I Sem (7^{th} semester)			
Course Code	**Operations Research (Professional Elective-4)**				
Teaching	Total contact hours-45	L	T	P	C
Prerequisite(s): Mathematics-III, Industrial Engineering and Management.		3	0	0	3

Course Objectives:

Students undergoing this course will be able to:

- Impart knowledge on various concepts of Operations Research and LP problems.
- Learn the solution methods of transportation, assignment and sequencing.
- Learn the solution methods of replacement and game theory problems.
- Understand inventory and waiting lines problems.
- Understand simulation methods.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Describe various operations research models and their applications.
CO2:	Solve various engineering and managerial problems of LPP, transportation, assignment, sequencing and replacement.
CO3:	Apply game theory in different competitive situations.
CO4:	Solve the problems related to theories of waiting line and inventory models.
CO5:	Apply the principles of dynamic programming and simulation framework to solve various decision making situations.

Syllabus:

UNIT –I

INTRODUCTION: Development, Definition, Characteristics and phases, Types of operation research models, Applications.

LINEAR PROGRAMMING PROBLEM: Linear programming problem formulation - Graphical solution -Simplex method -Artificial variables techniques -Two–phase method - Big-M method - Special cases: degeneracy, multiple optimal solution, infeasibility and unbounded solution, duality principle.

UNIT – II

TRANSPORTATION PROBLEMS: Formulation - Initial and optimal solutions for balanced and unbalanced transportation problems – Degeneracy in transportation problems.

ASSIGNMENT PROBLEMS: Formulation - Optimal solution - Variants of assignment problem-Traveling salesman problem.

SEQUENCING: Introduction, flow – Shop sequencing, n jobs through two machines, n jobs through three machines - Job shop sequencing, two jobs through 'm' machines.

UNIT – III

REPLACEMENT: Introduction – Replacement of items that deteriorate with time, when money value is not counted and counted, replacement of items that fail completely, group replacement.
THEORY OF GAMES: Introduction – Mini. max (max. mini) – Criterion and optimal strategy, solution of games with saddle points, rectangular games without saddle points, 2 x 2 games, dominance principle, m x 2 & 2 x n games , graphical method.

UNIT-IV

WAITING LINES: Introduction – Single channel, Poisson arrivals, exponential service times, with infinite population and finite population models, multichannel, Poisson arrivals, Exponential service times with infinite population single channel Poisson arrivals.
INVENTORY MODELS: Introduction, Deterministic inventory models – Static economic order quantity models, Dynamic economic order quantity models - Probabilistic Inventory Models – Continuous review models, single period models and multi period models, P-System, Q-System.

UNIT – V

DYNAMIC PROGRAMMING: Introduction – Bellman's principle of optimality, applications of dynamic programming, capital budgeting problem, shortest path problem, linear programming problem.
SIMULATION: Definition, types of simulation models, phases of simulation, applications of simulation, inventory and queuing problems, advantages and disadvantages, simulation languages, problems on inventory and queuing models.

Text Books:

1. Operations Research,S.D.Sharma, Kedarnath,Ramnath&Co, 5th edition, 2008.
2. Operations Research -An Introduction, H.A. Taha., PHI, 8th edition, 2008.

References:

1. Operations Research Theory &Applications, J.K.Sharma, Macmillan, 6th edition, 2013.
2. Operations Research, A.M. Natarajan, P. Balasubramani, A. Tamilarasi, Pearson Education, 2nd edition, 2014.
3. Operations Research, Methods & Problems, Maurice Saseini, ArhurYaspan & Lawrence Friedman, 1sedition, 1959.
4. Operations Research,R.Pannerselvam, PHI Publications, 2nd edition, 2009.
5. Operations Research, S Kalavathy, Vikas Publishers, 4th edition, 2013.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	3	-	-	-	-	-	-	-
CO2	-	-	-	-	2	-	-	-	-	-	-	-
CO3	3	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	3	-	-	-	-	-	-	-	-	-	2	-

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IV B. Tech. I Sem. (7th Semester)			
Course Code	**Micro Electro Mechanical Systems (Professional Elective-4)**				
Teaching	Totalcontacthours-45	L	T	P	C
Prerequisite(s):	Engineering Physics, Basic Electrical &Electronics Engineering.	3	0	0	3

Course Objectives:

Students undergoing this course will be able to:

- Understand the operation of major classes of MEMS sensors and actuators.
- Familiarize with the principles and concepts related to the micro electro mechanical systems.
- Learn the required properties of a material used for fabrication of micro systems.
- Learn the fundamentals of standard micro fabrication techniques and processes.
- Understand the unique demands, environments and applications of MEMS devices.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Discuss the principles and various steps of different micro machining and fabrication techniques.
CO2:	Explain the working principle and fabrication methods of Micro mechanical and thermal sensors and actuators.
CO3:	Describe the principles and construction of various MOEMS devices.
CO4:	Discuss the working principles and fabrication techniques of Magnetic sensors and actuators.
CO5:	Identify different micro fluid actuation techniques and explain the working and construction of Bio MEMS devices.

Syllabus

UNIT – I

INTRODUCTION: Definition of MEMS, MEMS history and development – micro machining – lithography principles & methods, photolithography – structural and sacrificial materials, thin film deposition – impurity doping – etching – surface micro machining – wafer bonding – LIGA.

MICRO MECHANICAL SENSORS AND ACTUATORS: Principles of sensing and actuation, beam and cantilever, capacitive sensors, piezo-electric sensors and actuators – measurement of strain, pressure and flow, pressure measurement by micro phone – MEMS gyroscopes, shear mode piezo actuator, gripping piezo actuator, Inchworm technology.

UNIT – II

THERMAL SENSORS AND ACTUATORS: Thermal energy basics and heat transfer processes, – thermisters, thermo devices – thermo couple, micro machined thermo couple probe – Peltier effect heat pumps – thermal flow sensors – micro hot plate gas sensors – MEMS thermo vessels – pyro electricity – shape memory alloys (SMA), – U-shaped horizontal and vertical electro thermal actuator – thermally activated MEMS relay – micro spring thermal actuator – data storage cantilever.

UNIT – III

MICRO-OPTO-ELECTRO MECHANICAL SYSTEMS: Principle of MOEMS technology – properties of light – light modulators, beam splitter, micro lens, micro mirrors – digital micro mirror device (DMD) – light detectors – grating light valve (GLV) – optical switch, wave guide and tuning, shear stress measurement.

UNIT – IV

MAGNETIC SENSORS AND ACTUATORS: Magnetic materials for MEMS and properties – magnetic sensing and detection – magneto resistive sensor, hall effect – magneto diodes, magneto transistor – MEMS magnetic sensor – pressure sensor utilizing MOKE – mag MEMS actuators – bi directional micro actuator – feedback circuit integrated magnetic actuator – large force reluctance actuator – magnetic probe based storage device.

UNIT – V

MICRO FLUIDIC SYSTEMS: Applications – considerations on micro scale fluid – fluid actuation methods, Dielectrophoresis (DEP), Electro wetting, Electro thermal flow, thermo capillary effect, electro osmosis flow, Opto-electro wetting (OEW) – tuning using micro fluidics – typical micro fluidic channel, – microfluid dispenser – micro needle – molecular gate – micro pumps.

CHEMICAL AND BIO MEDICAL MICRO SYSTEMS: Sensing mechanism & principle – membrane-transducer materials – chem.-lab-on-a-chip (CLOC) – chemoresistors, chemocapacitors, chemotransistors – electronic nose (E-nose) – mass sensitive chemosensors – fluroscence detection – calorimetric spectroscopy.

Text Books:

1. MEMS, Nitaigour Premch and Mahalik, TMH Publishers, 1st Edition, 2008.
2. Foundation of MEMS, Chang Liu, Prentice Hall Ltd., 2009.

References:

1. MEMS and Micro Systems: Design and Manufacture, Tai-Ran Hsu, TMH Publishers, 2002.
2. Introductory MEMS, TM Adams, R A Layton, Springer International Publishers, 2007
3. Fundamentals of Micro fabrication, Marc Madou, CRC press 2002.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	-	-	-	-	-	-	-	-	1
CO2	2	-	-	1	-	2	-	-	-	-	-	1
CO3	2	1	2	-	-	-	-	-	-	-	-	1
CO4	2	3	3	-	-	2	-	-	-	-	-	1
CO5	2	2	3	-	-	2	-	-	-	-	-	1

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech. I Sem (7th Semester)			
Course Code	**Design for Manufacturing (ProfessionalElective-4)**				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s): Production Technology, Metal cutting and Machine tools		3	0	0	3

Course Objectives:

Students undergoing this course will be able to:

- Understand the design philosophy, relation between design and manufacturability.
- Understand the parameters involved in machining and casting.
- Understand the extrusion, sheet metal and welding design parameters.
- Understand the design aspects in forging and manufacturing of plastics.
- Understand the design considerations involved in assembly process.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Explain the design philosophy and manufacturability of a product.
CO2:	Investigate machining and casting processes from design perspective.
CO3:	Identify the design principles in extrusion, sheet metal and welding.
CO4:	Infer design aspects in forging and manufacturing of plastics.
CO5:	Summarize the design considerations in manual and automatic assembly process.

Syllabus:

UNIT - I

INTRODUCTION: Design philosophy, steps in Design process – Criteria and Selection of Materials for design Developments, Design for assembly and evaluation, minimum part assessment. Design for minimum number of parts, development of modular design, minimizing part variations, design of parts to be multi-functional, multi-use, ease of fabrication.

GENERAL DESIGN RULES FOR MANUFACTURABILITY: Basic principles of designing for economical production - Creativity in design.

UNIT –II

SELECTION OF MACHINING PROCESSES: Overview of various machining processes -general design rules for machining - Dimensional tolerance and surface roughness -Design for machining - Redesigning of components for machining ease with suitable examples.

METAL CASTING: Appraisal of various casting processes, selection of casting process -general design considerations for casting - Casting allowances - Simulation of solidification process for casting design.

UNIT – III

JOINING PROCESSES: Appraisal of various welding processes, Factors in design of weldments - general design guidelines - Pre and post treatment of welds -effects of thermal stresses in weld joints - design of brazed and soldering joints.

Extrusion & Sheet Metal Work: Design guidelines for extruded sections -design principles for Punching, Blanking, Bending, Deep Drawing - Forming Limit Diagram –Component Design for sheet metal forming.

UNIT - IV

FORGING: Design factors for Forging -Closed dies forging design parting lines of dies drop forging die design -general design recommendations.

PLASTICS: Visco elastic and creep behaviour in plastics-design guidelines for plastic components-Design considerations for injection moulding – Design guidelines for machining and joining of plastics.

UNIT –V

DESIGN OF MANUAL ASSEMBLY: General design guidelines for manual assembly, development of the systematic Design for Assembly (DFA) methodology, assembly efficiency, classification system for manual handling. Classification system for manual insertion and fastening, effect of part symmetry, part thickness and weight on handling time.

AUTOMATIC ASSEMBLY: Development of the assemble process, choice of assemble method assemble advantages, social effects of automation.

Text Books:

1. Product Design for Manufacture and Assembly, Geoffrey Boothroyd, Peter Dewhurst, Winston A Knight, CRC Press, 3rd Edition, 2010.
2. Design for Manufacture: Strategies, Principles and Techniques, John Corbett, Mike Dooner, John Meleka, Christopher Pym, Pearson Education.

References:

1. Design for Manufacturability Handbook", James G. Bralla, McGraw Hill, 2nd Edition, 1998
2. Material Selection and Design, ASM Handbook –George E Dieter, ASM International, Vol. 20,1997.
3. Dimensioning and Tolerance for Quantity Production, Spotts M.F., Prentice Hall Inc., 1983.
4. Materials Selection in Mechanical Design, Second Edition, by MICHAEL F. ASHBY.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	3	2	-	2	1	-	1	-	-	3
CO2	1	2	1	-	-	2	-	-	1	-	-	-
CO3	-	3	-	-	-	1	-	-	-	-	-	-
CO4	1	1	-	-	-	-	-	-	-	-	-	-
CO5	-	2	1	-	-	-	-	-	-	-	-	-

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech. I Sem (7th Semester)			
Course Code	**Automation in Manufacturing (Professional Elective-4)**				
Teaching	Totalcontacthours-45	L	T	P	C
Prerequisite(s): Production Technology, Metal Cutting and Machine Tools, CAD/CAM.		3	0	0	3

Course Objectives:

Students undergoing this course will be able to:

- Attain the knowledge on basic concepts of Automation.
- Learn about line balancing methods.
- Understand the concepts of material handling systems.
- Learn the concepts of adaptive control systems.
- Study the automated inspection methods.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Discuss the different fundamental concepts of automation and its tools.
CO2:	Analyze the automated flow lines &line balancing methods.
CO3:	Classify the automated material handling, automated storage and retrieval systems in industries.
CO4:	Explain the working of adaptive control systems for temperature, vibration, forces etc.
CO5:	Describe various automated inspection methods.

Syllabus:

UNIT – I

INTRODUCTION: Types and strategies of automation - Pneumatic and hydraulic components, circuits -Automation in machine tools, mechanical feeding and tool changing and machine tool control.

AUTOMATED FLOW LINES: Methods of part transport, transfer mechanism, buffer storage-control function, Design and fabrication considerations.

UNIT –II

ANALYSIS OF AUTOMATED FLOW LINES - General terminology and analysis of transfer lines without and with buffer storage-partial automation, implementation of automated flow lines-Geneva mechanism.

ASSEMBLY SYSTEM AND LINE BALANCING: Assembly process and systems, assembly line, line balancing methods, ways of improving line balance, flexible assembly lines.

UNIT – III

AUTOMATED MATERIAL HANDLING AND STORAGE SYSTEMS: Types of equipment, functions-analysis and design of material handling systems, conveyor systems, automated guided vehicle systems Automated storage and retrieval systems-work in process storage, interfacing handling and storage with manufacturing.

UNIT –IV

ADAPTIVE CONTROL SYSTEMS: Introduction, adaptive control with optimization, adaptive control with constraints-application of adaptive control in machining operations. Consideration of various parameters such as cutting force, temperatures, vibration and acoustic emission in the adaptive controls systems.

UNIT – V

AUTOMATED INSPECTION: Fundamentals types of inspection methods, procedure, accuracy and equipment, Coordinate Measuring Machines - Constructional detail, Programming and Operation, Machine Vision.

Text Books:

1. Automation, Production Systems and Computer Integrated Manufacturing : M.P.GROOVER,/PE/PHI.
2. Numerical Control and Computer Aided Manufacture by Pressman and Williams/john wiley.

References:

1. Computer Control of Manufacturing Systems by YoramCoren ,McGraw Hill Education India .
2. CAD / CAM by Mikell P Groover and Emory W Zimmers/prentice hall.
3. Manufacturing and Automation Technology by R. Thomas Wright/good heart –willcox pub/ june 2006.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	2	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	1	-	-	-	-	-	-
CO4	-	-	-	-	-	1	-	-	-	-	-	-
CO5	-	-	-	-	-	-	1	-	-	-	-	-

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech. I Sem (7^{th} semester)			
Course Code	**Power Plant Engineering (Professional Elective-5)**				
Teaching	Total contact hours- 45	L	T	P	C
Prerequisite(s): Thermal Engineering		3	0	0	3

Course Objectives:

Students undergoing this course will be able to:

- Gain the basic knowledge on power plants operating with various energy sources.
- Understand diesel, gas and hydro electric power plant elements and their operations.
- Discuss the nuclear power plant operation using various reactors.
- Compare various combined plants and usage of instruments to measure various pollutants.
- Understand power plant economics and impact on environment.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Illustrate various power plant layouts and their working principles.
CO2:	Describe various elements involved in different power plants.
CO3:	Explain Nuclear power plants with various reactors.
CO4:	Analyze various combined plants and find importance of measurement of pollutants.
CO5:	Evaluate economic parameters and pollutants and their prevention.

Syllabus

UNIT - I

INTRODUCTION: Introduction to the sources of energy - Resources and Development of power in India – Power generation concepts.

STEAM POWER PLANT: Plant layout, design of plant layout, working of different circuits, fuel and handling equipment's, coal handling, coal storage, ash handling systems. Coal combustion: Properties of coal - Overfeed and Underfeed fuel beds, traveling grate stokers, spreader stokers, retort stokers, pulverized fuel burning system and its components, advantages & disadvantages, - Ball mills – Bowl mills - Combustion needs and draught system, cyclone furnace, design and construction, dust collectors, ESPs - Cooling towers - and Feed water treatment..

UNIT - II

DIESEL POWER PLANT: Plant layout with auxiliaries - Fuel supply system, air starting equipment, super charging – Advantages and Disadvantages.

GAS TURBINE PLANT: Introduction – Components of gas turbine - Classification – Gas power plant layout with auxiliaries, combined cycle power plants and comparison.

HYDRO ELECTRIC POWER PLANT: Water power - Hydrological cycle - Flow measurement -

Drainage area characteristics - Hydrographs - Storage and Pondage - Classification of dams and spill ways – Typical hydro electric power plant operation.

HYDRO PROJECTS AND PLANT: Classification - Typical layouts - Plant auxiliaries - Plant operation - Pumped storage plants.

UNIT – III

NUCLEAR POWER STATION: Nuclear Energy-Fission, fusion reaction nuclear fuel- Breeding and fertile materials - Nuclear reactor - Reactor operation. Environmental considerations.

REACTORS: Types**-** Pressurized water reactor, boiling water reactor, sodium-graphite reactor, fast breeder reactor, homogeneous reactor, gas cooled reactor, radiation hazards and shielding - Radioactive waste disposal.

UNIT - IV

COMBINED OPERATIONS OF DIFFERENT POWER PLANTS:

Introduction, advantages of combined working, load division between power stations, storage type hydro-electric plant in combination with steam plant, run-of-river plant in combination with steam plant, pump storage plant in combination with steam or nuclear power plant, co-ordination of hydro-electric and gas turbine stations, co-ordination of hydro-electric and nuclear power stations, co-ordination of different types of power plants.

POWER PLANT INSTRUMENTATION AND CONTROL: Importance of measurement and instrumentation in power plant, measurement of water purity, gas analysis, O2 and CO2 measurements, measurement of smoke and dust, measurement of moisture in carbon dioxide circuit, nuclear measurements.

UNIT – V

POWER PLANT ECONOMICS AND ENVIRONMENTAL CONSIDERATIONS: General arrangement of power distribution, load curves, load duration curve, definitions of connected load, maximum demand, demand factor, average load, load factor, diversity factor - Related calculations. Costs associated with power production. Effluents from power plants and their Impact on environment - Pollutants and pollution standards - Methods of pollution control.

Text Books:

1. A course in Power Plant Engineering, Arora and Domkundwar, Dhanpatrai & Co, 6 ed, 2013.
2. Power Plant Engineering, P.C. Sharma/ S.K. KatariaPub, 2013.

References:

1. Power Plant Engineering, P.K.Nag,TMH Pub, 2 ed,2006.
2. Power station Engineering, ElWakil, McHill.
3. An Introduction to Power Plant Technology, G.D.Rai, Khanna Pub; 3 ed.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	-	3	-	-	-	-	-	2
CO2	3	3	3	2	-	3	-	-	-	-	-	3
CO3	3	3	-	3	-	3	-	-	-	-	-	2
CO4	3	3	3	2	-	3	-	-	-	-	-	2
CO5	3	3	-	2	-	-	3	2	-	-	-	2

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech.I Sem (7th Semester)			
Course Code	**Nano Technology (Professional Elective-5)**				
Teaching	Total contact hours-45	L	T	P	C
Prerequisite(s): Metallurgy and Material Science		3	0	0	3

Course Objectives:

Students undergoing this course will be able to:

- Study the applications of nano materials.
- Understand the mechanical, electrical, thermal and physical properties of nano materials.
- Learn the synthesis and fabrication techniques of nano particles.
- Gain the knowledge on characterization techniques like SEM, TEM and XRD.
- Impart the knowledge on the synthesis methods.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Describe the classification and applications of nano materials in engineering and other fields.
CO2:	Discuss the mechanical, electrical, thermal and physical properties of nano materials.
CO3:	Explain the synthesis, fabrication and requirements of nano particles.
CO4:	Describe the uses of characterization techniques such as spectroscopy, SEM, TEM and XRD.
CO5:	Discuss the application of carbon nano technology.

Syllabus

UNIT-I

INTRODUCTION: History of nano science- definition of nano meter, nano materials, nano technology-Classification of nano materials-Crystal symmetries, crystal directions, crystal planes-Band structure-Applications in material science, biology and medicine, surface science, energy and environment-Applications of nano structured thin fins, applications of quantum dots.

UNIT-II

PROPERTIES OF NANO MATERIALS: Mechanical, Electrical, Dielectric, thermal, magnetic and opto electronic properties of nano materials. Effect of size reduction on properties, electronic structure of nano materials.

UNIT-III

SYNTHESIS AND FABRICATIONOF NANO MATERIALS: Synthesis of bulk polycrystalline samples, growth of single crystals. Synthesis techniques for preparation of nano particle – Bottom Up Approach – sol gel synthesis, hydro thermal growth, thin film growth, PVD and CVD.Top Down

Approach – Ball milling, micro fabrication, lithography. Requirements for realizing semiconductor nano structures, growth techniques for nano structures.

UNIT-IV

CHARACTERIZATION TECHNIQUES:X-Ray diffraction and Scherrer method, scanning electron microscopy, transmission electron microscopy, scanning probe microscopy, atomic force microscopy, piezo response microscopy, X-ray photo electron spectroscopy, XANES and XAFS, angle resolved photoemission spectroscopy, diffuse reflectance spectra, photo luminescence spectra, Raman spectroscopy.

UNIT-V

CARBON NANO TECHNOLOGY: Characterization of carbon allotropes, synthesis of diamond – nucleation of diamond, growth and morphology. Applications of nano crystalling diamond films, grapheme, applications of carbon nano tubes.

Text Books:

1. Nano science and nano technology by M.S RamachandraRao, Shubra Singh, Wiley publishers.
2. Introduction to Nanoscience and Nanotechnology by k.kchattopadhyay/A.N Banerjee/PHI.

References:

1. Introduction to Nano Technology by Charles P. Poole, Jr., Frank J.Owens, Wiley publishers.
2. Nanotechnology by Jermy J Ramsden, Elsevier publishers.
3. Nano Materials- A.K.Bandyopadhyay/ New Age International.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	3	-	2	-	-	-	-	-	-
CO2	3	3	-	3	-	2	-	-	-	-	-	-
CO3	3	3	-	3	-	3	-	-	-	-	-	-
CO4	3	3	-	2	-	2	-	-	-	-	-	-
CO5	3	3	-	2	-	2	-	-	-	-	-	-

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech. I Sem (7th Semester)			
Course Code	**Additive Manufacturing (Professional Elective-5)**				
Teaching	Total contact hours-45	L	T	P	C
Prerequisite(s): Computer Aided Design		3	0	0	3

Course Objectives:

Students undergoing this course will be able to:

- Understand the principles and working of various liquid based AM processes.
- Learn the principle of operation of extrusion based AM processes.
- Understand the process details of various sheet lamination AM processes.
- Learn the various powder based AM processes.
- Understand the principles and working of various directed energy deposition processes.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Discuss principles and working of vat photo polymerization processes
CO2:	Describe the working and process details of material jetting, binder jetting and extrusion based AM Processes.
CO3:	Explain principle and working of sheet lamination AM Processes.
CO4:	Explain principles and operation of Powder Bed Fusion AM Processes.
CO5:	Describe principles and working of Directed Energy deposition processes

Syllabus:

UNIT-I

INTRODUCTION TO ADDITIVE MANUFACTURING (AM): Introduction, Evolution, Steps, Classification, Types of materials for AM, Applications, Advantages and Limitations.

VAT PHOTO POLYMERIZATION PROCESSES: Stereolithography (SL), Micro-stereolithography, Mask Projection Processes, Two-Photon vat photopolymerization: - Process, Benefits and Draw backs, Applications of Vat Photopolymerization.

UNIT -II

MATERIAL JETTING AND BINDER JETTING PROCESSES: - Evolution, Materials, Process, Benefits and Drawbacks, Applications

EXTRUSION BASED PROCESSES: Fused Deposition Modelling (FDM), Principles, Materials, Process modelling, Plotting and path control, Bio-Extrusion, Contour Crafting, Process Benefits and Drawbacks, Applications of Extrusion-Based Processes.

UNIT- III

SHEET LAMINATION PROCESSES: Bonding Mechanisms, Materials, Laminated Object Manufacturing (LOM), Ultrasonic Consolidation (UC), Gluing, Thermal bonding, LOM and UC applications.

UNIT -IV

POWDER BED FUSION PROCESSES: Selective laser Sintering (SLS), Materials, Powder fusion mechanism and powder handling, SLS Metal and ceramic part creation, Electron Beam melting (EBM), Process Benefits and Drawbacks, Applications of Powder Bed Fusion Processes.

UNIT -V

DIRECTED ENERGY DEPOSITION PROCESSES: Process Description, Material Delivery, Laser Engineered Net Shaping (LENS), Direct Metal Deposition (DMD), Electron Beam Based Metal Deposition, Wire Arc Additive Manufacturing, Benefits and drawbacks, Applications of Directed Energy Deposition Processes.

Text Books:

1. Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping and Direct Digital Manufacturing, Ian Gibson, David W Rosen, Brent Stucker, 2/e, Springer, 2015.
2. Rapid Prototyping: Principles and Applications, Chua C.K., Leong K.F. and Lim C.S., 2/e, World Scientific, 2003.

References:

1. Rapid Prototyping: Principles and Applications, Rafiq I. Noorani, 1/e, John Wiley & Sons, 2006
2. Rapid Prototyping and Manufacturing: Fundamentals of Stereolithography, Paul F. Jacobs, 1/e, Society of Manufacturing Engineers, 1992.
3. Rapid Manufacturing, Pham D.T. and Dimov S.S., 1/e, Springer Verlog, 2001.
4. Rapid Prototyping – Laser based and other Technologies, P.K. VenuVinod and Weiyin Ma, 1/e, Springer Science+ Business Media, LLC, 2004.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	1	1	-	-	-	-	-	2
CO2	3	2	2	1	1	1	-	-	-	-	-	2
CO3	3	2	2	1	1	1	-	-	-	-	-	2
CO4	3	2	2	1	1	1	-	-	-	-	-	2
CO5	3	2	2	1	1	1	-	-	-	-	-	2

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech. I Sem (7th semester)			
Course Code	**Production Planning and Control (Professional Elective-5)**				
Teaching	Total contact hours - 55	L	T	P	C
Prerequisite(s): Production Technology, CAD/CAM		3	0	0	3

Course Objectives:

Students undergoing this course will be able to:

- Understand the concepts of production and service systems.
- Learn about various forecasting techniques.
- Learn various inventory concepts and models.
- Understand the concept and procedure of routing.
- Get familiarize with production controlling aspects and factory physics.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Explain the elements of production planning and control.
CO2:	Investigate various forecasting techniques for manufacturing and service sectors.
CO3:	Use the appropriate inventory model for various industrial circumstances.
CO4:	Create the optimized route and schedule for the product to achieve the desired objectives.
CO5:	Discuss the dispatch and control activities for production process, and factory physics.

Syllabus:

UNIT – I

INTRODUCTION: Definition – Objectives and functions of production planning and control – Elements of production control – Types of production – Organization of production planning and control department – Internal organization of department.

UNIT – II

Forecasting – Importance of forecasting – Types of forecasting, their uses – General principles of forecasting – Forecasting techniques – Qualitative methods and quantitative methods.

UNIT – III

Inventory management – Functions of inventories – Relevant inventory costs – ABC analysis – VED analysis – EOQ model – Inventory control systems – P-Systems and Q-Systems– Introduction to MRP I, MRP II, ERP, LOB (Line of Balance), JIT and KANBAN system.

UNIT – IV

Routing – Definition – Routing procedure –Route sheets – Bill of material – Factors affecting routing procedure, schedule –Definition – Difference with loading Scheduling policies – Techniques, standard scheduling methods - Line Balancing, aggregate planning, chase planning.

UNIT – V

PRODUCTION CONTROLLING ASPECTS: Dispatching – Activities of dispatcher – Dispatching procedure, expediting – Follow up – Definition – Reason for existence of functions – Types of follow up – Applications of computer in production planning and control.

FACTORY PHYSICS: Basic factory dynamics, introduction, definitions and parameters, simple relationships.

Text Books:

1. Elements of Production Planning and Control, Samuel Eilon, Macmillan Publisher, 2015.
2. Manufacturing, Planning and Control, Partik JonssonStig-Arne Mattsson, Tata McGraw-Hill, 2011.

References:

1. Inventory Control Theory and Practice, Martin K. Starr and David W.Miller, 1962.
2. Production Planning and Control, Mukhopadhyay, PHI, 2015.
3. Production Control A Quantitative Approach, John E. Biegel, 1971, 2nd edition.
4. Production Control, Moore, 1959, 2nd edition.
5. Factory Physics by Wallace J. Hopp& Mark L. Spearman, McGraw-Hill Education, 3rd Edition, 2000.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	1	-	-	-	-	-	-	-	-	-	-
CO2	-	1	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	2	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	1	-	-	-	-
CO5	-	-	-	-	-	1	-	-	-	-	-	-

4 Years B.Tech. (Mechanical Engineering) Course Structure: (2021-22)

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech. I Sem (7 semester)			
Course Code	**BUILDING TECHNOLOGY (OPEN ELECTIVE-III)**				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisite(s): Knowledge of Construction materials, Building drawing		3	-	-	3

Course Objectives:

The objective of this course is to enable the students to:

a. ***Understand the different components of the buildings.***
b. ***Understand the different materials of the buildings.***
c. ***Learn various specifications of buildings.***
d. ***Learn various dimensions of buildings.***
e. ***Understand the Drawings of the buildings.***

Course Outcomes

Upon the successful completion of this course student should be able to

1. ***Know the different elements of the buildings.***
2. ***Know the different materials of the buildings.***
3. ***Determine various specifications of materials.***
4. ***Determine various dimensions of buildings.***
5. ***prepare the Plans of the buildings.***

Unit – I

STONES, BRICKS & TIMBER:

STONES: Classification of stones and Aggregates, properties
BRICKS: Composition,manufacture, tests, size, weight and colour of bricks.
TIMBER: Structure of a tree, seasoning of timber and defects in timber.

Unit – II

CEMENT, LIME & STEEL:

CEMENT: Chemical compostion, manufacturing, types, tests.
LIME: chemical composition, classification
STEEL: manufacturing, types and properties of steel

Unit – III

CONCRETE: Chemical compostion of concrete, grades, tests, workability, tests on workability, compressive strength, split tensile strength, flexural strength, seggregation, bleeding, manufacturing of fresh concrete.

Unit – IV

BUILDING COMPONENTS: Parts of Building from foundation to roof like, footings, plinth wall, coloumns, beams, slab, walls, floors, lintels, sunshades, doors, windows, ventilators, parapet wall, stair case, etc. Functions of each component in Building.

Unit – V

BUILDING PLANS: Building Bye-laws, Preparation of Building plan, section, elevation for 2BHK Building and 3BHK Building.

Text Books:

1. "Building Materials", S.K.Duggal, New Age International Publications.
2. Building construction and construction materials", Birdie, G.S. and Ahuja, T.D.,
3. Building construction and construction materials", Birdie, G.S. and Ahuja, T.D., Dhanpath Rai Publishing company, "New Delhi, 1986.
4."Building planning and drawing", (3rd edition), Kumara swami & Kameswara rao, N., Anand Charotar Publishing House Pvt Ltd, 2010.
5. Building planning and drawing by M. Chakravarthi.

References:

1. Building drawing by Shah and Kale
2. Planning and Design of buildings by Y.S. Sane
3. Planning, designing and Scheduling by Gurucharan Singh and Jagadish Singh
4. 'A' Series & 'B' Series of JNTU Engineering College, Anantapur, "Building byelaws", of state and Central Governments and Municipal corporations, 2011.
5. "Building byelaws", of state and Central Governments and Municipal corporations, 2011.
6. "Building Materials", S.K.Duggal, New Age International Publications.
7. "Building Materials", P.C.Verghese, PHI learning (P) Ltd., 2009.
8. "Building Materials", M.L.Gambhir, Tata McGraw Hill Publishing Co. Ltd. New Delhi.
9. "Building construction", P.C.Verghese, PHI Learning (P) Ltd.
10. "Building construction and construction materials", Birdie, G.S. and Ahuja, T.D.,
11. Dhanpath Rai Publishing company, "New Delhi, 1986.
12. "Building Materials", S.S. Bhavikatti, Vikas publications House private ltd.
13. "Building Materia1s", B.C. Punmia, Laxmi Publications Pvt. Ltd.

Web-Resources: www.nptel.com

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], '-':NoCorrelation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	2	-	-	-	-	-	-	-	-
CO2	-	-	3	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	2	-	-	-	-	-	-	-	-
CO5	-	-	-	2	-	-	-	-	-	-	-	-

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech. I Sem (OPEN ELECTIVE-III)			
Course Code	FUNDAMENTALS OF SMART GRID TECHNOLOGIES				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s):	Basic knowledge on grid operation	3	0	0	3

Course Objectives:

The objectives of the course are to make the student learn about

1. To understand the basic concepts of smart grid technologies
2. To understand the communication technologies used in smart grids.
3. To understand the concepts of information security for smart grid.
4. To understand the concept of smart metering.
5. To understand communication infrastructure and protocols for smart metering.

Course Outcomes:

After successful completion of this course, a student will be able to:	
CO1:	Provide the students an understanding of the basic concepts of smart grid technologies
CO2:	Analyse the communication technologies used in smart grids
CO3:	Understand the concepts of information security for smart grid.
CO4:	Understand the concept of smart metering
CO5:	Understand communication infrastructure and protocols for smart metering.

UNIT-I

The Smart Grid: Introduction, Ageing Assets and Lack of Circuit capacity, Thermal constraints, Operational constraints, security of supply, National Initiatives, Early smart grid initiatives, Active distribution networks, virtual power plant, Other Initiatives and Demonstrations, Overview of the Technologies Required for the smart grid.

UNIT-II

Communication Technologies: Introduction, Dedicated and shared communication channels, switching Techniques, Circuit Switching, Message Switching, Packet Switching, communication channels, wired communication, optical fiber, Radio communication, Cellular Mobile communication, Layered architecture and protocols,

UNIT-III

Information Security for the Smart Grid: Introduction, Encryption and Decryption, Symmetric key encryption, Public key Encryption, Authentication, Authentication based on shared secret key, Authentication based on key distribution center, digital signature, Secret key signature, Public key signature, Message digest, Cyber Security standards.

UNIT-IV

Concept of Smart Metering: Introduction, Smart metering- evolution of electricity metering, key components of smart metering, Smart meters: An Overview of the hardware used – signal acquisition, signal conditioning, analogue to digital conversion, computation, input/output and communication.

UNIT-V

Communication infrastructure and protocols for smart metering- Introduction, Home area network, Neighborhood area network, data concentrator, meter management system, protocols for communication.

Text Books:

1. Smart grid, Janaka Ekanayake, Liyanage, Wu, Akihiko yokoyama, Jenkins, Wiley publications, 2012.

Reference Books:

1. Smart Grid: Fundamentals of Design and Analysis, James Momoh, Wiley, IEEE Presss., 2012.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlafion)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01	✓	✓										
C02								✓				
C03					✓							
C04	✓		✓									
C05						✓						

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech. I.Sem (7 semester)			
Course Code	INTRODUCTION TO EMBEDDED SYSTEMS (Open Elective-3)				
Teaching	Total contact hours–53	L	T	P	C
Prerequisites: Knowledge of familiarize with the different IDEs for firmware development for different family of processors/controllers and embedded operating systems.		3	-	-	3

Course Objectives: The student should be made:

1. The basic concepts of an embedded system are introduced.
2. The various elements of embedded hardware and their design principles are explained.
3. Different steps involved in the design and development of firmware for embedded systems is elaborated.
4. Internals of Real-Time operating system and the fundamentals of RTOS based embedded firmware design is discussed.
5. Fundamental issues in hardware software co-design were presented and explained.

Course Outcomes: At the end of the course, the student should be able to:

On Completion of the course, the students will be able to-	
CO1:	Understand the basic concepts of an embedded system
CO2:	An embedded system design approach to perform a specific function
CO3:	The hardware components required for an embedded system and the design approach of an embedded hardware.
CO4:	The various embedded firmware design approaches on embedded environment.
CO5:	Understand how to integrate hardware and firmware of an embedded system using real time operating system

Syllabus

UNIT-I

INTRODUCTION: Embedded system-Definition, history of embedded systems, classification of embedded systems, major application areas of embedded systems, purpose of embedded systems, the typical embedded system-core of the embedded system, Memory, Sensors and Actuators, Communication Interface, Embedded firmware

UNIT-II

EMBEDDED HARDWARE DESIGN: Characteristics of an embedded system, Quality attributes of embedded systems, and Application-specific and Domain-Specific examples of an embedded system. Analog and digital electronic components, I/O types and examples, Serial communication devices, Parallel device ports

UNIT-III

EMBEDDED FIRMWARE DESIGN: Embedded Firmware design approaches, Embedded Firmware development languages, , Wireless devices, Timer and counting devices, Watchdog timer, Real time clock. , DMA, Device driver programming, Concepts of C versus Embedded C and Compiler versus Cross -compiler.

UNIT-IV

REAL TIME OPERATING SYSTEM: Operating system basics, Types of operating systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling, Threads, Processes and Scheduling, Task communication, Task synchronization, Device Drivers. ISR concept, Interrupt sources, Interrupt servicing mechanism, multiple interrupts

UNIT-V

HARDWARE SOFTWARE CO-DESIGN: Fundamental Issues in Hardware Software Co-Design, Computational models in embedded design, Hardware software Trade-offs, Integration of Hardware and Firmware, ICE.

EMBEDDED SYSTEM DEVELOPMENT: The integrated development environment, Types of files generated on cross-compilation, Dissembler/Decompiler, Simulators, Emulators and Debugging, Target hardware debugging, Boundary Scan, Embedded Software development process and tools.

Text Books:

1. Embedded Systems Architecture- By Tammy Overgaard, Elsevier Publications, 2013.
2. Embedded Systems-By Shibu.K.V-Tata McGraw Hill Education Private Limited, 2013.

References:

1. Embedded System Design, Frank Vahid, Tony Gavages, John Wiley Publications, 2013.
2. Embedded Systems-Lyla B.Das-Pearson Publications, 2013.

Web Links:

1. NPTEL online courses.
2. MOOCS online courses by JNTUK

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-': No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	-	-	-	-	-	-	-	-	-	-
CO2	-	2	3	-	-	-	-	-	-	-	-	-
CO3	3	2	3	-	2	-	-	-	-	-	-	-
CO4	-	2	2	-	-	3	-	-	-	-	-	-
CO5	-	-	2	1	-	3	-	-	-	-	-	-

Regulation GRBT-20	GODAVARI INSTITUTE OF ENGINEERING & TECHNOLOGY (Autonomous)	IV B.Tech I Semester			
Course Code 201CS704	**INFORMATION SECURITY** Open Elective-III: CSE, CSE (AI/ML), CSE (Cyber Security)				
Teaching	Total contact hours- 48	L	T	P	C
Prerequisite(s): Basic Concepts of Computer Science and Security Systems		3	0	0	3

Course Objective(s):

1. Confidentiality, integrity, and availability and these are the three main objectives of information security
2. Principal concepts, major issues, technologies, and basic approaches in information security.
3. Foundation for understanding the key issues associated with protecting Computer Systems & Information Assets.

Course Outcome(s):

After completion of the course the student will be able to-

CO-1: Evaluate vulnerability of an information system and establish a plan for risk management.
CO-2: Demonstrate basic principles of Web application security
CO-3: Evaluate the authentication and encryption needs of an information system.
CO-4: Demonstrate how to secure a network
CO-5: Evaluate a company's security policies and procedures

UNIT-1

INTRODUCTION TO INFORMATION SECURITY: Introduction to Information Security, Need for Security- Threats to security & Attacks, Computer System Security and Access Controls - System access and data access.

UNIT-2

COMMUNICATION SECURITY: Introduction to cryptography, cryptosystems, Encryption & Decryption Techniques- classical encryption techniques, communication channel used in cryptographic system, various types of ciphers, Cryptanalysis, Hash function and Data integrity, Security of Hashing function.

UNIT-3

NETWORK: Introduction to Network Security, Email Security, IP Security, Web Security, Kerberos, X.509 techniques.

UNIT-4

SCANNING & ENUMERATION TECHNOLOGY: Malicious software's, Firewalls, Honey pots, Intrusion Detection system, Intrusion Prevention system

UNIT-5

ETHICS IN INFORMATION SECURITY: Implementing Information Security, Legal Ethical & Professional issues in Information Security.

Text Books

1. Matt Bishop, "Computer Security: Art and Science", Addison-Wesley Professional, First Edition, 2003. ISBN: 0201440997.
2. William Stallings, "Cryptography and Network Security", Pearson Education, Fourth Edition, 2006. ISBN: 8177587749

Reference Books

1. Michael E. Whitman, Herbert J. Mattord ,"Principles of Information Security" Cengage Learning, Fourth Edition, 2010, ISBN: 1111138214
2. Charlie Kaufman, Radia Perlman, Mike Speciner, "Network security: private communication in a public world", Second Edition, ISBN: 0130460192.
3. Dieter Gollmann ,"Computer Security ", Third Edition, ISBN: 0470741155.

Web Reference:

1. https://www.youtube.com/watch?v=fQ3ESFfvchg&list=PLUtfVcb-iqn834VGI9faVXGIGSDXZMGp8
2. https://www.youtube.com/watch?v=BvWvFAS1iP0&list=PLUtfVcb-iqn834VGI9faVXGIGSDXZMGp8&index=2
3. https://www.youtube.com/watch?v=b45EyiedG3M&list=PLUtfVcb-iqn834VGI9faVXGIGSDXZMGp8&index=4

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High]; '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	2	-	-	-	-	-	-	-	-		
CO2	1	-	1	-	3	-	-	-	1	-	-	-		
CO3	-	2	-	2	-	-	1	-	-	-	-	-		
CO4	2	1	2	-	3	-	-	-	-	-	-	-		
CO5	1	-	2	-	3	-	-	-	-	-	-	-		

AUTOMOBILE ENGINEERING GRBT20

IV Year – I Semester		L	T	P	C
		3	0	0	3
OPEN ELECTRIVE-3 MODERN VEHICLE TECHNOLOGY					

COURSE OBJECTIVES:

1. To make the student to design and develop modern vehicles
2. To make the student to analyze and control the exhaust emissions and noise
3. To make the student to analyze the vehicle operation and incorporate and develop the electronic control systems
4. To make the student to distinguish and choose the fuel injection system

Course Outcomes:

On Completion of the course, the students shall be able to-	
CO1:	Integrate modern vehicles
CO2:	Design modern suspension systems for automobile safety and comfort
CO3:	Analyze and control the exhaust emissions and noise
CO4:	Analyze the vehicle operation, incorporate and develop the electronic control systems
CO5:	Distinguish and choose the fuel injection system

Syllabus:

UNIT-I

Trends in Automotive Power Plants: Hybrid Vehicles - Stratified charged / lean burn engines - Hydrogen Engines-Electric vehicles-Magnetic track vehicles solar powered vehicle Combined power source vehicle, types of hybrid drives, Toyota hybrid system.

UNIT-II

Suspension: Interconnected air and liquid suspensions, Hydro-elastic suspension system, Hydra gas suspension.

UNIT-III

Braking systems and safety: Modern rear wheel brake, indirect floating caliper disc brake, self energising disc brake, brake limiting device, anti-slide system, Ford Escort and Orion anti lock system. Closed loop suspension; Regenerative braking; Passenger comfort.

An Autonomous Institution
NBA Accredited & NAAC 'A'

AUTOMOBILE ENGINEERING **GRBT20**

UNIT-IV

Fuel Supply Systems: SPFI, MPFI, DI, Pilot Injection, Unit Injection. CRDI; Two Wheeler Technology: DTS- i, DTS - Fi, DTS - Si; Four Wheeler Technology: VVT, Camless Engine, GDI.

Emission and Noise Pollution Control: Introduction, Engine emissions, types of catalytic conversion, open loop and closed loop operation to the oxidizing catalytic converter, Evaporative emissions, Internal and External Noise, Identification of Noise sources, Noise Control Techniques.

UNIT-V

Vehicle Operation and Control: Fundamentals of Automotive Electronics - sensors, actuators, Processors, Computer Control for pollution, noise and for fuel economy - Electronic Fuel Injection and Ignition system.

REFERENCES

1. K.K. Ramalingam, "Automobile Engineering", Scitech Publications Pvt. Ltd., 2005
2. Dr. N.K. Giri, "Automobile Mechanic", Khanna Publishers, 2006
3. Crouse/Anglin "Automotive Mechanics"
4. K.Newton, W.Steeds "The Motor Vechicle"
5. Heinz Heisler" Advanced Vehicle Technology" ELSEVIER

CO-PO Mapping:
(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	2	2	2	2	2	-	-	-	3
CO2	-	2	-	2	-	2	-	-	1	-	-	-
CO3	2	2	1	-	3	-	3	-	2	-	-	-
CO4	1	-	1	-	1	-	-	2	-	2	-	1
CO5	1	-	-	2	1	-	3	1	-	2	-	1

Department of Mining Engineering *Open Electives*

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IV B. Tech. I Sem. (7th Semester)			
Course Code	**Mining and Its Importance** (Open Elective - III)				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisites: Nil		3	0	0	3

Course Objectives

1. To discuss the contribution of mining industry to nation.
2. To elaborate importance of coal mining in India.
3. To illustrate the status and importance of metal mining.
4. To enlighten about sustainable concepts for mining industry.
5. To familiarize with the applications of different sensors in mining industry.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Understand the role of mining industry for development of nation.
CO2:	Classify the coal mining methods.
CO3:	Understand the concepts of metal mining.
CO4:	Assess the sustainable mining practices in India and abroad.
CO5:	Summarize the applications of different sensors for mining industry.

Syllabus

UNIT-I
Introduction
Introduction to mining industry; National and International mineral Scenario; Status of Minerals in National scenario; Role of mining in national economy, infrastructure building and society. Basic mining terminologies, Introduction to Mining Methods.

UNIT-II
Coal Mining
History of coal mining; Coal resources and their geographical distribution; Coal mining in India; Contribution of Indian coal mining industry towards nation; Indian coal classification; Coal Mining Methods – Opencast and Underground.

UNIT-III
Metal Mining
Status of Indian metal mining industry and its contribution towards nation development; Metal mining terminologies; Applicability; Scope and limitations of underground metal mining; Opening of underground deposits.

UNIT-IV

Sustainable Mining

Introduction to sustainability, Importance of sustainability in mining industry; Examples of Sustainable mining practices followed in India and abroad.

UNIT-V

Transdisciplinary application to Mining Industry

Case studies on application of sensors for real time gas detection, smoke detection, noise and vibrations detection, ground control monitoring, proximity analysis.

Textbook(s)

1. R.D. Singh, Principle and practices of modern coal mining, New Age International Publishers, 2005.
2. Lodhia S. K, Mining and Sustainable Development, Taylor & Francis, 2018

Reference(s)

1. D. J. Deshmukh, Elements of Mining Technology, Vol-I, Denett & Co., 2008.
2. D. J. Deshmukh, Elements of Mining Technology, Vol II, Denett & Co., 2016.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IVB.Tech. ISem (7th Semester)			
Course Code 201PT7613	**Basic Concepts in Reservoir Engineering** (Open Elective-III)				
Teaching	Total contact hours-48	L	T	P	C
Prerequisites		3	0	0	3

Course Objectives

The objectives of this course are to

- Impart knowledge on basic concepts in reservoir engineering
- Analyze PVT behavior of oil & gas reservoirs
- Apply material balance concepts to oil & gas reservoirs.
- Utilize Darcy's law in oil and gas reservoirs.
- Estimate well inflow for stabilized conditions.

Course Outcomes

On Completion of the course, the students shall be able to-	
CO1:	Identify Reservoir rock properties
CO2:	Understand the phase behaviour of reservoir fluid.
CO3:	Understand fluid flow through porous media.
CO4:	Identify type of drive mechanism and calculate the reserve estimation
CO5:	Understand the reservoir development in oil filed.

Syllabus

UNIT I
Reservoir Rock Properties

Porosity, permeability determination, combination of permeability in parallel & series beds, porosity permeability relationship, fluid saturation determination and significance, effective and relative permeability, wettability, capillary pressure characteristics, measurements and uses.

UNIT II
Reservoir Fluids

Phase behavior of hydrocarbon system, ideal & non ideal system, equilibrium ratios, reservoir fluid sampling, and PVT properties determination.

UNIT III

Flow of Fluids through Porous Media

Darcy's law, single and multiphase flow, linear, radial& spherical flow, steady state & unsteady state flow, flow through fractures, GOR, WOR equations, Water and gas coning. Principles of Fluid Flow for steady state, semi steady state & non steady state conditions.

UNIT IV

Reservoir Drives

Reservoir drive mechanics and recovery factors

Reserve estimation

Estimation of petroleum reserve, resource & reserve concept, MBE, decline curve analysis.

UNIT V

Reservoir Development (oil and gas filed development)

Rational development plan, Rate and order of drilling well, well spacing & pattern, selection of development scheme, economic aspect of development of oil and gas fields.

Text book(s)

1. Tarek Ahmed, "Reservoir Engineering Handbook", Gulf Professional Publishing..
2. NnaemekaEzekwe, "Petroleum Reservoir Engineering Practice", Pearson Education, Inc.

Reference(s)

1. Benjamin Cole Craft, Murray Free Hawkins, and Ronald E. Terry, "Applied Petroleum Reservoir Engineering" by Prentice Hall.
2. LP Dake, "Fundamentals of Reservoir Engineering" shell learning and development.
3. Tarek Ahmed, Paul D. McKinney, "Advanced Reservoir Engineering" Gulf Professional Publishing.
4. BF Towler, "Fundamental Principles of Reservoir Engineering", SPE.
5. Heriot Watt, "Reservoir Engineering Handbook".
6. Abhijit Y. Dandekar, "Petroleum Reservoir Rock and Fluid Properties", CRC Press.

4 Years B.Tech. (Mechanical Engineering) Course Structure: (2021-22)

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech. I Sem (7^{TH} semester)			
Course Code	**SAFETY ENGINEERING (OPEN ELECTIVE-IV)**				
Teaching	Total contact hours - 32	L	T	P	C
Prerequisite(s):Basics of Safety engineering in Construction, Railways Irrigation and Transportation.		3	-	-	3

Course Objective:

The objectives of the course are to enable the student to learn

a. To impart knowledge on different facets and aspects of engineering systems safety,
b. to focus on tools, techniques and methodologies needed for prevention of occurrences of unsafe operations,
c. to anticipate, recognize, evaluate and control hazardous conditions and practices affecting people, property and the environment,
d. to help prevent workplace injuries and illnesses,

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	To outline the different safety concepts and Job Safety analysis.
CO2	To outline and explain the Human and vehicle characteristics and protective devices.
CO3	To identify and suggest suitable mitigation measures in construction industry.
CO4	Investigate the Railway risk and safety operations
CO5	To explain the operation of various types of Irrigation System Accidents

UNIT-I

CONCEPTS AND TECHNIQUES :- History of Safety movement –Evolution of modern safety concept- general concepts of management –line and staff functions for safety-budgeting for safety-safety policy. Incident Recall Technique (IRT), disaster control, job safety analysis, safety survey, safety inspection, safety sampling, evaluation of performance of supervisors on safety.

UNIT-II

Road Safety in Planning And Geometric Design: Vehicle And Human Characteristics, Road Design and Road Equipments, Redesigning Junctions, Cross Section Improvements, Reconstruction and Rehabilitation of Roads, Road Maintenance, Traffic Control, Vehicle Design and Protective Devices, Post Accident Care

UNIT-III

Construction Safety Management:- Introduction to Construction Industry- Safety issues in construction- Human factors in construction safety management. Safety in various construction operations- Excavation- under- water works- under- pinning & shoring Ladders & Scaffolds- Tunneling- Blasting- Demolition- Pneumatic caissons- confined Space Temporary Structures. Safety in material handling and equipments-Safety in storage & stacking of construction materials. Safety in these of construction equipments- Vehicles, Cranes, Tower Cranes, Lifting gears, Hoists & Lifts, Wire Ropes, Pulley blocks, Mixers, Conveyors, Pneumatic and hydraulic

tools in construction. Contract Labor (R&A) Act and Central Rules: Licensing of Contractors.

UNIT IV

Railway Safety :- Railway risk and safety systems, Railway risk and safety operations and organization, Railway communications and control (include signaling), railway control systems.

UNIT V

Irrigation System Accidents, Irrigation Hazard Electrical Contacts Electrical Safety Goal Equipment & Installation Problems: Irrigation Hazard Overhead Power Lines ;Spraying Water on Power Lines, Lightning Irrigation Machine Disconnections Entanglements Chemical Exposure/Poisoning Precautionary Measures

Text books:

1. Safety Management in Construction (Principles and Practice), S.K. Bhattacharjee.
2. Safety Engineering Principles and Practices , Third Edition Frank R. Spellman.

Reference Books:

1. 1st Edition Fundamentals of Process Safety Engineering By Samarendra Kumar Biswas.
2. System Safety Engineering and Risk Assessment A Practical Approach, Second Edition, Nicholas J. Bahr

CO-PO Mapping:
(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], '-' : NoCorrelation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	2	-	-	-	-	-	-	-	-
CO3	-	-	-	2	-	-	-	-	-	-	-	-
CO4	-	-	-	2	-	-	-	-	-	-	-	-
CO5	-	-	-	2	-	-	-	-	-	-	-	-

GODAVARI INSTITUTE OF ENGINEERING & TECHNOLOGY GR-20
(AUTONOMOUS)
Approved by AICTE, Accredited by NBA & NAAC 'A' Grade, Recognized under 2(f) and 12(b) of UGC, Permanently Affiliated to JNTUK, Kakinada.
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
4 Years B.Tech. (Electrical & Electronics Engineering) Course Structure : (2020-21)

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech. I Sem (OPEN ELECTIVE-IV)			
Course Code	**Basics of electrical measurements and instrumentation**				
Teaching	Total contact hours – 45	L	T	P	C
Prerequisite(s): Basic electrical engineering		3	0	0	3

Course Objectives:

1. To impart knowledge on Basic functional elements of instrumentation
2. To impart knowledge on Fundamentals of electrical and electronic instruments
3. To impart knowledge on Comparison between various measurement techniques
4. To impart knowledge on Various storage and display devices
5. To impart knowledge on Various transducers and the data acquisition systems

Course Outcomes:

After successful completion of this course, a student will be able to:	
CO1:	To acquire knowledge on Basic functional elements of instrumentation
CO2:	Ability to compare between various measurement techniques
CO3:	To acquire knowledge on Various storage and display devices
CO4:	To understand the concepts Various transducers and the data acquisition systems
CO5:	Ability to model and analyze electrical and electronic Instruments and understand the operational features of display Devices and Data Acquisition System

UNIT I

INTRODUCTION

Functional elements of an instrument ,Static and dynamic characteristics ,Errors in measurement ,Statistical evaluation of measurement data ,Standards and calibration.

UNIT II

ELECTRICAL AND ELECTRONIC INSTRUMENTS

Principle and types of analog and digital voltmeters, ammeters, multi meters ,Single and three phase watt meters and energy meters.

UNIT III

COMPARATIVE METHODS OF MEASUREMENTS

D.C potentiometers, D.C (Wheat stone, Kelvin and Kelvin Double bridge) & A.C bridges (Maxwell, Anderson and Schering bridges), transformer ratio bridges, self-balancing bridges.

UNIT IV

STORAGE AND DISPLAY DEVICES

Magnetic disk and tape ,Recorders, digital plotters and printers, CRT display, digital CRO, LED, LCD & Dot matrix display ,Data Loggers.

UNIT V

TRANSDUCERS AND DATA ACQUISITION SYSTEMS

Classification of transducers ,Selection of transducers ,Resistive, capacitive & inductive Transducers, Piezoelectric, Hall effect, optical and digital transducers, Elements of data

GODAVARI INSTITUTE OF ENGINEERING & TECHNOLOGY GR-20
(AUTONOMOUS)
Approved by AICTE, Accredited by NBA & NAAC 'A' Grade, Recognized under 2(f) and 12(b) of UGC, Permanently Affiliated to JNTUK, Kakinada.
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
4 Years B.Tech. (Electrical & Electronics Engineering) Course Structure : (2020-21)

Text Books

1. Electrical Measurements and measuring Instruments – by E.W. Golding and F.C. Widdis, fifth Edition,Wheeler Publishing.
2. Electrical & Electronic Measurement & Instruments by A.K.SawhneyDhanpatRai& Co. Publications.
3. Electrical Measurements: Fundamentals, Concepts, Applications – by Reissland, M.U, New Age International (P) Limited, Publishers.

Reference Books

1. Electrical Measurements – by Buckingham and Price, Prentice – Hall
2. Electrical Measurements by Harris.
3. Electronic Instrumentation-by H S Kalsi, Tata McGraw-Hill Education

Web-Resources:

1. www.electrical4u.com
2. www.nptel.com

CO-PO Mapping: (1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], '-' : NoCorrelation)

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PO11	P012
C01		✓								✓		
C02			✓								✓	
C03			✓									
C04				✓								
C05					✓							

Regulation GRMT-20	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech. I Sem (7 semester)			
Course Code	**FUNDAMENTALS OF DIGITAL IMAGE PROCESSING**				
Teaching	Total contact hours-45	L	T	P	C
Prerequisites: knowledge of Signals and Systems, Concepts of Digital signal processing, and Basic Calculus and Probability.		3	-	-	3

Course Objectives:

1. To understand the basic concepts of Digital Image Processing.
2. To develop an understanding of the techniques of image enhancement.
3. To develop concepts for image segmentation.
4. To develop an understanding of color image processing and to develop coding methods of image compression.
5. To develop an understanding of various algorithms for image morphology.

Course Outcomes:

On Completion of the course, the students will be able to	
CO1:	Learn the basics of digital image processing and image transforms.
CO2:	Learn the various techniques to enhance digital images in the spatial and frequency domain.
CO3:	Apply various techniques of image segmentation to digital images.
CO4:	Analyze the concepts of color image processing and understand various coding techniques for digital image compression.
CO5:	Learn various algorithms of morphological image processing.

UNIT – I

DIGITAL IMAGE FUNDAMENTALS: Introduction to Digital Image, Image processing applications, Digital Image Processing System, Sampling and Quantization. Representation of Digital Image, Levels of image processing operations: Low-level operations and High-level operations. Image transforms 2D-DFT, Properties of 2D-DFT, 2D-DCT, Walsh transform, Hadamard transform. Types of Image File Formats: BMP, GIF, DICOM, PNG, TIFF, and JPEG.

UNIT – II

IMAGE ENHANCEMENT IN SPATIAL DOMAIN AND FREQUENCY DOMAIN:
Inversion, Contrast stretching, Intensity slicing, Bit-plane slicing. Histogram stretching, Histogram equalization. Neighborhood Processing, Spatial Filtering, Smoothing and Sharpening Filters, Median Filter. Noise models. Image smoothing in the frequency domain, Image sharpening in the frequency domain.

UNIT – III

IMAGE SEGMENTATION: Detection of discontinuities: Point detection and Line detection. Image Edge detection using Robert, Sobel, and Prewitt masks. Image Edge detection using Laplacian Mask. Thresholding-based segmentation: Global thresholding, Multiple thresholding, and Adaptive thresholding. Similarity-based segmentation: Region-Growing algorithm, Split-and-Merge algorithm.

UNIT – IV

COLOR IMAGE PROCESSING AND IMAGE COMPRESSION: Color Fundamentals, Color Models: RGB, HSV, and CMYK, Pseudo color image processing, Color features. Image compression models, Types of redundancies, Run-length coding, Huffman coding, Shannon-Fano coding, and Bit-plane coding. Image quality factors and Image quality metrics.

UNIT – V

MORPHOLOGICAL IMAGE PROCESSING: Need for morphological image processing, Dilation operation, Erosion operation, Properties of Dilation and Erosion, Hit-or-Miss transform, Basic Morphological algorithms: Boundary extraction, Noise removal, Thinning, Thickening. Grey-scale Dilation and Erosion, Top-hat and Well transformations algorithms.

Text Books:

1. Digital Image Processing, Second Edition by Rafel C. Gonzalez and Richard E. Woods, Pearson Education.
2. Digital Image Processing First Edition by S.Sridhar.

Reference Books:

1. Digital Image Processing by Bhabatosh Chanda and Dwijesh Majumder, PHI.
2. Fundamentals of Digital Image Processing by Anil K Jain, PHI.
3. Digital Image Processing Using Matlab, Rafel C. Gonzalez and Richard E. Woods, Pearson Education.

Web Links:

1. https://www.imageprocessingplace.com/
2. https://www.udemy.com/course/digital-image-processing-made-easy/
3. https://github.com/topics/digital-image-processing
4. https://in.mathworks.com/products/image.html

CO-PO Mapping:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) '-': No Correlation

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	3	-	1	1	1	-	-	-	1	3
CO2	2	1	1	-	-	-	1	2	-	2	-	-
CO3	2	-	3	2	1	2	2	-	3	-	2	-
CO4	1	2	-	-	-	2	3	3	2	1	-	3
CO5	3	-	-	2	-	1	-	2	-	2	-	-

Regulation GRBT-20	GODAVARI INSTITUTE OF ENGINEERING & TECHNOLOGY (Autonomous)	IV B.Tech I Semester			
Course Code 201CS705	**HUMAN COMPUTER INTERACTION** Open Elective-IV: CSE, CSE (AI/ML), CSE (Cyber Security)				
Teaching	Total contact hours- 48	L	T	P	C
Prerequisite(s): Basic Concepts of Computer Science and Security Systems		3	0	0	3

Course Objective(s):

1. Understand the important aspects of implementation of human-computer interfaces
2. Identify the various tools and techniques for interface analysis, design, and evaluation
3. Identify the importance of working in teams and the role of each member within an interface development phase

Course Outcome(s):

After completion of the course the student will be able to-

CO-1: Explain the capabilities of both humans and computers from the viewpoint of human information processing.

CO-2: Identify the various tools and techniques for interface analysis, design, and evaluation

CO-3: Describe typical human–computer interaction (HCI) models, styles, and various historic HCI paradigms.

CO-4: Apply an interactive design process and universal design principles to designing HCI systems.

CO-5: Identify the challenges and apply information visualization

UNIT-1

Introduction: Usability of Interactive Systems- introduction, usability goals and measures, usability motivations, universal usability, goals for our profession Managing **Design Processes:** Introduction, Organizational design to support usability, Four pillars of design, development methodologies, Ethnographic observation, Participatory design, Scenario Development, Social impact statement for early design review, legal issues, Usability Testing and Laboratories

UNIT-2

Menu Selection, Form Fill-In and Dialog Boxes: Introduction, Task- Related Menu Organization, Single menus, Combinations of Multiple Menus, Content Organization, Fast Movement through Menus, Data entry with Menus, Form Fill-in, dialog Boxes, and alternatives, Audio Menus and menus for Small Displays

UNIT-3

Command and Natural Languages: Introduction, command organization functionality, Strategies and Structure, Naming and Abbreviations, Natural Language in computing.

Interaction Devices: Introduction, Keyboards and Keypads, Pointing Devices, Speech and Auditory Interfaces, Displays- Small and large.

Quality of Service: Introduction, Models of Response-Time impacts, Expectations and attitudes, User Productivity, Variability in Response Time, Frustrating Experiences.

UNIT-4

Balancing Function and Fashion: Introduction, Error Messages, Non-anthropomorphic Design, Display Design, Web Page Design, Window Design, Color.

User Documentation and Online Help: Introduction, Online Vs Paper Documentation, Reading from paper Vs from Displays, Shaping the content of the Documentation, Accessing the Documentation, Online tutorials and animated documentation, Online communities for User Assistance, The Development Process

UNIT-5

Information Search: Introduction, Searching in Textual Documents and Database Querying, Multimedia Document Searches, Advanced Filtering and Searching Interfaces

Information Visualization: Introduction, Data Type by Task Taxonomy, Challenges for Information Visualization

Text books

1. Designing the User Interface, Strategies for Effective Human Computer Interaction, 5ed, Ben Shneiderman, Catherine Plaisant, Maxine Cohen, Steven M Jacobs, Pearson
2. The Essential guide to user interface design,2/e, Wilbert O Galitz, Wiley DreamaTech.

Reference Books

1. Human Computer, Interaction Dan R.Olsan, Cengage, 2010
2. Designing the user interface. 4/e, Ben Shneidermann, PEA.
3. User Interface Design, SorenLauesen , PEA
4. Interaction Design PRECE, ROGERS, SHARPS, Wiley.

Web Links:

1. https://nptel.ac.in/courses/106/103/106103115/
2. https://www.youtube.com/watch?v=azk99gD_2Io&list=PLwdnzlV3ogoX3iArOKRq4RHSPrZyxhkrI

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	2	-	-	-	-	-	1	-	-	-	1	3
CO2	1	-	-	2	3	-	-	-	-	-	2	3	2	2
CO3	2	-	2	3	-	3	-	2	-	-	3	-	1	-
CO4	1	-	2	-	-	2	-	-	-	-	-	-	2	-
CO5	1	2	-	3	3	2	-	-	-	-	3	3	-	2

An Autonomous Institution
NBA Accredited & NAAC 'A+'

AUTOMOBILE ENGINEERING **GRBT20**

IV Year – I Semester		L	T	P	C
		3	0	0	3
OPEN ELECTRIVE-4	ALTERNATIVE ENERGY RESOURCES FOR AUTOMOTIVES				

COURSE OBJECTIVES:
Students undergoing this course will be able to:
1. Produce and use the alternative fuels
2. Predict the properties of vegetable oils, gaseous fuels, hydrogen fuels, alcohol fuels
3. Judge the effect of alternative fuels on fossil fuels when use in IC engines
4. Analyze electric and hybrid automobiles

Course Outcomes:

On Completion of the course, the students shall be able to-	
CO1:	Produce and use vegetable oils, gaseous fuels, hydrogen fuels, alcohol fuels
CO2:	Determine the properties, performance, emission characteristics of alternative fuels
CO3:	Evaluate alternative fuels on fossil fuels when use in combination with both fuels
CO4:	Design, analyze and build the electric and hybrid automobiles
CO5:	Understand working of fuel cell and solar cars

UNIT-I Introduction: Need for non-conventional energy sources. Energy alternative: solar, photo-voltaic, Hydrogen, Biomass. Electrical- their merits and demerits.
Vegetable Oils: Various vegetable oils for diesel engines, structure and properties, problems in using vegetable oils in diesel engines, methods to improve the engine performance using vegetable oils-preheating,Esterification(biodiesel,blendingwithgoodsecondaryfuels,semi-adiabaticengine,surface ignition engine, ignition accelerators dual fuelling with gaseous and liquid fuels, performance, combustion and emission characteristics of vegetable oil fuelled diesel engines.

UNIT-II Gaseous Fuels: Properties of hydrogen, production and storage methods, safety precautions , use in SI and CI engines, biogas production and its properties, use in SI and CI engines, properties of LPG and CNG, use in SI and CI engines. Performance, combustion and emission characteristics of hydrogen, biogas, LPG and CNG in SI and CI engines.
Energy from Bio mass: Photosynthesis, photosynthetic oxygen production, energy plantation. Biogas production from organic waste, description and types of Bio gas plants, Application and limitations – Merits and demerits performance characteristics and their comparison.

UNIT-III Hydrogen Fuel: Hydrogen Energy: Properties of Hydrogen, sources of Hydrogen, Thermodynamics of water splitting Production of Hydrogen, Electrolysis of water. Thermal decomposition of water. Thermo-chemical production, Biochemical production.
Hydrogen fuel, Storage and Transportation methods, Applications to engines modifications necessary, precautions and safety measures- Performance characteristics in Engine and their comparison.

AUTOMOBILE ENGINEERING GRBT20

UNIT IV Alcohol Fuels: Properties of alcohols, engine modifications required to use alcohols in SI engines, performance, combustion and emission characteristics in SI engines, alcohol – gasoline blends, fuel flexible vehicle, methanol reformed gas engine, use of alcohols in CI engines-emulsions, dual fuelsystem,sparkassisteddieselengine,surfaceignitionengine,ignitionaccelerators,performance,combustion and emission characteristics in CI Engines.

UNIT-V Electric & Hybrid Vehicles: cost of electric car, Availability of energy for recharging. Traction motors and types. Electric Automobiles: Design considerations, limitations. Opportunities for improvement Batteries, problems. Future possibilities, capacities, types, material requirement
Solar & Fuel Cell Vehicles : Solar photo-voltaic conversion, Collection and storage of solar energy, collection devices, flat plate collectors, concentrating type collectors, principles and working of photo-voltaic Conversion, Applications to automobiles.

TEXT BOOKS:
1. G.D. Rai 'Non-conventional sources of energy Khamma Lab.
2. William Hamilton 'Electric Automobiles', PHI
3. Alternative sources and control system. Yes Dee publishing pvt Ltd

REFERENCEBOOKS:
1. S.P. Sukhatme 'Solar Energy', Tata Mc Graw Hill.
2. S. Rao & B. B. Larulekar 'Energy Technology', Khamma Lab
3. Frank Kreith & Jan F.Krieder 'Principles of Solar Engineering 'Mc Graw Hill.
4. J.A. Duffie & W.A. Beckman 'Solar Energy-thermal Process 'Mc Graw Hil1
5. E,D; Totta, 'Solar Hydrogen Energy-Systems'
6. T.N. Veziroglu. Alternative energy sources.
7. Mitsui E. Stal, Biological solar energy conversion

CO-PO Mapping:
(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	3	-	3	-	2	2	-	2	-	2
CO2	2	1	2	-	2	2	-	2	1	1	-	-
CO3	1	2	-	1	-	-	2	3	2	-	1	2
CO4	2	1	-	2	-	-	-	-	-	-	-	1
CO5	2	1	-	-	-	-	2	-	-	-	1	-

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IV B. Tech. I Sem. (7th Semester)			
Course Code	**Remote Sensing & GIS in Mining** (Open Elective - IV)				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisites: Nil		3	0	0	3

Course Objectives

1. To discuss the basic principles of Remote Sensing.
2. To elaborate the concepts of visual and digital image analysis.
3. To illustrate the concepts of GIS.
4. To impart the knowledge on the concept of spatial analysis.
5. To communicate the applications of remote sensing and GIS.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Outline the basic principles of Remote Sensing.
CO2:	Develop the concepts of visual and digital image analysis.
CO3:	Summarize the basic concepts of GIS.
CO4:	Perform spatial analysis.
CO5:	Apply knowledge of remote sensing and GIS in various fields.

Syllabus

UNIT-I

Introduction to remote sensing

Basic concepts of remote sensing, electromagnetic radiation, electromagnetic spectrum, interaction with atmosphere; energy interaction with the earth surfaces characteristics of remote sensing systems.

Sensors and platforms

Introduction, types of sensors; airborne remote sensing, space borne remote sensing; image data characteristics, digital image data formats-band interleaved by pixel, band interleaved by line, band sequential.

UNIT-II

Image analysis

Introduction, elements of visual interpretations, digital image processing- image pre-processing, image enhancement, image classification, supervised classification, unsupervised classification.

UNIT-III

Geographic Information System

Introduction, key components, application areas of GIS, map projections.

Data entry and preparation

Spatial data input, raster data models, vector data models.

UNIT-IV

Spatial data analysis

Introduction, overlay function-vector overlay operations, raster overlay operations, arithmetic operators, comparison and logical operators, conditional expressions, overlay using a decision table, network analysis-optimal path finding, network allocation, network tracing.

UNIT-V

Applications of Remote sensing and GIS

Land cover and land use pattern, forestry, geology, geomorphology and mining operations.

Textbook(s)

1. Bhatta B, Remote sensing and GIS, Oxford University Press, 2008.
2. Narayan LRA, Remote Sensing and its Applications, Universities Press, 2012.

Reference(s)

1. Lilles and, T.M, R.W. Kiefer and J.W. Chipman, Remote Sensing and Image Interpretation, Wiley India Pvt. Ltd., New Delhi, 2013.
2. Chor Pang Lo and A K W Yeung, Concepts and Techniques of Geographical Information System, Prentice Hall (India), 2006.
3. Kand Tsung Chang, Introduction to Geographic Information Systems, McGraw Hill Higher Education, 2009.
4. George Joseph, Fundamentals of Remote Sensing, Universities Press, 2013.
5. Demers, M.N, Fundamentals of Geographic Information Systems, Wiley India Pvt. Ltd, 2013.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IVB.Tech. ISem (7th Semester)			
Course Code 201PT7614	**Introduction to Petroleum Production Engineering** (Open Elective-IV)				
Teaching	Total contact hours-48	L	T	P	C
Prerequisites		3	0	0	3

Course Objectives

The objectives of this course are to

- Impart knowledge on competition techniques
- Illustrate oil and gas well stimulation techniques
- Understand oil and gas well services.

Course Outcomes

On Completion of the course, the students shall be able to-	
CO1:	Identify the well head equipment
CO2:	Identify the different types of well completion.
CO3:	Understand well activation and stimulate well for improving the flow at well bore
CO4:	Identify well production problems and apply mitigation techniques
CO5:	Understand work over jobs for oil well

Syllabus

UNIT-I
Well Equipment

Well Head Equipment's, Christmas tree, valves, hangers, flow control devices, packers, tubular and flow lines.

UNIT-II
Well Completion

Types of well completion, Perforating Oil & Gas Wells - Conventional and Unconventional techniques viz. through tubing and tubing conveyed underbalanced perforating techniques, type size and orientation of perforation holes.

UNIT-III

Well Activation and Stimulation Techniques

Well activation methods, stimulation type & description, design of matrix acidization and acid fracturing. Design of hydraulic fracturing (mini, massive & high energy frac.). Wave technology & microbial stimulation.

UNIT-IV

Well Production Problems and Mitigation

Scale formation, paraffin deposition, formation damage, water production, gas production, sand deposition etc.

UNIT-V

Work over Operations

Work over system, work over rigs and selection, rig less work over including Endless/ Coiled tubing unit, minor & major work over jobs-diagnosis & remedial measures water shut off and gas shut off-Chemical treatment and conformance control.

Text Book(s)

1. Thomas O Allen, Alan P. Roberts, "Production Operations: Well Completions, Workover, and Stimulation", (Volume 1 and 2), Oil & Gas Consultants International.

Reference(s)

1. Daniel Hill, Christine Ehlig-Economides, Ding Zhu, Michael J. Economides, "Petroleum Production Systems", 2nd Ed., Prentice Hall.
2. BoyunGuo, William C. Lyons, Ali Ghalambor, "Petroleum Production Engineering: A computer assisted approach" Elsevier Science and Technology Books.

GODAVARI INSTITUTE OF ENGINEERING & TECHNOLOGY GRBT20
(AUTONOMOUS)
Approved by AICTE, Accredited by NBA & NAAC 'A' Grade, Recognized under 2(f) and 12(b) of UGC, Permanently Affiliated to JNTUK, Kakinada

Regulation GRBT20	Godavari Institute of Engineering & Technology (Autonomous)	B.Tech – IV -I			
Course Code	**Digital Marketing (Common to all Branches)**				
Teaching	Total Contact Hours-45	L	T	P	C
Prerequisite(s): Basic knowledge of English		3	0	0	3

Course Objectives:

1.To analyzethe confluence of marketing, operations, and human resources in real-time delivery.

2. To demonstrate cognitive knowledge of the skills required in conducting online research and research markets, as well as in identifying, assessing and selecting digital market . opportunities.

Course outcomes:

On Completion of the course, the students will be able to-	
CO1:	Gain Knowledge of overall understanding of digital marketing
CO2:	Develop insight on current trends – digital and social statistics (Infographics)
CO3:	Provide an introduction to digital marketing platforms like.. Facebook, Twitter, YouTube, Pinterest, etc.
CO4:	Learn the knowledge of SEO& SEM.
CO5:	Learn Web analytics.

UNIT I

Introduction to Digital Marketing : Evolution of Digital Marketing from traditional to modern era, Role of Internet; latest trends, Info-graphics, implications for business & society, Emergence of digital marketing as a tool, Drivers of the new marketing environment; Digital marketing strategy, Digital marketing plan, Digital marketing models.

UNIT II

Internet Marketing and Digital Marketing Mix: Internet Marketing, opportunities and challenges, Digital marketing framework, Digital Marketing mix, Impact of digital channels on IMC,Display marketing: Types of Display Ads - Buying Models - Programmable Digital Marketing - Analytical Tools - YouTube marketing.

GODAVARI INSTITUTE OF ENGINEERING & TECHNOLOGY GRBT20
(AUTONOMOUS)
Approved by AICTE, Accredited by NBA & NAAC 'A' Grade, Recognized under 2(f) and 12(b) of UGC, Permanently Affiliated to JNTUK, Kakinada.

UNIT III

Social Media Marketing: Role of Influencer Marketing, Tools & Plan, Introduction to social media platforms, penetration & characteristics; Building a successful social media marketing strategy. Facebook Marketing: Business through Face book Marketing, Face book Marketing Tools, Linked in Marketing: Introduction and Importance of Linked in Marketing, Framing Linked in Strategy, Lead Generation through Linkedin, Content Strategy, Analytics and Targeting,

UNIT IV

Introduction to SEO, SEM, Web Analytics: Need for SEO, How to use internet & search engines; search engine and its working pattern, On-page and off-page optimization, SEO Tactics - Introduction to SEMMobile Marketing: Mobile Advertising, Forms of Mobile Marketing, Features, Mobile Campaign Development, Mobile Advertising Analytics

UNIT V

Web Analytics: Google Analytics & Google Ad Words; data collection for web analytics, multichannel attribution, Universal analytics, tracking code Trends in digital advertising, Landing Page.

Text Books :

1. Digital Marketing Paperback – Illustrated, 13 April 2015 by Vandana Ahuja (Author)
2. Digital Marketing | Second Edition Paperback – 6 August 2020 by Seema Gupta (Author)
3. Fundamentals of Digital Marketing | Second Edition | By Pearson Paperback – 30 June 2019by Puneet Bhatia (Author)
4. Social Media & Mobile Marketing Paperback – 1 January 2019by Puneet Singh Bhatia

References

1. E-Commerce: Strategy, Technologies and Applications Paperback – 2001 by David Whiteley
2. E-Commerce: An Indian Perspective Paperback – Import, 30 Nov 2015-by P. T. Joseph
3. One Click: Jeff Bezos and the Rise of Amazon.com Kindle Edition- by Richard L. Brandt
4. E-Commerce: Strategy, Technologies and Applications Paperback – 2001 by David Whiteley
5. E-Commerce: An Indian Perspective Paperback – Import, 30 Nov 2015-by P. T. Joseph

Web references

1 https://learndigital.withgoogle.com/digitalunlocked/
2 https://digitalskills.fb.com/en-in/
3 https://www.hubspot.com/digital-marketing
4 http://www.afaqs.com/
5 https://www.linkedin.com/learning/
6 Journal of Marketing 7 ET-Brand Equity 8 HBR T

Regulation GRBT-20	GODAVARI INSTITUTE OF ENGINEERING & TECHNOLOGY(Autonomous)	IV B.Tech I Semester			
Course Code	**UHV 2 - Understanding Harmony**				
Teaching	Total contact hours- 48	L	T	P	C
Prerequisite(s): ---		3	0	0	3

Course Objective(s):

1. Development of a holistic perspective based on self-exploration about themselves (human being),family, society and nature/existence.
2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

Course Outcome(s):

After completion of the course the student will be able to-

CO-1: Become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.

CO-2: They would have better critical ability. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society). It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

Module 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

1. Purpose and motivation for the course, recapitulation from Universal Human Values-I
2. Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking

Module 2: Understanding Harmony in the Human Being - Harmony in Myself!

1. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
2. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
3. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
4. Understanding the characteristics and activities of 'I' and harmony in 'I'
5. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
6. Programs to ensureSanyam and Health.

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

Module 3: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

1. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
2. Understanding the meaning of Trust; Difference between intention and competence
3. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
4. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
5. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family**.**

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

Module 4: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

1. Understanding the harmony in the Nature
2. Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature
3. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space
4. Holistic perception of harmony at all levels of existence.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

Module 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics

5. Natural acceptance of human values
6. Definitiveness of Ethical Human Conduct
7. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
8. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people- friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
9. Case studies of typical holistic technologies, management models and production systems
10. Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations
11. Sum up.

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

Text Books

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books,New Delhi, 2010

Reference Books:

1. JeevanVidya: EkParichaya, ANagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj - PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech. I Sem (7th semester)			
Course Code	**Computational Fluid Dynamics Lab**				
Teaching	Totalcontacthours–55	L	T	P	C
Prerequisite(s): Fluid Mechanics and Hydraulic Machinery, Heat Transfer		0	1	2	2

Course Objectives:

Students undergoing this course will be able to:

- To familiarize the laminar and turbulent fluid flow behaviour in 2D and 3D models.
- To understand the fluid flow behaviour on sudden contraction, enlargement and C-D nozzle.
- To understand the heat transfer phenomenon in heat exchangers.
- To understand the mixing phenomenon of two different fluids.
- To understand the fluid flow and heat transfer phenomenon of SI engine fins.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Simulate the laminar and turbulent flow behaviour in 2D and 3D models.
CO2:	Examine the fluid flow behaviour in sudden contraction, enlargement and C-D nozzle.
CO3:	Analyse the heat transfer phenomenon on different heat exchangers.
CO4:	Measure the outlet temperature of fluid in mixing elbow.
CO5:	Simulate the fluid flow and heat transfer phenomenon of SI engine fins.

List of Exercises: -

Fluid Flows: Steady and unsteady flows, uniform and non- uniform flows, laminar and turbulent flows, compressible and incompressible flows, rotational and ir-rotational flows and one, two and three dimensional flows.

Flow through pipes: Introduction, Sudden Enlargement and sudden contraction.

Nozzles: Introduction, Convergent nozzle and Convergent- Divergent nozzle.

Heat Exchangers: Introduction, Classification of heat exchangers according to transfer processes, number of fluids, surface compactness, construction, flow arrangements, heat transfer mechanisms and process of function.

Heat Engines: Introduction, Internal combustion engine, External combustion engine, Introduction to CI and SI engines.

Computational Fluid Dynamics: Introduction, Pre-processing, Processing(Solving), Post- processing. Introduction to Finite Difference Method (FDM),Introduction to Finite Volume Method (FVM) and Introduction to Finite Element Method (FEM).

1. Laminar Flow over Flat Plate
2. Turbulent Flow Over a Flat Plate
3. Laminar flow through the3D Circular Pipe
4. Turbulent flow through the 3D Circular Pipe
5. Fluid flow phenomenon in sudden contraction.
6. Fluid flow phenomenon in sudden enlargement.
7. Fluid flow phenomenon in Convergent-Divergent Nozzle.
8. Heat transfer phenomenon in Plate Heat Exchangers
9. Heat transfer phenomenon in Double Tube Heat Exchangers
10. Heat transfer phenomenon in shell and tube heat exchanger
11. Heat transfer phenomenon in mixing elbow.
12. Fluid flow phenomenon on SI engine fins.

References:

- A TEXTBOOK OF FLUID MECHANICS AND HYDRAULIC MACHINES, Tenth edition, R.K. Bansal, Laxmi Publications,2019.
- THERMAL ENGINEERING, Eleventh edition, R.K. Rajput, Laxmi Publications,2020.
- Heat and Mass Transfer",3rd edition,P Nag ,Tata Mcgraw Hill Education Private Limited,2011.

CO-PO Mapping:
(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	3	-	-	-	-	-	2	-	-	2
CO2	2	2	3	-	-	-	-	-	2	-	-	2
CO3	2	2	3	-	-	-	-	-	2	-	-	2
CO4	2	2	3	-	-	-	-	-	2	-	-	2
CO5	2	2	3	-	-	-	-	-	2	-	-	2