CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

DEPARTMENT OF MECHANICAL ENGINEERING

ACTION TAKEN TOWARDS STAKE HOLDERS' FEEDBACK ON THE CURRICULUM

2018-19

PROFESSOR & HEAD
Dept of Mechanical Engineering
Bharathi Institute of Technology (A)
Hyderabad-500 075. Telangana

Action taken Report on Student feed back

2018-19

S. No	Description	Rating Out of 5	Action Taken/Proposed	Proof Page No
1	Satisfaction level of students in association with CBIT	4.13	-	-
2	Addressing the grievances	3.76	-	-
3	How far the acquired knowledge of mathematics, science and engineering fundamentals helped you in solving complex mechanical engineering problems? (PO1)	4	-	-
4	How confident are you in identifying, formulating and analyzing complex engineering problems reaching to substantial conclusions by using first principles of mathematics and sciences? (PO2)	4.5	-	-
5	How adequate is the knowledge you gained, helped in providing solutions for complex engineering problems and design/develop systems to meet the societal needs as per standards? (PO3)	3.9	-	-
6	How competent are you in conducting investigations of complex problems using research-based knowledge/methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions?(PO4)	3.7	-	-
7	How acquainted are you in using modern IT tools in modeling of complex engineering problems? (PO5)	3.8	-	-
8	How informed are you with the contextual knowledge of the engineer and society relevant to the professional engineering practice? (PO6)	3.8	-	-
9	How well versed are you in understanding the impact of professional Engineering solutions in the context of environment and sustainable development? (PO7)	4.1	-	-
10	How equipped are you with the ethical principles and responsibilities in accordance with the Engineering practices? (PO8)	3.9	-	-

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11	How managerial are you in effective functioning with the team?(PO9)	4.2	-	-
12	How effective are you in communicating for comprehension, documentation and presentation of engineering activities? (PO10)	4	-	-
13	How entrepreneurial are you in identifying, acquiring and allocating the finance and other resources for an effective project management? (PO11)	4.	-	-
14	How adaptable are you to engage in lifelong learning approaches in the of context of technological changes?(PO12)	3.9	-	-
15	How do you rate the Curriculum/Syllabus that you have undergone?	4.23	-	-
16.	As preparation for campus interviews, competitive exams take considerable amount of time in 4th Year, the number of courses need to be reduced.	-	In addition to project and seminar there were 4 subjects in R-13 , the same is reduce to 2 in R-18	-
	In addition to casting, welding and forming processes, advanced manufacturing processes may be introduced in MP subject	-	Additive manufacturing, powder processing and processing of composited are introduced in R-18	4-11

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UNIT - II

Beams: Definition of bending moment and shear force; relationship between intensity of loading, shear force and bending moment; bending moment and shear force diagrams for cantilever, simply supported and overhanging beams; simple theory of bending, moment of resistance, modulus of section.

UNIT - III

Slopes and Deflections: Slope and deflection calculations of cantilever, simply supported beams subjected to point loads and uniformly distributed loads with Macaulay's and double integration methods.

Torsion: Derivation of torsion formula for circular sections, power transmission, effect of combined bending and torsion.

UNIT - IV

Shear Stresses in beams: Distribution of shear stresses in rectangular, I-section, T-section, solid and hollow circular sections.

Compound stresses: principal stresses and strains. Mohr's circle of stress.

UNIT - V

Cylinders: Stresses in thin and thick cylinders with internal and external pressures. Stresses in compound cylinders. **Columns and struts**: Euler's and Rankine's formulae for axial load applications. Secant and Perry formulae for eccentrically loaded columns.

Text Books:

1. S.S.Rattan, "Strength of Materials", 3/e, Tata Mc-Graw Hill, 2016.
2. S. Ramamrutham, "Strength of Materials", Dhanpatrai and Sons, 1993.
3. G.H.Ryder, "Strength of Materials", 3/e, Macmillan India Limited, Delhi 2002.

Suggested Reading:

1. S.S. Bhavakatti, "Strength of Materials", Vikas Publication, 2003.
2. James M Gere, "Mechanics of materials", 8/e, cengage learning, 2013.
3. R.C. Hibbeler, "Mechanics of Materials", 9/e, Pearson, 2018.

18PE C01

MANUFACTURING PROCESSES

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Objectives: To enable the students to

1. Understand various terms related to manufacturing processes
2. Understand various manufacturing processes
3. Provide the ability to solve simple problems such as riser design and sheet metal calculations
4. Compare various Manufacturing processes
5. Select suitable manufacturing process for a given component

Outcomes: At the end of the course, a student will be able to

1. Students should able to define various terms related to manufacturing processes (Level-1)
2. Demonstrate the understanding of various manufacturing processes (Level 2)
3. Solve simple problems such as riser design and sheet metal calculations (Level 3)
4. Compare various Manufacturing processes (Level 4)
5. Choose suitable manufacturing process for a given component (level 5)

UNIT - I

Pattern Design and Methoding: Introduction to casting, classification of casting processes, pattern design: Types of patterns, pattern materials, pattern allowances; Gating system: purpose, elements, requirements, types of gates, Risering: purpose, requirements, chvorinov's rule, optimum shape and dimensions of riser, riser design by Caine's method, and Modulus method.

UNIT - II

Moulding, Melting and Special Casting Processes: Moulding sand: ingredients, required properties of moulding sand; Core : purpose, core prints, Melting by ,Cupoa furncace, induction and arc furnace; casting defects and remedies; Special casting processes: Pressure die casting, Centrifugal casting, shell moulding, investment casting, CO2 moulding.

UNIT - III

Welding: Introduction, Classification of welding processes, Physics of arc, DCSP, DCRP, AC, shielded Metal Arc Welding, Submerged arc welding, Gas Tungsten arc welding, Plasma arc welding, Resistance welding: spot, projection, seam, butt and percussion welding. Oxy-Acetylene welding, Thermit welding, laser beam welding, Electron beam welding. solid state welding: friction welding, ultrasonic welding and explosive welding Soldering and brazing.

UNIT – IV

Metal Forming Processes: forging: open die ,closed die and isothermal forging processes, Rolling: process, nomenclature, geometric relationships, rolling mills; Extrusion: Direct, indirect, hydrostatic and impact extrusion processes ; Wire Drawing Process, shearing: shearing load, energy required, types of shearing processes; Cup Drawing : process, calculation of blank diameter for a given cup, drawing load; sheet bending: process, bend allowance.

UNIT – V

Additive Manufacturing: Introduction, Liquid based, powder based and deposition based layer wise manufacturing, Apllications of additive manufacturing.

Powder Processing: Introduction, Production of powders, mixing, blending, compacting and sintering. Secondary processes such as repressing, coining, sizing, P/M Forging, Impregnation and infiltration. Merits, demerits and application of powder metallurgy products

Processing of Plastics, Ceramics and Composites: Injection moulding, Blow moulding, Thermoforming, Extrusion, Compression and transfer moulding processes. Ceramic processing techniques such as injection moulding and slip casting. Processing methods of composites such as roll bending, diffusion bonding, Pultrusion and filament winding processes.

Text Books:

1. P.N.Rao, "Manufacturing Technology", Vol.1, 3/e, Tata McGraw Hill Publ., 2011.
2. Amitabh Ghosh and Mallick, "Manufacturing Science", 4/e, Assoc. East West Press Pvt. Ltd., 2011.

Suggested Reading:

1. G.K.Lal and S.K.Choudhury," Fundamentals of Manufacturing Processes" Alpha science international ltd.,2005.
2. Schey, "Introduction To Manufacturing Processes", 2/e, Mcgraw - hill Education.
3. Mikell P.Grover, "Fundamentals of Modern Manufacturing Materials, Processes and Systems", 3/e, Willey A.

18EG M01

INDIAN CONSTITUTION AND FUNDAMENTAL PRINCIPLES

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
SEE	50 Marks
CIE	———
Credits	0

Objectives: The course will introduce the students to

1. The history of Indian Constitution and how it reflects the social, political and economic perspectives of the Indian society.
2. Address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. Have knowledge of the various Organs of Governance and Local Administration.

Outcomes: After successful completion of the course the students will be able to

1. Understand the making of the Indian Constitution and its features.
2. Have an insight into various Organs of Governance - composition and functions.
3. Understand powers and functions of Municipalities, Panchayats and Co-operative Societies.
4. Be aware of the Emergency Provisions in India.
5. Understand the Right To equality, the Right To freedom and the Right To Liberty.

UNIT - I

Constitution of India: Introduction and salient features, Constitutional history, Directive principles of state policy - Its importance and implementation.

UNIT - II

Union Government and its Administration: Structure of the Indian Union: Federalism, distribution of legislative and financial powers between the Union and the States, Parliamentary form of government in India. **President**: role, power and position.

With effect from academic year 2021-2022

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

AICTE MODEL CURRICULUM SCHEME

B.E. (PRODUCTION ENGINEERING)

SEMESTER – VII

S. No.	Course Code	Title of the Course	Scheme of instruction			Scheme of examination			Credits
			Hours per week			Duration in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	18ME C22	Metrology and Instrumentation	3	--	--	3	30	70	3
2	18ME C23	Operations Research	3	--	--	3	30	70	3
3	18PE C11	Additive Manufacturing Technologies	3	--	--	3	30	70	3
4		Core Elective – VI	3	--	--	3	30	70	3
5		Open Elective – I	3	--	--	3	30	70	3
PRACTICALS									
6	18ME C25	Metrology and Instrumentation Lab	--	--	3	3	25	50	1.5
7	18PE C12	Additive Manufacturing Lab	--	--	3	3	25	50	1.5
8	18PE C13	Project: Part - 1	--	--	4	--	50	--	2
		TOTAL	**15**	--	**10**	--	**250**	**450**	**20**

L: Lecture T: Tutorial D: Drawing P: Practical
CIE - Continuous Internal Evaluation SEE – Semester End Examination

Core Elective – VI (3/3)			Open Elective – I (3/3)		
SNO	Subj. Code	Name of the Subject	SNO	Subj. Code	Name of the Subject
1	18ME E21	Power Plant Engineering	1	18IT O01	Object Oriented Programming using JAVA
2	18ME E22	Engineering Research Methodology	2	18PY O01	History of Science & Technology
3	18ME E23	Data Analytics	3	18EG O02	Gender Sensitization
4	18ME E24	Innovations, Protection and legal aspects	4	18IT O03	Principles of Internet of Things
5	18PE E12	Supply Chain Management	5	18CS O09	Basics of Artificial Intelligence

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18PE C11

ADDITIVE MANUFACTURING TECHNOLOGIES

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Objectives:

1. To introduce to students the basics of Additive Manufacturing, its advantages and limitations and concept of mass customization.
2. To familiarize students with various Additive Manufacturing processes.
3. To teach students about STL file issues and familiarize them with various AM softwares.
4. To demonstrate various post processing techniques and rapid tooling concept.
5. To demonstrate the applications of rapid prototyping in various fields

Outcomes: At the end of the course a student will be able to

1. Explain the process chain of Additive manufacturing and their classification, advantages and disadvantages
2. Critically explore and compare the technologies used for additive manufacturing in terms of their material, parameters, applications and limitations
3. Analyse various software issues for rapid prototyping and related operations for STL file and features of various slicing softwares.
4. Identify different post processing techniques involved in enhancing the properties of the 3d printed components, understand rapid tooling
5. Understand applications of Additive Manufacturing in various fields

UNIT - I

Introduction to AM: Customization and mass customization, types of mass customization. Classification of fundamental fabrication processes (additive/subtractive/formative), Difference between AM and CNC. Process chain for Additive Manufacturing(AM) processes. Classification of additive (layered) Manufacturing processes. Advantages and Limitations of AM

UNIT - II

AM Techniques: Photopolymerization, Stereolithography (SLA) , Fused Deposition Modeling (FDM), Solid Ground Curing(SGC) , Shape deposition manufacturing(SDM) - Working principles and their applications, advantages and disadvantages. Laser sintering based technologies (SLA and DMLS) and their related details.

UNIT - III

Pre-processing in AM: Pre-processing of CAD model- STL conversion, STL error diagnostics, STL file Repairs: Generic Solution. Newly Proposed Formats. Support generation, transformations, slicing, surface preparation of materials, pre-heating of powders.
Rapid Prototyping Softwares: Features of various RP softwares - Magics, Mimics, Solid View, Rhino.

UNIT - IV

Post processing in AM: Post processing equipment, Support material removal , Surface texture improvement, Accuracy improvement, Aesthetic improvement, Preparation for use as a pattern, Property enhancements using Non–thermal and Thermal techniques.
Rapid Tooling: Introduction to Rapid Tooling (RT), Conventional Tooling Vs RT, Rapid Tooling Classification: Indirect Rapid Tooling Methods: Arc Spray Metal Deposition, Investment Casting, 3D Keltool process. Direct Rapid Tooling: Direct AIM , LOM Tools, EOS Direct Tool Process.

UNIT - V

AM Applications: Application in Design, Engineering, Analysis & Planning. Application in Aerospace Industry, Automotive Industry, Jewelry Industry, Coin Industry..
RP in Medical and Bioengineering Applications: Planning and simulation of complex surgery, Forensic

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Science.

Text Books:

1. Gibson, DW. Rosen and B.Stucker; "Additive manufacturing methodologies : Rapid prototyping to direct digital manufacturing ", Springer, 2010.
2. Chee Kai Chua, Kah Fai Leong, "3D printing and additive manufacturing : principles and application" , 4/e of rapid prototyping.
3. PK. Venuvinod, "Rapid prototyping – Laser based and other technologies", Kluwer, 2004.

Suggested Reading:

1. Jacob, Paul, "Rapid tooling : Technologies and industrial applications"
2. Andreas Gebhanrdt, "Understanding Additive anufacturing", Hanses, 2012.
3. Alain Brnard, Georges Talliander, "Additive Manufacturing", Wiley, 2014.

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With Effect from the Academic Year 2020 – 2021

18PE C12

ADDITIVE MANUFACTURING LAB

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
SEE	35 Marks
CIE	15 Marks
Credits	1

Objectives:

The objectives of the course are

1. To introduce to the students the additive manufacturing machines
2. To impart knowledge about various materials used for the digital fabrication
3. To demonstrate rapid tooling concept
4. To demonstrate reverse engineering process
5. To impart knowledge about tool path generation

Outcomes:

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

1. Generate tool path data for any component using slicing software
2. Compare different Additive manufacturing processes and select a subtractive or an AM process for a particular application for product development of engineering components
3. Use different post processing techniques to enhance the component after fabrication
4. Generate STL file from digital data input
5. Operate themselves the 3d printing machine.

List of the Experiments

1. Introduction to RP machine, Machine Specifications, Materials,
2. Review of modeling of resin and metal parts in cad software.
3. STL file Generation , Slicing of STL files, Obtaining the tool path data and sending it to RP Machines
4. 3d printing of jigs, fixtures and other manufacturing tools
5. 3d printing of bottle die
6. Prototyping of petrol engine Connecting rod.
7. Fabrication of Components of Screw jack and assembling them.
8. Demonstration of working of Stereo lithography machine
9. Removing the supports & post processing (cleaning the surfaces) Post curing of fabricated resin parts.
10. Reverse engineering: from scanner to model validation (solid works).

Text Books:

1. Gibson, DW. Rosen and B.Stucker; "Additive manufacturing methodologies : Rapid prototyping to direct digital manufacturing ", Springer, 2010.
2. Chee Kai Chua, Kah Fai Leong, "3D printing and additive manufacturing : principles and application of rapid prototyping" 4/e ,
3. PK. Venuvinod, Ma, W, "Rapid prototyping – Laser based and other technologies", Kluwer , 2004.

Suggested Reading:

1. Jacob, Paul, "Rapid tooling : Technologies and industrial applications".
2. Andreas Gebhanrdt, "Understanding Additive Manufacturing", Hanses, 2012.
3. Alain Brnard, Georges Talliander, "Additive Manufacturing", Wiley, 2014.

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With effect from academic year 2020-2021

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

AICTE MODEL CURRICULUM

B.E. (PRODUCTION ENGINEERING)

SEMESTER – V

S. No.	Course Code	Title of the Course	Scheme of instruction			Scheme of examination			Credits
			Hours per week			Duration in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	18ME C12	Dynamics of Machines	3	--	--	3	30	70	3
2	18ME C13	Applied Thermodynamics and Heat Transfer	3	--	--	3	30	70	3
3	18ME C14	Design of Machine Elements	3	--	--	3	30	70	3
4	18PE C05	Metal Forming Technology	3	--	--	3	30	70	3
5		Core Elective – I	3	--	--	3	30	70	3
6		Core Elective – II	3	--	--	3	30	70	3
PRACTICALS									
7	18ME C15	Dynamics and Vibrations Lab	--	--	2	2	15	35	1
8	18ME C16	Applied Thermodynamics and Heat Transfer Lab	--	--	2	2	15	35	1
9	18PE C06	Metal Forming Technology Lab	--	--	2	2	15	35	1
		TOTAL	**18**	--	**06**	--	**225**	**525**	**21**

L: Lecture T: Tutorial D: Drawing P: Practical
CIE - Continuous Internal Evaluation SEE – Semester End Examination

Core Elective – I (3/3)			Core Elective – II (3/3)		
SNO	Subj. Code	Name of the Subject	SNO	Subj. Code	Name of the Subject
1	18ME E01	Refrigeration and Air Conditioning	1	18ME E04	Automobile Engineering
2	18ME E02	Values, Ethics and Society	2	18ME E05	Nano Science and Technology
3	18PE E01	Plastics, Ceramics and Composite Materials	3	18ME E06	Rights, Duties and Legislation
4	18PE E02	Product Design and Process Planning	4	18PE E04	Non Destructive Testing and Evaluation
5	18PE E03	Powder Processing	5	18PE E05	Surface Engineering

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18PE E03

POWDER PROCESSING (Core Elective-I)

Instruction	3	Hours per week
Duration of Semester End Examination	3	Hours
SEE	70	Marks
CIE	30	Marks
Credits	3	

Objectives:

To make the students to understand the different

1. Powder properties & characteristics.
2. Powder mixing & compaction methods.
3. Powder Sintering methods.
4. Post Sintering processes.
5. Testing's of sintered parts.

Outcomes:

At the end of the course, the students are able to

1. Characterize the Powders in different techniques.
2. Suggest appropriate compaction technique for a particular powder.
3. Suggest appropriate sintering technique for a particular powder.
4. Choose correct post sintering processes.
5. Have ability to choose the appropriate testing for sintered parts.

UNIT - I

Introduction: Importance and advantages of powder processing.

Powder Manufacture: Comminution, solid state reduction, electrolysis, thermal decomposition, and Atomization (water atomization, oil atomization, gas atomization, centrifugal atomization).

UNIT - II

Powder Properties, Characterization and Mixing: Chemical composition, particle shape, powder density, particle size, size distribution compressibility, green strength. Blending and mixing. Compaction: Compact size, tool materials, design of sintered part, Olivetti process hot pressing, injection moulding, cold iso-static pressing, and hot iso-static pressing.

UNIT - III

Sintering: Theory of sintering, Sintering practice – furnace design, furnace atmospheres, vacuum sintering, control of shrinkage, liquid phase sintering, activated sintering, and loose powder sintering.

UNIT - IV

Post-Sintering Operations: Re-press and re-enter, hot re-press, hot forge in a closed die, sizing, coining, HIP, steam treatment, infiltration, and impregnation. Heat treatment, hardening, and tempering, surface hardening, electro-plating, and other coatings. Deburring, machining and joining. Sinter forging.

UNIT - V

Testing of Sintered Parts and Applications: Porous bearings, filters Magnetic Materials, super alloys, High speed steels, Stainless steels, ODS materials, Production of Near-net shapes, rapidly solidified powders, and spray forming. Manufacturing of Cutting tools, forming dies using powder metallurgy.

Text Books:

1. J. S. Hirsch horn: "Introduction to Powder Metallurgy", American Powder Metallurgy Institute, Princeton, NJ, 1976.
2. P. C. Angelo and R. Subramanian: "Powder Metallurgy- Science, Technology and Applications", PHI, New Delhi, 2008.

Suggested Reading:

1. G.S.Upadhya, "Powder Metallurgy Technology", Cambridge international Science publishing,1997.
2. B.K Dutta, "Powder Metallurgy: An advanced technique and processing of engineering materials", PHI Publications , 2011.
3. Clark Frances Hurd, "Advanced Techniques in Powder Metallurgy", Literary Licensing,2017.

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DEPARTMENT OF MECHANICAL ENGINEERING

Action taken report on Faculty Feedback

2018-19

S. No	Description	Action Taken/Proposed	Page Number
1.	Ms Y.Nagini suggested include Conduction and Convection topics in ATD & HT	Sent to CEG Thermal for possibility to include in the Upcoming Revision	13-14
2.	Dr. G. Laxmaiah suggested that crank shaft topic should be specified in Machine Design subject	Sent to CEG Design for possibility to include in the Upcoming Revision	15-16
3.	Ms Y.Nagini suggested to include Conduction and Convection topics in ATD & HT	Included in R-20	13-14
4.	Dr R P Chowdary suggested that Non Reactive Ideal Gas Mixture may be introduced in Thermodynamics.	The same included	17-18
5.	Mr Chandra Kanth suggested adding centre of precision topic in DOM and the process of electrochemical grinding in MMFM.	Could not be included in DOM as syllabus is already heavy. Eletrochemical grinding is part of electrochemical machining.	19-20
6.	Dr Aleem Pasha suggested adding perspective projection in Engineering Graphics.	It could be done as it is converted to lab NA	—
7.	Dr Aleem Pasha suggested adding Dendrite Structure and in MSM and SEM analysis	As the syllabus is heavy, it could not be included	—

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With Effect from the Academic Year 2022 – 23

20ME C17

APPLIED THERMODYNAMICS AND HEAT TRANSFER

Instruction	3	Hours per week
Duration of SEE	3	Hours
SEE	60	Marks
CIE	40	Marks
Credits	3	

Objectives: To understand

1. The working principle of single stage and multi stage reciprocating air compressor.
2. The working principle of diesel and petrol engines.
3. The combustion phenomena in IC Engines, parameters leading to abnormal combustion; cooling, lubrication and ignition systems.
4. The principles of conductive and convective heat transfer.
5. The principles of heat exchanger, concepts of radiation, phase change heat transfer.

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

1. Estimate the power required and efficiency of reciprocating air compressor using the principles of thermodynamics.
2. Understand the working principle of I.C engines and evaluate the performance of I.C. engines.
3. Understand the concepts of normal, abnormal combustion and the functioning of engine systems like cooling, lubrication and ignition.
4. Estimate the heat transfer through composite slabs, composite cylinders and understand the dimensionless numbers used in convection.
5. Understand the basic principles of heat exchangers, radiation, boiling and condensation.

UNIT – I

Reciprocating Air Compressors: Classification of compressors, advantages of reciprocating compressors over rotary compressors, applications of compressed air, working principle of reciprocating compressors - single stage and multi stage compressors with and without clearance, concept of optimum pressure ratio, minimum work input, various efficiencies of multi stage compressors, simple problems on reciprocating compressors.

UNIT - II

Internal Combustion Engines: Classification, working principles of 2 stroke, 4 stroke SI and CI engines, valve and port timing diagrams, performance of IC engines, Morse test, various methods of determining frictional power, various efficiencies, heat balance sheet.

UNIT - III

Combustion Phenomena: Stages of combustion in SI and CI engines, factors affecting, normal and abnormal combustion phenomenon in SI and CI engines, methods to control the abnormal combustion, octane and cetane number, types of combustion chambers, cooling systems, lubrication systems, battery and magneto ignition systems of IC engines, working principle of simple carburetor and fuel injector.

UNIT - IV

Modes of Heat Transfer: **Conduction**-General 3-D conduction equation in cartesian and cylindrical coordinates, one dimensional steady state conduction through slabs, hollow cylinders without heat

generation, critical radius of insulation for cylinders.

Convection: Basic concepts of free and forced convection, dimensionless numbers and their physical significance, simple problems on free and forced convection.

UNIT - V

Radiation: Concept of black-body Laws of radiation – Planck's Law, Wien's displacement law, Stefan Boltzmann Law, Kirchoff's Law.

Heat Exchangers: Classification, concept of LMTD, effectiveness, simple problems.

Boiling and Condensation: Basic concepts of boiling and condensation, pool boiling curve.

Text Books:

1. Mahesh M. Rathore, Thermal Engineering, TMH, New Delhi, 2010
2. V. Ganeshan, Internal Combustion Engines, Tata McGraw Hill Publishing, New Delhi,2015
3. J.P. Holman, Heat Transfer, McGraw Hill Publication, New Delhi,

Data Book:

1. C.P.Kothandaraman, Heat Transfer Data Book, TMH

Suggested Reading:

1. R.K. Rajput., Thermal Engineering, Laxmi Publishers, New Delhi, 2014
2. Ozisik, Heat Transfer, TMH, 2004

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With Effect from the Academic Year 2022 – 23

20ME C24

MACHINE DESIGN

(Use of design data handbook is permitted)

Instruction	3	Hours per week
Duration of SEE	3	Hours
SEE	60	Marks
CIE	40	Marks
Credits	3	

Objectives:

1. Understand the materials used for helical and leaf springs, learn design principles of closely coiled helical and leaf springs.
2. To become familiar with the design principles of gear drives for power transmission.
3. To become familiar with design principles of sliding contact bearings and selection of rolling contact bearings.
4. Design principles of IC engine components such as piston, connecting rod, crank shaft.
5. Analyze the curved beams and selection of chain drives used in power transmission.

Outcomes: At the end of the course, the students are able to

1. Understand the design procedure of helical, leaf springs under static and fluctuating loads.
2. Design the spur, helical and bevel gears based on beam strength and wear strength.
3. Demonstrate the ability in designing sliding contact bearings & selection of rolling contact bearings.
4. Design of IC engine piston, connecting rod and crank shaft.
5. Analyze the curved beams and selection of chain drives for a given application.

UNIT-I

Mechanical Springs: Introduction, types of springs, Materials used for springs.

Helical Springs: stresses in springs, Wahl's factor, deflection and energy stored in spring. Design for static and fluctuating loads.

Leaf Springs: modeling of leaf springs, stresses and deflection, nipping of Leaf springs. Design for static loads.

UNIT-II

Gears: Introduction to gear drives, types of gears, materials used for gears, Design of Spur, Helical and Bevel gears. Lewis beam strength equation. Dynamic loads on gear tooth. Wear load and design for wear strength.

UNIT-III

Bearings: Introduction, classification of bearings, materials used for bearings, properties and types of lubricants.

Design of Sliding Contact Bearings: Hydrodynamic bearings: journal bearing and thrust bearings.

Selection of Rolling Contact Bearings: Types of rolling elements and their constructional details, Static and dynamic load carrying capacity, Load-life relationship, selection of bearing for cyclic loads and speeds.

UNIT-IV

I.C. Engine Parts: Introduction, Materials used, Design of piston, connecting rod and overhang crank shaft.

UNIT-V

Design of Curved Beams: Introduction, stresses in curved beams, expression for radius of curvature of neutral axis for rectangular, circular and trapezoidal sections, Design of C-clamp and crane Hook.

Selection of chain drives: Power rating of roller chains, Strength of roller chains.

Text Books:

1. V.B. Bhandari, Design Machine Elements, Mc Graw Hill Publication, 2017.
2. J.E. Shigley, C.R. Mischne, Mechanical Engineering Design, Tata Mc Graw Hill Publications, 2015.
3. R.S.Khurmi and J.K.Gupta, Machine design, 34th edition, S Chand publications, 2018.

Suggested Reading:

1. P. Kannaiah, Machine Design, Sci-Tech Publications, 2010
2. M.F. Spotts, Design of Machine Elements, Prentice Hall of India, 2013.

Machine Design Data Books:

1. K. Mahadevan, K.Balaveera Reddy., Design Data Hand book for Mechanical Engineers, 3rd edition, CBS Publisher, 2018
2. PSG College, Design Data book,2012

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CBIT (A) With Effect from the Academic Year 2021-22

20MEC11

THERMODYNAMICS

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Objectives: Students will understand

1. Basic definitions of thermodynamics and significance of Zeroth law of thermodynamics.
2. The importance and application of first law of thermodynamics.
3. The principles associated with second law of thermodynamics.
4. Properties of pure substances and use of Mollier diagram.
5. Various air standard cycles, vapour power cycles and their importance.

Outcomes: At the end of the course a student will be able to

1. Understand the concepts of system, thermodynamic properties, thermodynamic equilibrium and various methods of pressure and temperature measurements.
2. Apply the first law of thermodynamics to various thermodynamic processes along with the applications of steady flow energy equation.
3. Apply the Second law of thermodynamics to analyze heat pumps, refrigerators, heat engines and to evaluate entropy changes.
4. Evaluate the properties of pure substances and analyze the performance of steam power cycles.
5. Evaluate performance of air standard cycles and analyze the properties of gas mixtures.

UNIT - I

Introduction: Thermodynamics, Macroscopic and Microscopic approaches, Thermodynamic systems, Properties, Processes and cycles, Thermodynamic equilibrium, Quasi – static process, Measurement of pressure, Zeroth law of thermodynamics and its significance, Measurement of temperature, Reference points, Ideal gas equation.

UNIT - II

Energy Interactions and First Law of Thermodynamics: Concept of heat and work, First law of thermodynamics for closed system, Energy a property of the system, Application of first law to various thermodynamic processes like isobaric, Isochoric, Isothermal, Adiabatic and polytropic, Definition of enthalpy, PMM1, First law applied to flow processes, Application of SFEE to Nozzle, Diffuser, Throttling device, Turbine, Compressor and heat exchanger.

UNIT- III

Second Law of Thermodynamics: Limitations of first law of thermodynamics, Kelvin–Planck and Clausius statements of second law of thermodynamics, PMM2, Equivalence of Kelvin-Planck and Clausius statement, Reversible and irreversible processes, Carnot

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theorem, Clausius inequality, Calculation of entropy change during various thermodynamic processes, Principle of entropy increase, T–s diagrams, Application of entropy principle for mixing of two fluids, Introduction to available and unavailable energy, Third law of thermodynamics, Helmholtz and Gibb's functions.

UNIT - IV

Pure Substances: Properties of pure substances, P–V diagram, P–T diagram, P-V-T surface, T–s diagram, h–s diagram, Dryness fraction, Use of steam tables, Maxwell relations, Clapeyron equation.

Vapour Power Cycles: Vapour power cycles - Carnot cycle, Simple Rankine cycle, Representation on p-v, T-s and h-s diagrams, Evaluation of performance parameters, Efficiency, Work ratio, Specific steam consumption and heat rate.

UNIT - V

Air Standard Cycles: Air standard cycles, Otto, Diesel, Dual combustion cycles, Working principle, Derivation of expression for air standard efficiency, Comparison of Otto, Diesel and dual cycles for the same compression ratio, For the same maximum pressure and temperature.

Non-reactive Ideal Gas Mixtures: Mole fraction, Mass fraction, Partial pressure, Dalton's law of partial pressures, Amagat-Leduc law of partial volumes, Relation between partial pressures, Mole fraction and volume fraction, Gas constant, Molecular mass, Specific heats of gas mixtures, Relation between volumetric and gravimetric analysis, Determination of theoretical air fuel ratio and equivalence ratio for various fuels,

Text Books:

1. P.K. Nag., Engineering Thermodynamics, 6th edition, Tata McGraw Hill Publishing, 2017
2. Yunus Cengel and Michael Boles., Thermodynamics: An Engineering Approach, 8th edition, McGraw Hill Education, 2017.

Suggested Reading:

1. R.K. Rajput., Engineering Thermodynamics, 4th Edition, Laxmi Publications, 2016.
2. Mahesh M Rathore., Thermal Engineering, Tata McGraw Hill Publishers, 2013.
3. D.S. Kumar., Engineering Thermodynamics, S.K. Kataria and Sons, 2014.

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With Effect from the Academic Year 2020 – 2021

18PE E08

MODERN MACHINING AND FORMING METHODS

(Core Elective - IV)

Instruction	3	Hours per week
Duration of SEE	3	Hours
SEE	70	Marks
CIE	30	Marks
Credits	3	

Objectives:

1. Various non-conventional machining processes and their process parameters.
2. The relative merits, limitations and applications of various non-conventional machining processes.
3. The knowledge regarding working media and its functions of non-conventional machining processes.
4. The concepts of non-conventional forming processes such as rubber pad forming, hydro forming, stretch forming, etc.
5. The concepts of HERF and to provide the description of HERF process

Outcomes: At the end of the course, the students are able to

1. Compare the Traditional and Non Traditional Machining process and recognize the need for Non traditional Machining process. (BL-2)
2. Illustrate constructional features, performance parameters, process characteristics, applications, advantages and limitations of Non Traditional Machining process. (BL-3)
3. Classify mechanisms of material removal of various non traditional machining processes. (BL-4)
4. Describe the principles, characteristics, advantages, limitations and applications of various unconventional methods of forming, HERF. (BL-1)
5. Compare the principles, constructional features and applications among explosive forming, EHF and EMF.

i. (BL-4)

UNIT-I

Ultrasonic Machining (USM):Introduction, Process description, abrasive slurry, Abrasive materials and theircharacteristics, Functions of liquid medium in slurry, Types of transducers, effect of process parameters, applications and limitations.

Abrasive Jet Machining (AJM): Principle of operation, process details, process variables and their effect onMRR and accuracy, advantages, disadvantages and applications

Water Jet Machining (WJM): Schematic diagram, equipment used, advantages and applications.

Abrasive Water Jet Machining (AWJM): Process, advantages, limitations and applications

UNIT-II

Electro Discharge Machining (EDM): Process description with schematic diagram, process parameters,functions and characteristics of dielectric medium, dielectric fluids, flushing, mechanism of metal removal, types of power supply circuits, mathematical analysis of metal removal rate (MRR), equations for surface finish, characteristics of spark eroded surfaces, advantages, disadvantages and applications.

Wire EDM: Process description and applications.

Laser Beam Machining (LBM): Principle of LASER beam production, materials used, process parameters,advantages, limitations and applications.

Plasma Arc Machining (PAM): Introduction, equipment used, process description and parameters, types of plasma arc: transferred arc and non transferred arc and process applications.

Electron Beam Machining (EBM): Schematic of the process, process parameters, principle of production ofelectron beam, equipment used, advantages, disadvantages and applications.

UNIT-III

Electro-chemical machining (ECM): Schematic of processparameters, function and characteristics of electrolyte, MRR for pure metal and alloys, electrode feed rate (EFR), advantages, limitations and applications.

Chemical Machining : Chemical blanking and chemical milling, advantages, limitations and applications.**ION Etching**: Process description, merits, limitations and applications.

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UNIT-IV

High Energy Rate Forming Processes (HERF): Introduction, applications, advantages

Explosive Forming: Principles, explosive materials, Equipment, types of explosive forming, standoffoperation and contact operation.

Electro Hydraulic Forming (EHF): Schematic of process, description and its applications

Electro Magnetic Forming (EMF): Process description, merits, limitations and applications.

UNIT-V

Flexible Forming: Principle of the process, process details and its types, Guerin, wheelon, Mar formingand Hydro forming processes and applications

Stretch Forming: Introduction, types of stretch forming, stretch draw forming, rotary stretch forming or stretchwrapping, compression forming, radial draw forming.

Tube spinning: Introduction, methods of tube spinning, backward spinning, forward spinning.

Text Books:

1. P.C. Pandey and H.S. Shah, "Modern Machining Process", Tata McGraw Hill Publishing Co. Ltd., New Delhi, 1980.
2. J Paulo Davim, "Modern Machining Technology - A Practical Guide", 1/e, Woodhead Publishing in Mechanical Engineering, 1980.
3. Hassan Abdel-Gawad El-Hofy, "Advanced Machining Processes, Nontraditional and Hybrid Machining Processes", McGraw Hill Publishing Co. Ltd., 1984.

Suggested Reading:

1. Davies and Austin, "Developments in High Speed Metal Forming", The Machinery Publishing Co. Ltd., 1985.
2. "Production Technology", HMT, 1984.

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CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

DEPARTMENT OF MECHANICAL ENGINEERING

Action taken report on Alumni, Recruiters and Industry feedback

2018-19

S. No	Description	Action Taken/Proposed	Page No
1.	Mr. G Ashrith Reddy working with Ajel Ltd felt that students should be given projects related to Societal problems.	I&I cell has been established by the institution and the same is looking after these aspects.	—
2.	Mr Gangasai Anith Reddy commented that combination of systems such as electronics, Mehanical and IT as as system approach should be offered	Elective courses such as Mechatronics and Robotics are being offered. The proposal of robotics lab is under consideration	22-25
3	Mr. Nitin working TU Chemnitz, Germany suggested to teach how to do research	Engineering Research Methodology is introduced as an elective	26
4.	An alumni opined that more software tools and courses should be introduced.	Introduced more Software tools & courses.	27-35

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With effect from the academic year 2022-23

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

Scheme of Instruction as per R20 Curriculum

B.E. (MECHANICAL ENGINEERING)

SEMESTER – V

S. No.	Course Code	Title of the Course	Scheme of instruction			Scheme of examination			Credits
			Hours per week			Duration in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	20MEC16	Dynamics of Machines	3	--	--	3	40	60	3
2	20MEC17	Applied Thermodynamics and HeatTransfer	3	--	--	3	40	60	3
3	20MEC18	Design of Machine Elements	3	1	--	3	40	60	4
4	20MEC19	CAD/CAM	3	--	--	3	40	60	3
5		Professional Elective - II	3	--	--	3	40	60	3
6		Open Elective - I	3	--	--	3	40	60	3
PRACTICALS									
7	20MEC20	Dynamics and Vibrations Lab	--	--	2	3	50	50	1
8	20MEC21	Applied Thermodynamics and HeatTransfer Lab	--	--	2	3	50	50	1
9	20MEC22	CAD/CAM Lab	--	--	2	3	50	50	1
Industrial/Rural Internship			3-4 weeks / 175 hours						2
TOTAL			**18**	**01**	**06**	--	**390**	**510**	**22+2**

L: Lecture *T: Tutorial* *D: Drawing* *P: Practical*

CIE - Continuous Internal Evaluation **SEE – Semester End Examination**

Professional Elective – II(3/3)		
S.No.	**Subject Code**	**Name of the Subject**
1	20MEE05	Refrigeration and Air Conditioning
2	20MEE06	Robotic Engineering
3	20MEE07	Research Methodology and Innovation
4	20MEE08	Product Design and Process Planning

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CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

R20 SCHEME

B.E. (MECHANICAL ENGINEERING)

SEMESTER – IV

S. No.	Course Code	Title of the Course	Scheme of instruction			Scheme of examination			Credits
			Hours per week			Duration in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	20MEC10	Kinematics of Machines	3	1	--	3	40	60	4
2	20MEC11	Thermodynamics	3	--	--	3	40	60	3
3	20MEC12	Fluid Principles and Hydraulic Machines	3	1	--	3	40	60	4
4	20MEC13	Metal Cutting and Machine Tool Engineering	3	--	--	3	40	60	3
5	20EGM01	Indian Constitution and Fundamental Principles	2	--	--	2	--	50	*Non Credit
6	20EEM01	Indian Traditional Knowledge	2	--	--	2	--	50	*Non Credit
7		Professional Elective - I	3	--	--	3	40	60	3
PRACTICALS									
8	20MEC14	Fluid Principles and Hydraulic Machines Lab	--	--	2	3	50	50	1
9	20MEC15	Metal Cutting and Machine Tool Engineering Lab	--	--	2	3	50	50	1
TOTAL			**19**	**02**	**04**	--	**300**	**500**	**19**

L: Lecture T: Tutorial D: Drawing P: Practical

CIE - Continuous Internal Evaluation SEE – Semester End Examination

Professional Elective – I (3/3)		
SNO	**Subj. Code**	**Name of the Subject**
1	20MEE01	Power Plant Engineering
2	20MEE02	Production and Operations Management
3	20MEE03	Entrepreneurship
4	20MEE04	Mechatronics and Automation

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CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

Scheme of Instructions of I Semester of B.E. – Mechanical Engineering as per AICTE Model Curriculum 2022-23

DEPARTMENT OF MECHANICAL ENGINEERING

SEMESTER – I

S. No	Course Code	Title of the Course	Scheme of Instruction			Credits
			Hours per Week			
			L	T	P/D	
THEORY						
1	22MTC02	Calculus	3	1	0	4
2	22CYC01	Chemistry	3	0	0	3
3	22EEC01	Basic Electrical Engineering	2	1	0	3
4	22CSC01	Problem Solving and Programming	2	1	0	3
PRACTICAL						
5	22CYC02	Chemistry Lab	0	0	3	1.5
6	22MBC02	Community Engagement	0	0	3	1.5
7	22CSC02	Problem Solving and Programming Lab	0	0	3	1.5
8	22MEC37	Robotics & Drones Lab	0	2	2	3
9	22EEC02	Basic Electrical Engineering Lab	0	0	2	1
TOTAL			**10**	**5**	**13**	**21.5**

L: Lecture **T: Tutorial** **D: Drawing** **P: Practical**

CIE - Continuous Internal Evaluation **SEE - Semester End Examination**

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With effect from the Academic Year 2022–23

22MEC37

ROBOTICS AND DRONES LAB
(Common to All Branches)

Instruction	2T + 2P Hours per week
CIE	100
Credits	3

Objectives: The objectives of this course are to:

1. To develop the students' knowledge in various robot and drone structures and their workspace.
2. To develop multidisciplinary robotics that have practical importance by participating in robotics competitions
3. To develop students' skills in performing spatial transformations associated with rigid body motions, kinematic and dynamitic analysis of robot systems.
4. Through projects done in lab, increase the true hands-on student learning experience and enhance their conceptual understanding, increase students' ability, competence and teamwork skills on dealing with real-life engineering problems

Outcomes: After completion of course, students would be able to:

1. Demonstrate knowledge of the relationship between mechanical structures of robotics and their operational workspace characteristics
2. Understand mechanical components, motors, sensors and electronic circuits of robots and build robots.
3. Demonstrate knowledge of robot controllers.
4. Use Linux environment for robotic programming.
5. Write Python scripts to control robots using Python and Open CV.

Lab Experiments:

1. Assembling of robot mechanical components, mounting of motors, sensors, electronic circuits to the chassis.
2. Connecting to electronic circuitry: motor drivers, incremental encoders proximity sensors, micro controller,
3. Different types of batteries, selection of suitable battery for application, safety precaution.
4. Introduction to Linux Command Line Interface: basic file and directory management and other useful commands
5. Controlling robot using Python: i) Move robot using Python code, ii) Make robot move in patterns using Python
6. Robot programming with Sensor inputs:i) Read sensor data using Python, ii) Visualize sensor data using Python, iii) Code robot to avoid obstacles by using sensor data
7. Open CV: i) Create an Image and display an image; ii) Read and change pixel values; iii) Create colored shapes and save image; iv) Extract the RGB values of a pixel; v) Reading and Writing Videos
8. Open CV: i) Extraction of Regions of Interest; ii) Extraction of RGB values of a pixel
9. Coding robot to work with colors, follow colored objects, identifying shape of the object-oriented
10. Projects: i)Making a line follower robot using a Camera; ii) Writing code for a complex function
11. Assembly of a drone

Suggested readings

1. https://www.geeksforgeeks.org/robotics-introduction/
2. https://www.ohio.edu/mechanical-faculty/williams/html/PDF/IntroRob.pdf
3. https://www.idtechex.com/en/research-report/new-robotics-and-drones-2018-2038-technologies-forecasts-players/584
4. https://dronebotworkshop.com/

With effect from the academic year 2022-23

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

Scheme of Instruction as per R20 Curriculum

B.E. (MECHANICAL ENGINEERING)

SEMESTER – V

S. No.	Course Code	Title of the Course	Scheme of instruction			Scheme of examination			Credits
			Hours per week			Duration in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	20MEC16	Dynamics of Machines	3	--	--	3	40	60	3
2	20MEC17	Applied Thermodynamics and HeatTransfer	3	--	--	3	40	60	3
3	20MEC18	Design of Machine Elements	3	1	--	3	40	60	4
4	20MEC19	CAD/CAM	3	--	--	3	40	60	3
5		Professional Elective - II	3	--	--	3	40	60	3
6		Open Elective - I	3	--	--	3	40	60	3
PRACTICALS									
7	20MEC20	Dynamics and Vibrations Lab	--	--	2	3	50	50	1
8	20MEC21	Applied Thermodynamics and HeatTransfer Lab	--	--	2	3	50	50	1
9	20MEC22	CAD/CAM Lab	--	--	2	3	50	50	1
Industrial/Rural Internship			3-4 weeks / 175 hours						2
TOTAL			**18**	**01**	**06**	--	**390**	**510**	**22+2**

L: Lecture T: Tutorial D: Drawing P: Practical

CIE - Continuous Internal Evaluation SEE – Semester End Examination

Professional Elective – II(3/3)		
S.No.	**Subject Code**	**Name of the Subject**
1	20MEE05	Refrigeration and Air Conditioning
2	20MEE06	Robotic Engineering
3	20MEE07	Research Methodology and Innovation
4	20MEE08	Product Design and Process Planning

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CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

Scheme of Instructions of II Semester of B.E. – Mechanical Engineering as per AICTE Model Curriculum 2020-21

DEPARTMENT OF MECHANICAL ENGINEERING

SEMESTER -II

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	20MT C06	Vector Calculus and Differential Equations	3	1	-	3	40	60	4
2	20EG C01	English	2	-	-	3	40	60	2
3	20PY C05	Mechanics and Materials Science	3	-	-	3	40	60	3
4	20EEC01	Basic Electrical Engineering	3	-	-	3	40	60	3
PRACTICAL									
5	20EG C02	English lab	-	-	2	3	50	50	1
6	20PY C08	Mechanics and Materials Science Lab	-	-	4	3	50	50	2
7	20EEC02	Basic Electrical Engineering Lab	-	-	2	3	50	50	1
8	20ME C01	CAD and Drafting	-	1	3	3	50	50	2.5
9	20MB C02	Community Engagement	30 field + 2P/W			-	50	-	1.5
TOTAL			**11**	**2**	**11**	**-**	**410**	**440**	**20**

L: Lecture **T: Tutorial** **P: Practical**

CIE - Continuous Internal Evaluation **SEE - Semester End Examination**

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with effect from the Academic Year 2020-21

20ME C01

CAD AND DRAFTING

Instruction	1 T + 3 D Hours per week
Duration of SEE	3Hours
SEE	50Marks
CIE	50Marks
Credits	2.5

Course Objectives:

1. To get exposure to a cad package and its utility.
2. Understanding orthographic projections.
3. To visualize different solids and their sections in orthographic projection
4. To prepare the student to communicate effectively by using isometric projection.
5. To prepare the student to use the techniques, skills, and modern tools necessary for practice.

Outcomes: At the end of the course, the Students are able to

1. Become conversant with appropriate use of CAD software for drafting. (BL-3)
2. Recognize BIS, ISO Standards and conventions in Engineering Drafting. (BL-2)
3. Construct the projections of points, lines, planes, solids (BL-3)
4. Analyse the internal details of solids through sectional views (BL-4)
5. Create an isometric projections and views (BL-6)

List of Exercises:

1. Introduction to CAD package: Settings, draw, modify tools, dimensioning and documentation
2. Construction of Conic Sections by General method
3. Orthographic projection: Principles, conventions, Projection of points
4. Projection of straight lines: Simple position, inclined to one plane
5. Projection of straight lines inclined to both the planes (without traces and mid-point)
6. Projection of planes: Perpendicular planes
7. Projection of planes: Oblique planes
8. Projection of solids: Simple position
9. Projection of solids: Inclined to one plane
10. Sections of solids: Prism, pyramid in simple position
11. Sections of solids: Cone and cylinder in simple position
12. Isometric projections and views
13. Conversion of isometric views to orthographic projections and vice versa.

Text Books:

1. N.D.Bhatt, "Elementary Engineering Drawing", Charotar Publishers, 2012.
2. K.Venugopal, "Engineering Drawing and Graphics + AutoCAD", New Age International Pvt. Ltd,2011.
3. Basanth Agrawal and C M Agrawal, "Engineering Drawing", 2/e, McGraw-Hill Education (India) Pvt. Ltd.

Suggested Reading:

1. Shaw M.B and Rana B.C., "Engineering Drawing", 2/e, Pearson, 2009.
2. K.L. Narayana and P.K. Kannaiah, "Text Book of Engineering Drawing", Scitech Publications, 2011.

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CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

Scheme of Instruction as per R20 Curriculum

B.E. (MECHANICAL ENGINEERING)

SEMESTER – V

S. No.	Course Code	Title of the Course	Scheme of instruction			Scheme of examination			Credits
			Hours per week			Duration in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	20MEC16	Dynamics of Machines	3	--	--	3	40	60	3
2	20MEC17	Applied Thermodynamics and HeatTransfer	3	--	--	3	40	60	3
3	20MEC18	Design of Machine Elements	3	1	--	3	40	60	4
4	20MEC19	CAD/CAM	3	--	--	3	40	60	3
5		Professional Elective - II	3	--	--	3	40	60	3
6		Open Elective - I	3	--	--	3	40	60	3
PRACTICALS									
7	20MEC20	Dynamics and Vibrations Lab	--	--	2	3	50	50	1
8	20MEC21	Applied Thermodynamics and HeatTransfer Lab	--	--	2	3	50	50	1
9	20MEC22	CAD/CAM Lab	--	--	2	3	50	50	1
Industrial/Rural Internship			3-4 weeks / 175 hours						2
TOTAL			**18**	**01**	**06**	--	**390**	**510**	**22+2**

L: Lecture *T: Tutorial* *D: Drawing* *P: Practical*

CIE - Continuous Internal Evaluation **SEE – Semester End Examination**

Professional Elective – II(3/3)		
S.No.	**Subject Code**	**Name of the Subject**
1	20MEE05	Refrigeration and Air Conditioning
2	20MEE06	Robotic Engineering
3	20MEE07	Research Methodology and Innovation
4	20MEE08	Product Design and Process Planning

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With Effect from the Academic Year 2022 – 23

20ME C22

CAD/CAM LAB

Instruction	2	Hours per week
Duration of SEE	3	Hours
SEE	50	Marks
CIE	50	Marks
Credits	1	

Objectives:

1. To teach the basic design process and the importance and types of geometric modeling techniques
2. To teach Assembly modelling by applying suitable assembly constraints
3. To generate orthographic views of components and assemblies.
4. To demonstrate the Indication of size, form, and positional tolerances on the drawing sheets
5. To demonstrate the working of CNC machines and write part programs for different operations

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

1. Make use of appropriate features to generate 3D model using CAD software
2. Apply constraints to assemble the components
3. Demonstrate the knowledge splines and surface modelling
4. Select tools required for performing specific job on CNC mill and CNC lathe
5. Write CNC part program to generate tool path for different machining operations

List of the Exercises:

1. Introduction and Working with Splines
2. Surface Modeling
3. Part modeling of simple parts using various features
4. Assembly of simple machine components (couplings)
5. Implementation of Geometric Transformations and Bezier curves using MATLAB
6. Contouring on CNC Milling Machine
7. Rectangular Pocketing and Circular Pocketing on CNC Milling Machine
8. Step Turning on CNC Lathe Machine and Taper Turning on CNC Lathe Machine
9. Multiple Turning on CNC Lathe Machine
10. Generation of STL files , Part orientation, support and Tool path generation using any RP software
11. Demonstration of FDM technology using 3D printer.
12. Develop a product using 3D Printing / generate CNC toolpath for its component it

Note: Student should complete a minimum of 10 exercises including exercise number14 which is compulsory.

Text books:

1. P.N.Rao, -CAD/CAM:Principles andApplication, TataMcGraw-Hill,July2017
2. N Mehta,-MachineToolDesign andNumericalControl, McGrawHillEducation, 3rd edition, 2017
3. DassaultSystems,-SOLIDWORKS Essentials:Training, SolidWorkscorp., 2011

Suggested Reading:

1. https://my.solidworks.com/solidworks/guide/SOLIDWORKS_Introduction_EN.pdf
2. https://help.solidworks.com

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With effect from the academic year 2022-23

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

Scheme of Instruction as per R20 Curriculum

B.E. (MECHANICAL ENGINEERING)

SEMESTER – VI

S. No.	Course Code	Title of the Course	Scheme of instruction			Scheme of examination			Credits
			Hours per week			Duration in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	20MEC23	Metrology and Instrumentation	3	--	--	3	40	60	3
2	20MEC24	Machine Design	3	--	--	3	40	60	3
3	20MEC25	Thermal Turbo Machines	3	--	--	3	40	60	3
4	20MEC26	Finite Element Analysis	3	1	--	3	40	60	4
5		Professional Elective - III	3	--	--	3	40	60	3
PRACTICALS									
6	20MEC27	Metrology and Instrumentation Lab	--	--	2	3	50	50	1
7	20MEC28	Machine Drawing Lab	--	--	2	3	50	50	1
8	20MEC29	Production Drawing Lab	--	--	2	3	50	50	1
9	20MEC30	Thermal Engineering Lab	--	--	2	3	50	50	1
10	20MEC31	Finite Element Analysis Lab	--	--	2	3	50	50	1
11	20EGCO3	Employability Skills Lab	--	--	2	3	50	50	1
TOTAL			**15**	**01**	**12**	--	**500**	**600**	**22**

L: Lecture T: Tutorial D: Drawing P: Practical

CIE - Continuous Internal Evaluation SEE – Semester End ExaminationA

Professional Elective – III (3/3)		
S.No.	**Subject Code**	**Name of the Subject**
1	20MEE09	Computational Fluid Dynamics
2	20MEE10	Additive Manufacturing
3	20MEE11	Operations Research
4	20MEE12	Industrial Safety and Maintenance

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20MEC28

MACHINE DRAWING LAB

Instruction	2	Hours per week
Duration of SEE	3	Hours
SEE	50	Marks
CIE	50	Marks
Credits	1	

Objectives: Students will learn

1. The importance of machine drawing in industries
2. The usage of solid modeling software
3. Various drawing and feature commands
4. Orthographic and isometric views
5. The assembly of various industrial components

Outcomes: Students are able to

1. Understand the importance and need of machine drawing in industries.
2. Model different machine components using CAD software.
3. Draw a detailed dra
4. wing of a component to facilitate its manufacture.
5. Analyze aspects of orthographic views in the preparation of the part/assembly drawings.
6. Identify the sequence of steps to assemble the machine/system components

List of Experiments/Exercises:

1. Introduction to machine drawing: importance and need in industries of automobile, aero and manufacturing, classifications of drawings.
2. Study of various commands/ tool bars using solid modelling package (solid works).
3. Part modelling of a components using feature commands Extrude Boss, Extrude Cut, Fillet, Chamfer with mass properties
4. Part modelling using feature commands Revolve, Rib with mass properties
5. Part modelling of a components using feature commands loft, sweep with mass properties
6. Drawing the view from the front, top and left of the objects.
7. Drawing the sectional views of a components
8. Creation of Stuffing box assembly model from parts and views of the assembly
9. Creation of Screw Jack assembly model from parts and views of the assembly
10. Creation of Piston of a petrol engine assembly model from parts and views of the assembly
11. Creation of Lathe tail-stock assembly model from parts and views of the assembly
12. Creation of Revolving centre assembly model from parts and views of the assembly

Note : Students should prepare a minimum of 10 drawings

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Suggested Reading:

1. K.L. Narayana, P. Kannaiah, K. Venkata Reddy, Machine drawing Published by New Age International (P) Limited, 5th edition, 2018.
2. N. D. Bhatt, V. M. Panchal Machine drawing [including computer aided drafting first-angle projection method], Charotar publishing house, 50th edition, 2016.

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20ME C29

PRODUCTION DRAWING LAB

Instruction	2	Hours per week
Duration of SEE	3	Hours
SEE	50	Marks
CIE	50	Marks
Credits	1	

Objectives: Students will learn to

1. Construct production drawings to enable produce the components in the shop floor and assemble them to meet the final functional requirements.
2. Create drawings for visualization using any modelling packages Solid works, CATIA etc.
3. Choose the Fits, Limits and Tolerances of parts for manufacturing and assembly.
4. Use the Conventions like surface finish, roughness, concentricity
5. Prepare Bill of materials for assembly and process sheet in manufacturing industry.

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

1. Interpret the working drawing/ industrial blueprint of various components.
2. Identify the different parts of the object with dimensional tolerances
3. Create the various part drawings using solid modelling package
4. Use the various functions of modelling soft ware: annotations, sheet making etc.
5. Prepare Bill of materials for assembly and process sheet in manufacturing industry.

List of Exercises/Experiments:

1. Introduction to production drawing: importance and need in industries
2. Conventional representation of Materials and machine components
3. Study of the terms used in the limit system and types of fits
4. To learn the need of geometrical tolerances, form and positional tolerances
5. Understanding surface roughness and its indication
6. Study the importance of process sheet preparation

Study the following assembly drawings and draw the component drawings with suitable tolerances and fits, surface roughness, bill of materials etc., Prepare the process sheet using any one of the modelling software tools: solid works/solid edge/CATIA/ProE/Auto CAD-MDT/Nx.

7. Stuffing box
8. I.C engine connecting rod
9. Revolving centre
10. Square tool post
11. Universal coupling
12. Steam Engine Cross Head
13. Drill Jig (Plate Type)
14. Non Return Valve
15. Blow off Cock

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Note : Students should prepare a minimum of 6 drawings

With Effect from the Academic Year 2022 – 23

20MEC31

FINITE ELEMENT ANALYSIS LAB

Instruction	2	Hours per week
Duration of SEE	3	Hours
SEE	50	Marks
CIE	50	Marks
Credits	1	

Objectives:

1. Trusses , Bars of constant cross section area, tapered cross section area and stepped bar.
2. Beams -Simply supported, cantilever, beams with UDL, and beams with varying load etc.
3. Stress analysis of a rectangular plate with a circular hole, axisymmetric problems.
4. Buckling analysis and Dynamic Analysis.
5. Steady state and Transient heat transfer analysis.

Outcomes: At the end of the course, the students are able to

1. Apply basics of Theory of Elasticity to continuum problems.
2. Analyze finite elements like 1D, 2D and 3D structures for linear static analysis.
3. Solve heat transfer problems.
4. Examine problems of limited complexity in buckling and dynamic analysis.
5. Evaluate solutions to practical problems by finite element software.

List of Exercises:

1. Analysis of plane truss & special truss with various cross sections and materials.
2. 2D & 3D beam analysis with different sections, different materials for different loads
3. Static analysis of plate with a hole.
4. Plane stress, plane strain and axisymmetric loading on the in plane members.
5. Static analysis of connecting rod with tetrahedron and brick elements.
6. Static analysis of flat and curved shell due to internal pressure.
7. Buckling analysis of plates, shells and beams to estimate BF and modes.
8. Modal analysis of beams, plates and shells for natural frequencies and mode shapes.
9. Harmonic analysis of a shaft and transient analysis of plate.
10. Steady state heat transfer analysis of chimney and transient analysis of casting.
11. Non linear analysis of cantilever beam.
12. Coupled field analysis.
13. Static/Buckling/Modal/Harmonic/Transient/Non-Linear/ heat transfer analysis of a selected component.

Note:

1. Students should complete a minimum of 10 exercises including exercise number 13 which is compulsory.
2. Students may use any or combination of FEA software (ANSYS/ABAQUS/NASTRAN/NISA/CAEFEM/ADINA).

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