CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

DEPARTMENT OF MECHANICAL ENGINEERING

ACTION TAKEN TOWARDS STAKEHOLDERS FEEDBACK ON CURRICULUM

2022-23

SNo	Description	Action Taken/Proposed	Page No
1	Sri V. Jaipal Reddy suggested that, a separate course related to 'Machine Drawing' with applications/use of computer will add more value to the program.	A separate course titled 'Computer Aided Machine Drawing' was introduced in IV semester of R22 curriculum.	5-7
2	Dr. P.V.R. Ravindra Reddy suggested that, experiments related to 'Gas Welding' and 'Cup Drawing Process' should be included in the course 'Manufacturing Processes Lab'.	Experiments on 'Gas Welding' and 'Cup Drawing Process' were added in the course 'Manufacturing Processes Lab' in IV semester of R22 curriculum.	8
3	Dr. B.V.S. Rao opined that, more experiments related to 'moulding sand testing' should be included in the course 'Manufacturing Processes Lab'.	Experiments on 'moulding sand testing' were added in the course 'Manufacturing Processes Lab' in IV semester of R22 curriculum.	8
4	Dr. V.V.R. Seshagiri Rao suggested that, the course 'Applied Thermodynamics & Heat Transfer' should be split in to TWO separate courses 'Applied Thermodynamics' and ' Heat Transfer', as most important topics were missed out in the combined course in R20 curriculum.	Keeping in view the importance of the suggestion and on the advice of the subjects experts, ONE separate course 'Heat Transfer' was introduced in III semester and ONE course 'Applied Thermodynamics' was introduced in IV semester of R22 curriculum.	5, 9-12
5	Dr. L. Suresh Kumar put forth his suggestion of including the current trends in Intellectual Property Rights.	As the course 'Intellectual Property Rights' was in VII semester, the suggested topic will be considered while framing the syllabus for VII semester courses.	-

SNo	Description	Action Taken/Proposed	Page No
6	Sri Yasoda Sreeram Kalluri suggested to add few experiments pertaining to Drones will be helpful for the students in the course 'Robotics and Drones Lab'.	Can be added in the next revision.	-
7	Dr. Solomon Raj opined that ICT facilities can be upgraded for effective teaching & learning.	The suggestion will be considered.	--
8	Dr. R.P. Chowdary expressed the opinion that, the syllabus for the course 'Advanced Heat and Mass Transfer' is huge and should be reduced for ME – Thermal Engineering program.	It will be considered in the next revision.	-
9	Dr. R.P. Chowdary suggested that, 'Heat Transfer' should be added as a separate course.	Keeping in view the importance of the suggestion and on the advice of the subjects experts, ONE separate course 'Heat Transfer' was introduced in III semester of R22 curriculum.	9-10
10	Sri D. Ravi suggested making the course 'Applied Thermodynamics & Heat Transfer' in to TWO separate courses.	Keeping in view the importance of the suggestion and on the advice of the subjects experts, ONE separate course 'Heat Transfer' was introduced in III semester and ONE course 'Applied Thermodynamics' was introduced in IV semester of R22 curriculum.	5, 9-12
11	Sri D. Ravi suggested adding 'Fluid Mechanics' topics in the course 'Fluid Principles and Hydraulic Machines' and the course name can be changed to 'Fluid Mechanics and Hydraulic Machines'.	As the topics related to 'Fluid Mechanics' were not there in any course, they were added in the syllabus and the course was accordingly named 'Fluid Mechanics and Hydraulic Machines' and was introduced in IV semester of R22 curriculum.	5, 13-14

12	Dr. K. Kishor suggested adding 'Fluid Mechanics' topics in the course 'Fluid Principles and Hydraulic Machines' as the topics were not there in any other course in the entire curriculum.	As the topics related to 'Fluid Mechanics' were not there in any course, they were added in the syllabus and the course was accordingly named 'Fluid Mechanics and Hydraulic Machines' and was introduced in IV semester of R22 curriculum.	5, 13-14
13	Dr. N.V. Srinivasulu opined that, the students should have industrial visits as a part of the course 'Automation'.	The students are visiting the industries as a part of the program.	--
14	Dr. S. Narasimha Kumar suggested to include exclusive topic on Solar Energy Technologies in place of 'Design of Solar and Wind Systems'.	It will be considered in the next revision.	--
15	Dr. R.P. Chowdary suggested that, a course can be introduced which links up electronic components in today's engine manufacturing.	It will be considered in the next revision.	--
16	Sri Kirti Arora, parent of Mr. G. Veerabhadra, said that they mainly expecting placements.	Industry specific training programmes were conducted for the shortlisted students to improve the performance of the students in the campus placements.	25
17	Ms. Sireesha Baile, working as Manager in BHEL Corp. R&D, Hyderabad, suggested that, the topics "Transient Heat Conduction' and 'Radiation' are there in the GATE examination, hence a separate course 'Heat Transfer' can be introduced in the curriculum.	Keeping in view the importance of the suggestion and on the advice of the subjects experts, ONE separate course 'Heat Transfer' with the topics "Transient Heat Conduction' and 'Radiation' was introduced in III semester of R22 curriculum.	5, 10

18	Ms. Sireesha Baile, working as Manager in BHEL Corp. R&D, Hyderabad, suggested that, the topics "Steam Boilers' and 'Steam Nozzles' are there in the GATE examination, hence these topics can be included in the syllabus for the course 'Applied Thermodynamics'.	Keeping in view the importance of the suggestion and on the advice of the subjects experts, the topics "Steam Boilers' and 'Steam Nozzles' were included in the syllabus for the course 'Applied Thermodynamics' and was in IV semester of R22 curriculum.	5, 11-12
19	Sri N. Venkateswara Rao suggested that, 'Machine Drawing' may be added in the curriculum as a separate course.	A separate course titled 'Computer Aided Machine Drawing' was introduced in IV semester of R22 curriculum.	5-7
20	Dr. N.V. Srinivasulu suggested to add 'Computer Aided Machine Drawing' in the curriculum.	A separate course titled 'Computer Aided Machine Drawing' was introduced in IV semester of R22 curriculum.	5-7
21	Dr. N.V. Srinivasulu suggested to add '3D printing' in the curriculum.	3D printing exercises were in the course 'Digital Fabrication Lab' in II semester of R22 curriculum.	15-16
22	Dr. Y.S. Kannan opined, it would be helpful to the students, if 3D printing related exercises can be included in the curriculum, considering the digital approach towards fabrication of latest components.	3D printing exercises were in the course 'Digital Fabrication Lab' in II semester of R22 curriculum.	15-16
23	Mr. P. Surender Reddy suggested that, the course 'Robotics' can be included as theory/laboratory in the curriculum.	The course 'Robotics and Drones Lab' was there in II semester of R22 curriculum.	17-18
24	Mr. R. Aravind working with INFOSYS, suggested to include multidisciplinary subject related to industry	A course 'Business analytics' which is multidisciplinary is included.	19-21
25	Ms. S. Sowmya Reddy working in SKYLARK SMART METERS suggested adding a smart materials course in the curriculum..	A new course 'Smart Materials and Structures' was introduced in the curriculum.	22-24

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

(Inline with AICTE Model Curriculum with effect from AY 2022-23)

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 Hrs	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	22MEC09	Kinematics of Machines	3	1	--	3	40	60	4
2	22MEC10	Applied Thermodynamics	2	--	--	3	40	60	2
3	22MEC11	Fluid Mechanics and Hydraulic Machines	3	--	--	3	40	60	3
4	22MEC12	Manufacturing Processes	3	--	--	3	40	60	3
5		Professional Elective - I	3	--	--	3	40	60	3
6	22PGM01	Indian Constitution and Fundamental Principles	2	--	--	2	--	50	*Non Credit
PRACTICALS									
7	22MEC13	Computer Aided Machine drawing	--	1	2	3	50	50	2
8	22MEC14	Fluid Mechanics and Hydraulic Machines Lab	--	--	2	3	50	50	1
9	22MEC15	Manufacturing Processes Lab	--	--	2	3	50	50	1
10	22MEC16	Applied Thermodynamics Lab	--	--	2	3	50	50	1
TOTAL			16	02	06	--	400	550	20
Clock Hours Per Week: 26									

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

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Professional Elective – I		
S. No	Course Code	Title of the Course
1	22MEE01	Power Plant Engineering
2	22MEE02	Production and Operations Management
3	22MEE03	Entrepreneurship
4	22MEE04	Mechatronics and Automation

22MEC13

COMPUTER AIDED MACHINE DRAWING

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

COURSE OBJECTIVES: This course aims to

1. The conventions and rules to be followed by engineers for making accurate Drawings.
2. The Modeling of different machine components using CAD software.
3. Shape and structure of different types of screws, keys, couplings, and rivets.
4. Modeling of the assemblies of the machine components
5. To prepare the process sheets for the components.

COURSE OUTCOMES: After completion of this course, students will be able to

1. Understand the representation of materials and conventions used in machine drawing
2. Draw the orthographic projections and sectional views of machine parts
3. Draw the different types of fasteners.
4. Construct an assembly drawing using part drawings of machine components.
5. Represent tolerances and the levels of surface finish of machine elements and prepare the process sheet

CO-PO-PSO ARTICULATION MATRIX

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	2	1	-	3	-	-	-	2	2	-	2	2	2	3
CO2	2	3	2	-	3	-	-	-	2	3	-	2	2	2	3
CO3	2	3	2	-	3	-	-	-	2	3	-	2	2	2	3
CO4	2	2	2	-	3	-	-	-	2	3	-	2	2	2	3
CO5	2	2	2	-	3	-	-	-	2	3	-	2	2	2	3

1. MACHINE DRAWING: Format of drawing sheet, title block, conventions of drawing lines and dimensions, First and third angles projections, Conventional representation of Engineering materials and various machine components, methods of indicating notes on drawing, conversion of Pictorial view to orthographic views, convention for sectional views. Orthographic projections including sectional views of simple machine elements. Study of various commands/ tool bars using solid modelling package (solid works) Component Drawings Of Fasteners, Joints And Couplings - Bolts and Nuts, Keys and Cotter joints, Knuckle Joint, Riveted joints, Shaft Couplings and Bearings Assembly drawings of Connecting rod, Stuffing box, Screw jack, Lathe single Tool Post, Pedestal bearing (Plummer block), Revolving centre, Steam Engine Cross Head

2. PRODUCTION DRAWING: Introduction to production drawing - importance and need in industries, limit system and types of fits, geometrical tolerances, form and positional tolerances, surface roughness and its indication, process sheet preparation.

LIST OF EXERCISES:

1. Part Modelling of machine components and finding their mass properties
2. Drawing the view from the front, top and left of the objects.
3. Drawing the sectional views of a components
4. Part Modelling of threaded fasteners
5. Creation of a double row chain type riveted lap joint from parts and views of the assembly
6. Creation of cotter joint assembly model from parts and views of the assembly
7. Creation of flange coupling assembly model from parts and views of the assembly
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 component drawings with suitable tolerances and fits, surface roughness, bill of materials etc., for Foot step bearing assembly
11. Creation of component drawings with suitable tolerances and fits, surface roughness, bill of materials etc., for Revolving center assembly

12. Creation of component drawings with suitable tolerances and fits, surface roughness, bill of material etc., for Square tool post assembly

Note: Students should complete minimum of 10 drawings

TEXT BOOKS:

1. K.L. Narayan, P. Kannaiah, K. Venkat Reddy, *Machine Drawing*. New Age International (P) Ltd., 4th edition 2018
2. K.L. Narayan. P. Kannaiah, K. Venkat Reddy, *Production Drawing*, New Age International (P) Ltd., 4th edition 2018.
3. N. Siddeshwar, *Machine Drawing*, Tata McGraw Hill Publishing Co., Ltd., 5th edition, 2004.

SUGGESTED READING:

1. K.C. John, *Text book of Machine Drawing*, PHI Learning, 2010.
2. Ajeet Singh, *Machine Drawing*, Galgotia Publications, 2010.
3. 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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22MEC15

MANUFACTURING PROCESSES LAB

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

COURSE OBJECTIVES: This course aims to

1. Test the moulding sand and analyze the same.
2. Test the bead geometry and correlate the results to the input parameters.
3. Use TIG, MIG and Spot welding machines and experiment with them.
4. Test the formability characteristics of a given sheet metal and study different types of dies
5. Understand the various type of sheet metal forming dies

COURSE OUTCOMES: After completion of this course, students will be able to

1. Test the moulding sand and analyze the same
2. Test the bead geometry and correlate the results to the input parameters.
3. Use TIG, MIG and spot welding machines and experiment with them.
4. Test the formability characteristics of a given sheet metal.
5. Demonstrate the understanding of various types of dies.

CO-PO-PSO ARTICULATION MATRIX

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	1	-	-	1	-	-	-	-	2	-	-	-	1	1	-
CO2	1	-	-	1	-	-	-	-	2	-	-	-	1	1	-
CO3	1	-	-	1	-	-	-	-	2	-	-	-	1	1	-
CO4	1	-	-	1	-	-	-	-	2	-	-	-	1	-	-
CO5	1	-	-	1	-	-	-	-	2	-	-	-	1	1	-

LIST OF THE EXPERIMENTS:

CASTING:

1. Study of Ingredients of moulding sand and mould preparation for single piece
2. Study of core, core prints and moulding for split pattern.
3. Design of a simple pattern with various allowances.
4. Study of required properties of moulding sand and testing the properties of moulding sand
5. Study on the effect of the effect of grain fineness on moulding sand properties and Finding out the GFN of a given sand sample.
6. Demonstration of Melting and Pouring of Aluminium.

WELDING:

1. Study of Arc welding process, comparison of the bead geometry with DCSP, DCRP and A.C.
2. Study of Gas Welding process, types of flames and making a butt joint with gas welding.
3. Study of resistance welding process and spot welding of MS Sheets.
4. Study of TIG welding process and plotting cooling curve in TIG welding process
5. Study of SAW Welding process and finding out deposition efficiency of the process
6. Study of MIG welding process and testing of weld bead formed by MIG welding

METAL FORMING:

1. Evaluation of Formability of a given sheet material using Erichsen cupping test.
2. Study of cup drawing process, estimation of blank size for given cup and drawing a cup using simple die
3. Study of Progressive die design and manufacturing of washer components using the same on a Fly press (capacity 6 Tons) and estimation of forces
4. Study of Compound die design and manufacturing of washer components using the same on double hoo fly press (capacity 8 Tons) and estimation of forces.
5. Study of Combination die design and manufacturing of cylindrical cups using the same on a hydraulic power press (capacity 50 Tons) and estimation of drawing force.
6. Study of extrusion dies and demonstration of extruding lead material

Note: A minimum of 12 experiments need to be conducted.

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(Inline with AICTE Model Curriculum with effect from AY 2022-23)

B.E. (MECHANICAL ENGINEERING)

SEMESTER III

S. No.	Course Code	Title of the Course	Scheme of instruction			Scheme of examination			Credits
			Hours per week			Duration in Hrs	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	22MTC10	Partial differential Equations and Statistics	3	1	--	3	40	60	4
2	22CSC35	Data Structures using Python	2	--	--	3	40	60	2
3	22MEC02	Material Science and Metallurgy	3	--	--	3	40	60	3
4	22MEC03	Strength of Materials	3	1	--	3	40	60	4
5	22MEC04	Thermodynamics	3	--	--	3	40	60	3
6	22MEC05	Heat Transfer	2	--	--	3	40	60	2
7	22UEM01	Universal Human Values II: Understanding Harmony	--	1	--	--	50	--	1
8	22CEM01	Environmental Science	2	--	--	2	--	50	Non Credit
PRACTICALS									
9	22MEC06	Material Science and Metallurgy Lab	--	--	2	3	50	50	1
10	22MEC07	Strength of Materials Lab	--	--	2	3	50	50	1
11	22CSC36	Data Structures using Python Lab	--	--	2	3	50	50	1
12	22MEC08	Heat Transfer lab	--	--	2	3	50	50	1
13	22MI801	MOOCs/Training/Internship	2-3 weeks/90 hours				50	-	2
TOTAL			18	03	08	--	490	610	23+2
Clock Hours Per Week: 29									

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

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

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22MEC05

HEAT TRANSFER

Instruction	2 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	2

COURSE OBJECTIVES: This course aims to

1. The concepts of 1-D steady state heat conduction.
2. The concepts of heat transfer through fins and unsteady state conduction.
3. The relationship between various dimensionless numbers for free convection and forced convection.
4. The principles of radiation heat transfer
5. The basic concepts of heat exchangers and phase change heat transfer

COURSE OUTCOMES: After completion of this course, student will be able to

1. Estimate heat transfer through composite slabs and cylinders with and without heat generation.
2. Estimate the heat transfer through rectangular straight and pin fins, and temperature distribution in unsteady state conduction
3. Estimate the heat transfer in case of flow over plates, cylinders and flow through tubes.
4. Estimate radiation heat exchange between surfaces in different situations and the effect of radiation shield
5. Estimate the effectiveness of heat exchanger by LMTD, NTU methods and acquire knowledge of boiling and condensation phenomenon.

CO-PO ARTICULATION MATRIX

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	2	1	2	-	-	-	-	-	-	1	1	-	-
CO2	3	2	2	1	1	-	-	-	-	-	-	1	1	-	1
CO3	2	3	2	1	1	-	-	-	-	-	-	1	1	-	1
CO4	2	3	2	1	1	-	-	-	-	-	-	1	1	-	2
CO5	3	2	2	1	1	-	-	-	-	-	-	1	1	-	2

UNIT I

Modes of heat transfer: Laws of heat transfer - Fourier, Newton, Stefan-Boltzmann General conduction equation in cartesian and cylindrical coordinates, One dimensional steady state conduction through slabs, hollow cylinders with and without heat generation, steady state heat transfer through composite slabs and cylinders, critical radius of insulation

UNIT II

Fins: Heat transfer analysis of fins with heat dissipation: environment rectangular straight and pin fins, unsteady state conduction, Lumped parameter analysis of a body with negligible internal temperature gradients, Use of Heisler charts for solving problems of infinite slabs and cylinders.

UNIT III

Convection Dimensional analysis and its use in free and forced convection, Buckingham pi theorem, Physical significance of different dimensionless numbers, Concepts of velocity and thermal boundary layers, Reynold's analogy for flow over plane surfaces. Calculation of heat transfer coefficient for flow over plates, cylinders and for flow through tubes in free and forced convection using empirical formulae.

UNIT IV

Radiation. Definition of absorptivity, reflectivity and transmissivity, Concept of black-body and emissivity, Kirchoff's law, Planck's law , Wien's and Stefan Boltzmann law, Monochromatic and total emissive power, radiant heat exchange between two gray surfaces, Shape factor, Thermal circuit for radiant heat exchange between infinite parallel plates and between concentric cylinders, Radiation shields

UNIT V

Heat Exchangers: Classification, analysis of parallel flow and counter flow heat exchangers using LMTD and NTU methods, effectiveness, simple problems.

Boiling: Boiling curve and critical heat flux for nucleate pool boiling.

Condensation: Types of condensation, convective heat transfer coefficient for Laminar Film Condensation on a Vertical Plate.

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22MEC10

APPLIED THERMODYNAMICS

Instruction	2 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	2

COURSE OBJECTIVES: This course aims to

1. The working principle of single 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 working principles of steam boilers.
5. The efficiency improvement methods of Rankine cycle and functioning of nozzles.

COURSE OUTCOMES: After completion of this course, 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 their performance evaluation
3. Understand the concepts of normal, abnormal combustion and the functioning of engine systems like cooling, lubrication and ignition.
4. Understand the types of boilers and their performance.
5. Determine the efficiency of Rankine cycle with performance improvement techniques; understand the nozzle performance and the condenser for the maximum discharge.

CO-PO-PSO ARTICULATION MATRIX

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	1	2	-	1	-	-	-	-	-	-	1	-	-	1
CO2	2	2	2	-	1	1	-	-	-	-	-	1	-	-	1
CO3	2	2	2	1	1	1	-	1	-	-	-	1	-	-	1
CO4	2	1	2	-	1	-	-	-	-	-	-	1	1	-	2
CO5	2	1	-	-	-	-	-	-	-	-	-	1	1	-	2

UNIT I

Reciprocating Air Compressors: Classification of 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, octane and cetane number, cooling systems, lubrication systems, battery and magneto ignition systems of IC engines.

UNIT IV

Steam Boilers: Classification of boilers- Fire tube boilers- Cochran boiler, Locomotive boiler and Lancashire boiler, Water tube boilers- Babcock and Wilcox boiler. Boiler mountings and accessories. Boiler performances, Types of condensers- Jet and Surface condensers.

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UNIT V

Steam power plant: Modified Rankine cycle, Cycle efficiency improvement methods, Reheating, Regeneration and Cogeneration.

Steam nozzles. Types of nozzles, Nozzle efficiency, Velocity of steam flowing through the nozzle, Mass of steam discharged from the nozzle, Condition for maximum discharge, Critical pressure ratio. Diameters of nozzle throat and exit for maximum discharge

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. R K. Rajput., Thermal Engineering, Laxmi Publishers. New Delhi, 2014

SUGGESTED READINGS:

1. Heywood, J.B. "Internal Combustion Engine Fundamentals", TMH. New York. 2004
2. Soman, Thermal Engineering, PHI, 2011.
3. Kulshrestha S.K., 'Thermal Engineering', Vikas Publishing, 2nd Edition. 2011

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22MECC11

FLUID MECHANICS AND HYDRAULIC MACHINES

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

COURSE OBJECTIVES: This course aims to

1. Learn the fluid statics and properties of fluids
2. Understand the laws related to fluid flow and their applications
3. Understand various principles and performance characteristics related to Reciprocating pumps
4. Learn the working principle and efficiencies of hydraulic turbines
5. Come to know the working principles and performance characteristics of Centrifugal pumps

COURSE OUTCOMES: After completion of this course, students will be able to

1. Determine the various properties of fluids
2. Understand the laws related to fluid flow and their applications
3. Acquire the knowledge of the functionality and performance of reciprocating pumps.
4. Acquire knowledge in the functionality, performance and testing of hydraulic turbines
5. Estimate the performance and testing of centrifugal pumps.

CO-PO-PSO ARTICULATION MATRIX

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	-	-	-	-	-	-	2	-	3	-	3	-	-	-
CO2	2	-	-	-	-	-	-	2	-	3	-	3	-	-	-
CO3	2	-	-	-	-	-	-	2	-	3	-	3	2	-	-
CO4	2	-	-	-	-	-	-	2	-	2	-	3	2	-	-
CO5	2	-	-	-	-	3	3	2	3	3	3	3	2	-	3

UNIT I

Static Forces on Surface and Buoyancy:
Fluids, ideal and real fluids, incompressible and compressible fluids, stream lines, path lines, stream function and velocity potential, fluid statics, action of fluid pressure on surface, resultant force and center of pressure on a plane surface under uniform pressure. Equilibrium of floating bodies, stability of a submerged body, stability of floating bodies, determination of the metacentric height, determination of the position of the metacenter relative to the center of buoyancy.
Properties of fluids: Density, specific weight, specific gravity, specific volume, viscosity, Newton's law of viscosity, dynamic and kinematic viscosity, pressure

UNIT II

Laws of Fluid Flow: Continuity theorem, Bernoulli's theorem, applications of Bernoulli's theorem, Pitot tube theoretical discharge, actual discharge and coefficient of discharge of Venturimeter, notches-rectangular, triangular, trapezoidal and stepped notches
Viscous Flow: Nature of flow-laminar, turbulent and transient flows, Reynolds number and its significance
Flow through Pipes: Head losses in pipes, pipe bends, major energy losses, loss of head due to friction in the pipe, Darcy-Weisbach equation, hydraulic gradient and total energy lines, pipes in series and parallel.

UNIT III

Reciprocating Pumps: Classification and working principle, discharge, slip, coefficient of discharge, power required to drive the pump and efficiency, variation of pressure head due to acceleration of piston and pipe friction, ideal and actual indicator diagrams, separation, safe speed to avoid separation, air vessels, work saved, quantity of water entering into or coming out of air vessels and performance characteristic curves.

UNIT IV

Hydraulic machines and impact of jet on vanes: Types of hydraulic machines, impulse-momentum equation and its applications, layout of hydraulic power plant-working principle, velocity triangles, impact force, specific power developed and efficiency of jet striking at the center and at one end of a single and series of unsymmetrical moving curved vanes

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Hydraulic Turbines: Classification and working, Velocity triangles, Power developed and efficiencies of Pelton wheel, Francis turbine and Kaplan turbines. Design of hydraulic turbines, Specific speed, Physical significance, Unit testing, Unit quantities. Model testing. Conditions for similarity and performance characteristic curves

UNIT V

Centrifugal Pumps: Classification and working principle, Comparison over reciprocating pumps, Velocity triangles, Head equivalent of work done, Efficiencies, Pressure rise, Minimum starting speed, Specific speed, Physical significance, Model testing, Conditions of similarity, Priming, Performance characteristic curves, Common operational problems (troubles), reasons and remedies.

TEXT BOOKS:

1. P.N. Modi and S.M. Seth., Hydraulics and Fluid Mechanics Including Hydraulic Machines, 22nd edition, Standard Book House, New Delhi, 2019
2. R K. Bansal , A Text Book of Fluid Mechanics and Hydraulic Machines, 9th edition, Laxmi Publications (P) Ltd., New Delhi. 2015.

SUGGESTED READING:

1. R S. Khurmi and N. Khurmi., Hydraulics, Fluid Mechanics and Hydraulic Machines, 20th edition, S Chand publishing, 2014
2. S. Ramamurthan., Hydraulics, Fluid Mechanics and Fluid Machines, Dhanpat Rai and Sons, New Delhi. 2004.
3. Modan Mohan Das., Fluid Mechanics and Turbomachines. PHI Learning Private Limited, New Delhi, 2009.

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22MEC38

DIGITAL FABRICATION LAB

Instruction	2P Hours per week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1.5

COURSE OBJECTIVES: This course aims to

1. Give a feel of Engineering Practices & develop holistic understanding of various Engineering materials and Manufacturing processes.
2. Develop skills of manufacturing, safety, precision, quality, intelligent effort, optimization, positive &team work attitude to get things right the first time.
3. Provide basic knowledge of Steel, Plastic, Composite and other materials for suitable applications.
4. Study of Principle and hands on practice on techniques of fabrication, welding, casting, manufacturing, metrology, and allied skills.
5. Advance important hard & pertinent soft skills, productivity, create skilled manpower which is cognizant of industrial workshop components and processes and can communicate their work in a technical, clear and effective way

COURSE OUTCOMES: After completion of course, students would be able to

1. Understand safety measures to be followed in workshop to avoid accidents
2. Identify various tools used in carpentry, house wiring and plumbing.
3. Make a given model by using workshop trades like carpentry, plumbing, House wiring and 3d modeling using solid works software for Additive Manufacturing.
4. Perform preprocessing operations on STL files for 3D printing, also understand reverse engineering process.
5. Conceptualize and produce simple device/mechanism of their choice.

CO-PO ARTICULATION MATRIX

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

LIST OF EXERCISES:
GROUP-1

1. To make a lap joint on the given wooden piece according to the given dimensions
2. To make a dove tail-joint on the given wooden piece according to the given dimensions.
3. A. Wiring of one light point controlled by one single pole switch, a three pin socket controlled by a single pole switch
   B. Wiring of two light points connected in series and controlled by single pole switch. Verify the above circuit with different bulbs. Wiring of two light points connected in parallel from two single pole switches and a three pin socket
4. Stair case wiring-wiring of one light point controlled from two different places independently using two 2 way switches
5. To make external threads for GI pipes using die and connect the GI pipes as per the given diagram using taps, couplings & bends
6. A. To connect the GI pipes as per the given diagram using, couplings, unions, reducer & bends.
   B. To connect the GI pipes as per the given diagram using shower, tap & valves and Demonstrate by giving water connection

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GROUP- 2

1. To Study the method of Additive Manufacturing process using a 3D printer
2. To create a 3D CAD model of a door bracket using a modeling software
3. To Print a door bracket using an extruder type 3D Printer.
4. To create a 3D CAD model by reverse Engineering
5. To Design an innovative component using the CAD software
6. To Print the selected innovative component by the students using a 3D printer

TEXT BOOKS:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., Elements of Workshop Technology, Vol. I, 2008 and Vol. II, Media promoters and publishers private limited, Mumbai, 2010.
2. Kalpakjian. S. And Steven S. Schmid, Manufacturing Engineering and Technology, 4th edition, Pearson Education India Edition, 2002.
3. Sachidnand Jha. 3D PRINTING PROJECTS: 200 3D Practice Drawings For 3D Printing On Your 3D Printer, June 1, 2019.

SUGGESTED READING:

1. Gowri P. Hariharan and A. Suresh Babu, Manufacturing Technology – I, Pearson Education, 2008
2. Oliver Bothmann , 3D Printers: A Beginner's Guide , January 1, 2015

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CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

(Inline with AICTE Model Curriculum with effect from AY 2022-23)

DEPARTMENT OF MECHANICAL ENGINEERING

SEMESTER – I

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	22MTC02	Calculus	3	1	0	3	40	60	4
2	22CYC01	Chemistry	3	0	0	3	40	60	3
3	22BEC01	Basic Electrical Engineering	2	1	0	3	40	60	3
4	22CSC01	Problem Solving and Programming	2	1	0	3	40	60	3
PRACTICAL									
5	22CYC02	Chemistry Lab	0	0	3	3	50	50	1.5
6	22MBC02	Community Engagement	0	0	3	-	50	-	1.5
7	22CSC02	Problem Solving and Programming Lab	0	0	3	3	50	50	1.5
8	22MEC37	Robotics & Drones Lab	0	2	2	-	100	-	3
9	22EEC02	Basic Electrical Engineering Lab	0	0	2	3	50	50	1
TOTAL			10	5	13	-	460	390	21.5

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

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

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22MEC37

ROBOTICS AND DRONES LAB
(COMMON TO ALL BRANCHES)

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

COURSE OBJECTIVES: This course aims 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 dynamic 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

COURSE 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.

CO-PO ARTICULATION MATRIX

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	1	1	1	2	1	1	1	2	2	2
CO2	2	3	1	2	3	1	1	1	1	2	2	1
CO3	2	2	2	2	2	1	1	1	1	2	2	2
CO4	2	2	1	2	2	2	1	1	1	2	2	2
CO5	1	1	1	1	1	3	3	3	1	3	3	3

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, i) 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 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/

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CBIT (A) With Effect from the Academic Year 2020 – 2021

Professional Elective – V (3/3)				Open Elective (3/3)	
NO	Subj. Code	Name of the Subject	S NO	Subj. Code	Name of the Subject
1	20MEE112	Advanced Finite Element Method	1	20CEO101	Cost Management of Engineering Projects
2	20MEE113	Digital Manufacturing and Design	2	20EEO101	Waste to Energy
3	20MEE114	Product Design and Process Planning	3	20CSO101	Business Analytics

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

20CSO101

BUSINESS ANALYTICS

(Open Elective)

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

Course Objectives: **The objectives of this course are**

1. **Understanding the basic concepts of business analytics and applications.**
2. Study various business analytics methods including predictive, prescriptive and prescriptive analytics.
3. Prepare the students to model business data using various data mining, decision making methods.

Course Outcomes: On Successful completion of the course, students will be able to

1. Identify and describe complex business problems in terms of analytical models.
2. Apply appropriate analytical methods to find solutions to business problems that achieve stated objectives.
3. Interpret various metrics, measures used in business analytics.
4. Illustrate various descriptive, predictive and prescriptive methods and techniques.
5. Model the business data using various business analytical methods and techniques.
6. Create viable solutions to decision making problems.

UNIT-I

Introduction to Business Analytics: **Introduction to business analytics, Need and science of data driven decision making, Descriptive, Predictive, Prescriptive analytics and techniques, Big data analytics, Web and social media analytics, Machine learning algorithms, framework for decision making, Challenges in data driven decision making and future.**

UNIT-II

Descriptive Analytics: **Introduction, Data types and scales, Types of measurement**

scales, Population and samples, Measures of central tendency, Percentile, Decile and quadrille, Measures of variation, Measures of shape skewness, Data visualization.

UNIT-III

Forecasting Techniques: **Introduction, time-series data and components, forecasting accuracy, moving average method, single exponential smoothing, Holt's method, Holt-Winter model, Croston's forecasting method, regression model for forecasting, Auto regression models, auto-regressive moving process, ARIMA, Theil's coefficient.**

UNIT-IV

Decision Trees: **CHAID, Classification and regression tree, Splitting criteria, Ensemble and method and random forest, Clustering, Distance and similarity measures used in clustering, Clustering algorithms, K-Means and hierarchical algorithms, Prescriptive analytics, Linear programming and LP model building.**

UNIT-V

Six Sigma: **Introduction, Introduction, Origin, 3-Sigma Vs Six-Sigma process, Cost of poor quality, Sigma score, Industry applications, Six sigma measures, DPMO, Yield, Sigma score, DMAIC methodology, Six Sigma toolbox**

Text Books:

1. **U. Dinesh Kumar, Data Analytics, Wiley Publications, 1st Edition, 2017.**
2. **Marc J. Schniederjans, Dara G. Schniederjans and Christopher M. Starkey, Business Analytics Principles, Concepts and Applications with SAS, Associate Publishers, 2015.**

Suggested Reading:

1. **S. Christian Albright and Wayne L. Winston, Business Analytics - Data Analysis and Decision Making, 5th Edition, Cengage, 2015.**

Web Resources:

1. **https://onlinecourses.nptel.ac.in/noc18-mg11/preview**
2. **https://nptel.ac.in/courses/110105089/**

Programme Elective – III (3/3)			Programme Elective – IV (3/3)		
SNO	Subject Code	Name of the Subject	SNO	Subject Code	Name of the Subject
1	23MEE206	Computational Fluid Dynamics	1	23MEE109	Multibody Dynamics
2	23MEE107	Smart Materials and Structures	2	23MEE110	Tribology in Design
3	23MEE108	Fracture Mechanics	3	23MEE111	Failure Analysis and Design

23MEE107

SMART MATERIALS AND STRUCTURES

(Programme Elective – III)

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

COURSE OBJECTIVES: This course aims to

1. Provide the basics of smart materials
2. Make students analyze Constitutive Relationships.
3. Understand the Mathematical modeling for response of piezo beam.
4. Understand High-Band Width, Low Strain Smart Sensors.
2. Apply the smart materials to engineering problems.

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

1. Understand basics of smart materials
2. Analyze direct and reverse effect of piezo.
3. Understand and Evaluate Principles of piezo, Magnetostrictive materials, SMA.
4. Analyze design of piezoelectric materials
5. Understand High-Band Width, Low Strain Smart Sensors and Intelligent Devices

CO-PO Articulation Matrix

PO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO1	3	1	2	1	1	-
CO2	3	1	2	1	1	-
CO3	3	1	2	1	-	-
CO4	3	1	2	1	1	1
CO5	3	1	2	1	-	-

Unit-I.

Overview of Smart Materials: Piezoelectric Materials : Introduction to Smart Material , What is a Smart Material, Applications of Smart Material, Applications of Smart Material ,Smart systems using Smart Material Materials, Smart Actuators, Direct and Reverse Effects, Piezoelectric Materials, History of Piezoelectricity, Piezoelectric Materials. Piezoelectric Materials, Piezoceramic Actuator, Constitutive Relationship, Piezoceramic Polymers &Composites Composites Bimorphs & Piezostacks.

Unit II.

Magnetostrictive Smart Materials & Active Smart Polymer: What is Magnetostriction, Some Examples, A Brief History of Magnetostrictive Material Materials, What are the different effects of Magnetostriction? The Constitutive Relationship, Actuators Developed using Terfenol D, Sensors Developed using Terfenol-D., Magnetostrictive Composites. What is Active Smart Polymer Classifications of Electroactive Polymers . The Constitutive Relationship, Actuators Developed using FAP, Sensors Developed using IAP, Future of IPMC Ionic Polymer Metal Composite (IPMC), Actuators Developed using IPMC Actuators Developed using IPMC , Sensors Developed using IPMC, Future of IPMC What is Shape Memory Effect? Metallic alloys that show Shape Metallic alloys that show Shape Memory Effect, The Constitutive Relationship , Actuators Developed using SMA, Sensors Developed using SMA, Future of SMA.

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Unit III:

Modelling of Piezoelectric Material: Piezoelectric Property, Crystal structure Crystal Structure, Constitutive Relationship, Active Strain Evaluation, Piezoelectric Coefficients, A Comparison of Properties, Comparison of Properties, Actuators Developed using Piezoelectric Material induced Strain Actuation (ISA), Uniform Strain Model, Static Equilibrium Configuration against ,Uniform Strain Uniform Stram Configurat on against Bending Strain, ISA – Euler-Bernoulli Model , ISA Model for Magnetostrictive Model for Magnetostrictive Mini Actuator, Active Fibre Composite Actuation.

Unit IV

High-Band Width, Low Strain Smart Sensors: Piezoelectric Actuators – Piezoceramic Unimorph and Bimorphs, Amplified Piezoactuators Piezoelectric Composites– Piezoelectric Composites Piezo-transducres, Electrostrictive (PMN) Actuators, Magnetostrictive Actuators, Magnetostrictive Actuators , Terfenol-D Actuators as MMA, Terfenol D Composites, Delamination Sensing and Vibration Control using Magnetostrictive Control using Magnetostrictive Materials, Piezoelectric Inchworm Devices –Piezoelectric Fuel Injectors , Ultrasonic Motors.

Unit V

Intelligent Devices based on Smart Materials: Piezoelectric Inchworm Devices, Inchworm devices for Actuation, Sizes and Specifications, Inchworm Devices for Locomotion, Unimorph Thunder, Rainbow Actuators, Rainbow and Thunder Actuation, Active Elasto-dynamic Motion, A Case history of Sensor Application, Introduction to MEMS Devices, MEMS based Accelerometers.

Text Books:

1. Brian Culshaw, Smart Structures and Materials, Artech House, 2000
2. Gauenzi, P., Smart Structures, Wiley, 2009

SUGGESTED READING:

1. Cady, W. G., Piezoelectricity, Dover Publication
2. https://nptel.ac.in/courses/112104173.

25

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

COMMITTED TO RESEARCH, INNOVATION AND EDUCATION 43 years

DEPARTMENT OF MECHANICAL ENGINEERING

CIRCULAR

Date: 29-08-2022

The following core companies are visiting the campus for the recruitment in the month of September 2022.

1. Technip FMC
2. Pokarna Engineering Limited
3. Cloud4C
4. Dravin Engineering Pvt. Ltd.

As per the data received from CDC, the students should have knowledge in Strength of Materials, Finite Element Analysis, CAD/CAM and Design of Machine Elements. The following online programme is scheduled to improve the performance of the students in the above campus placements.

S.No	Date	Topic Name	Faculty Name	Time
1	01-09-2022	Strength of Materials	Dr. Solomon Raj	7.00 pm to 9.00 pm
2	02-09-2022	Strength of Materials	Dr. Solomon Raj	7.00 pm to 9.00 pm
3	03-09-2022	Finite Element Analysis	Dr. T. Ratna Reddy/ Mrs. Anjani Devi	10.00 am to 12.00 pm
4	03-09-2022	CAD/CAM	Mrs. Ch. V. Sushma	2.00 pm to 4.00 pm
5	04-09-2022	Session with Seniors who were placed in the above companies	CBIT, Alumini	10.00 am to 11.00 pm
6	05-09-2022	Design of Machine Elements	Dr. G. Laxmaiah	7.00 pm to 9.00 pm
7	06-09-2022	Design of Machine Elements	Dr. G. Laxmaiah	7.00 pm to 8.00 pm

The Students who are interested may register for the session in the following link

https://forms.gle/cjiSPsJwZpmV4XeQ6

cc to Principal, CBIT, for information

HEAD, MED

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