HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST

HICET

HINDUSTHAN

COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution)

Coimbatore – 641032

DEPARTMENT OF MECHANICAL ENGINEERING

ME – CAD/CAM

Curriculum and ODD Semesters Syllabus for the Batch

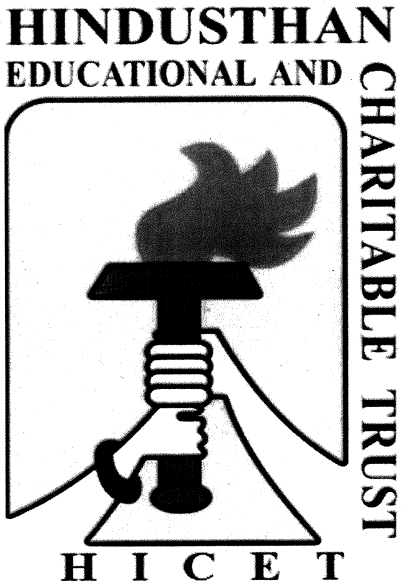
2024 – 2026 (R2024)

2023 – 2025 (R2020)

(Board of Studies held on 20.05.2024)

(Academic Council Meeting held on 21.06.2024)

HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY
An Autonomous Institution
Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai
Accredited by NBA (AERO, AUTO, CIVIL, CSE, ECE, EEE, IT, MECH & MCT)
Accredited with 'A++' Grade by NAAC.
Coimbatore - 641 032



CHOICE BASED CREDIT SYSTEM

Revised Curriculum and Syllabus for the ODD semester

Academic year 2024-25

CURRICULUM 2024

HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY
An Autonomous Institution
Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai
Accredited by NBA (AERO, AUTO, CIVIL, CSE, ECE, EEE, IT, MECH & MCT)
Accredited with 'A++' Grade by NAAC.
Coimbatore - 641 032

M.E. CAD/CAM - REGULATIONS - 2024
CHOICE BASED CREDIT SYSTEM CURRICULA AND SYLLABI
SEMESTER I

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	24MA1104	Applied mathematics for engineers	FC	4	0	0	4	4
2.	24RM1153	Research Methodology and IPR	RMC	2	1	0	3	3
3.	24CC1201	Computer Aided Design	PCC	3	0	1	4	3
4.	24CC1202	Integrated Mechanical Design	PCC	3	1	0	4	3
5.	24CC1203	Computer Aided Manufacturing	PCC	3	0	0	3	3
PRACTICALS								
6.	24CC1001	Computer Aided Design Lab	PCC	0	0	4	4	2
7.	24CC1002	Computer Aided ManufacturingLab	PCC	0	0	4	4	2
TOTAL				**15**	**2**	**10**	**26**	**20**

SEMESTER II

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	24CC2201	Finite Element Analysis	PCC	3	1	0	4	4
2.	24CC2202	Integrated Product and Processes Development	PCC	3	1	0	4	3
3.	24CC2203	Design for Manufacture Assembly and Environment	PCC	3	0	0	3	3
4.	24CCXXX	Professional Elective I	PEC	3	0	0	3	3
5.	24CCXXX	Professional Elective II	PEC	3	0	0	3	3
PRACTICALS								
6.	24CC2001	Computer Aided Engineering Lab	PCC	0	0	4	4	2
7.	24CC2002	Inplant Training / Internship/ Mini Project	EEC	0	0	4	4	2
TOTAL				**15**	**0**	**12**	**27**	**20**

SEMESTER III

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	24CCXXX	Professional Elective III	PEC	3	0	0	3	3
2.	24CCXXX	Professional Elective IV	PEC	3	0	0	3	3
3.	24CCXXX	Professional Elective V	PEC	3	0	0	3	3
4.	24CCXXX	Professional Elective VI	PEC	3	0	0	3	3
PRACTICALS								
4.	24CC3901	Project Work I	EEC	0	0	12	12	6
			TOTAL	**12**	**0**	**12**	**24**	**18**

SEMESTER IV

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
PRACTICALS								
1.	24CC4901	Project Work II	EEC	0	0	24	24	12
			TOTAL	**0**	**0**	**24**	**24**	**12**

TOTAL NO. OF CREDITS: 70

LIST OF PROFESSIONAL ELECTIVES

SEMESTER II ELECTIVE I

S. NO.	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			CREDITS	SEMESTER
			L	T	P		
1.	24CC2301	Computer Aided Process Planning	3	0	0	3	II
2	24CC2302	Additive Manufacturing	3	0	0	3	II
3	24CC2303	Computer Integrated Production and Inventory Systems	3	0	0	3	II
4	24CC2304	Design and Analysis of Experiments	3	0	0	3	II

SEMESTER II ELECTIVE II

S. NO.	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			CREDITS	SEMESTER
			L	T	P		
1.	24CC2305	Metrology and Non Destructive Testing	3	0	0	3	II
2	24CC2306	Competitive Manufacturing Systems	3	0	0	3	II
3	24CC2307	Design of Heat Exchanger	3	0	0	3	II
4	24CC2308	Composite Materials andMechanisms	3	0	0	3	II

SEMESTER III ELECTIVE III

S. NO.	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			CREDITS	SEMESTER
			L	T	P		
1.	24CC3301	Mechatronics Applications in Manufacturing	3	0	0	3	III
2	24CC3302	Industrial Safety Management	3	0	0	3	III
3	24CC3303	Supply Chain Management	3	0	0	3	III
4	24CC3304	Industrial Robotics and Expert Systems	3	0	0	3	III

ELECTIVE IV

S. NO.	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			CREDITS	SEMESTER
			L	T	P		
1.	24CC3305	Computational Fluid Dynamics	3	0	0	3	III
2	24CC3306	Vibration Analysis and Control	3	0	0	3	III
3	24CC3307	Optimization Techniques inDesign	3	0	0	3	III
4	24CC3308	Tribology in Design	3	0	0	3	III

ELECTIVE V

S. NO.	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			CREDITS	SEMESTER
			L	T	P		
1.	24CC3309	Advanced Tool Design	3	0	0	3	III
2	24CC3310	Manufacturing – Online Course Nptel/EDX/Mooc	3	0	0	3	III
3	24CC3311	Design and Analysis of Thermal Energy Systems	3	0	0	3	III
4	24CC3312	Basics and applications for Internet of Things	3	0	0	3	III

FOUNDATION COURSE (FC)

S. NO.	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			CREDITS	SEMESTER
			L	T	P		
1.	24MA1104	Mathematics	4	0	0	4	I
TOTAL			4	0	0	4	

PROFESSIONAL CORE COURSES (PCC)

S. NO.	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			CREDITS	SEMESTER
			L	T	P		
1.	24CC1201	Computer Aided Design	3	0	1	3	I
2.	24CC1202	Integrated Mechanical Design	3	1	0	3	I
3.	24CC1203	Computer Aided Manufacturing	3	0	0	3	I
5.	24CC1001	Computer Aided Design Lab	0	0	4	2	I
6.	24CC1002	Computer Aided ManufacturingLab	0	0	4	2	I
7	24CC2201	Finite Element Analysis	3	1	0	4	II
8	24CC2202	Integrated Product and Processes Development	3	1	0	3	II
9	24CC2203	Design for Manufacture Assembly and Environment	3	0	0	3	II
10	24CC2001	Computer Aided Engineering Lab	0	0	4	2	II
TOTAL			18	3	13	25	

RESEARCH METHODOLOGY AND IPR COURSES (RMC)

S. NO.	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			CREDITS	SEMESTER
			L	T	P		
1.	24RM1153	Research Methodology	2	1	0	3	I
TOTAL			2	1	0	3	

PROFESSIONAL ELECTIVE COURSES (PEC)

S. NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			CONTACT PERIODS	CREDITS
				L	T	P		
1.	24CC2301	Computer Aided Process Planning	PEC	3	0	0	3	3
2.	24CC2302	Additive Manufacturing	PEC	3	0	0	3	3
3.	24CC2303	Computer Integrated Production and Inventory Systems	PEC	3	0	0	3	3
4.	24CC2304	Design and Analysis of Experiments	PEC	3	0	0	3	3

5	24CC2305	Metrology and Non Destructive Testing	PEC	3	0	0	3	3
6	24CC2306	Competitive Manufacturing Systems	PEC	3	0	0	3	3
7	24CC2307	Design of Heat Exchanger	PEC	3	0	0	3	3
8	24CC2308	Composite Materials and Mechanisms	PEC	3	0	0	3	3
9	24CC3301	Mechatronics Applications in Manufacturing	PEC	3	0	0	3	3
10	24CC3302	Industrial Safety Management	PEC	3	0	0	3	3
11	24CC3303	Supply Chain Management	PEC	3	0	0	3	3
12	24CC3304	Industrial Robotics and Expert Systems	PEC	3	0	0	3	3
13	24CC3305	Computational Fluid Dynamics	PEC	3	0	0	3	3
14	24CC3306	Vibration Analysis and Control	PEC	3	0	0	3	3
15	24CC3307	Optimization Techniques inDesign	PEC	3	0	0	3	3
16	24CC3308	Tribology in Design	PEC	3	0	0	3	3
17	24CC3309	Advanced Tool Design	PEC	3	0	0	3	3
18	24CC3310	Manufacturing – Online Course Nptel/EDX/Mooc	PEC	3	0	0	3	3
19	24CC3311	Design and Analysis of Thermal Energy Systems	PEC	3	0	0	3	3
20	24CC3312	Basics and applications for Internet of Things	PEC	3	0	0	3	3
TOTAL II Semester				6	0	0	6	
TOTAL III Semester				12	0	0	12	

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

S.NO	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			CREDITS	SEMESTER
			L	T	P		
1.	24CC2002	Inplant Training / Internship/ Mini Project	0	0	4	2	II
2.	24CC3901	Project Work I	0	0	12	6	III
3.	24CC4901	Project Work II	0	0	24	12	IV
TOTAL CREDITS						**20**	

S.NO	M.E CAD/CAM						
	SUBJECT AREA	CREDITS PER SEMESTER				CREDITS TOTAL	% DISTRIBUTION
		I	II	III	IV		
1.	FC	4	-	-	-	4	5.71
2.	PCC	13	12	-	-	25	35.71
3.	PEC	-	6	12	-	18	25.71
4.	RMC	3	-	-	-	3	4.29
5.	EEC	-	2	6	12	20	28.57
	TOTAL CREDITS	**20**	**20**	**18**	**12**	**70**	**100**

Chairman, BoS

Chairman - BoS
MECH - HiCET

Dean Academics

Dean (Academics)
HiCET

Principal

PRINCIPAL
Hindusthan College Of Engineering & Technology
COIMBATORE - 641 032.

Programme	Course Code	Name of the Course	L	T	P	C
M.E CAD/CAM /I	24MA1104	APPLIED MATHEMATICS FOR ENGINEERS	3	1	0	4

Course Objectives

1. Acquire knowledge of algebraic equations, which are useful in many fields of Engineering.
2. Impart knowledge on numerical solutions of Ordinary differential equations
3. Impart knowledge on numerical solutions of partial differential equations.
4. Establish mathematical technique for solving a partial differential equation using Laplace transform
5. Introduce optimization techniques for problem solving.

Unit	Description	Instructional Hours
I	**SOLUTION OF TRANSCENDENTAL EQUATIONS** Systems of linear equations: Gauss elimination method - LU - Choleski method - Gauss Siedel method - Systems of nonlinear equations: Fixed-point iterations - Newton Method.	12
II	**NUMERICAL SOLUTION OF ODE** Taylor series method - Euler and Modified Euler method - Runge - Kutta method - Adams – Bash forth method.	12
III	**NUMERICAL SOLUTION OF PDE** Classification of partial differential equations of second order - Liebmann's method for Laplace equation and Poisson equation, explicit method and Crank-Nicolson method for parabolic equations, explicit method for hyperbolic equations	12
IV	**LAPLACE TRANSFORM TECHNIQUES FOR PARTIAL DIFFERENTIAL EQUATIONS** Laplace transform: Definitions – Properties – Dirac delta function – Unit step functions – Convolution theorem – Inverse Laplace transform - Solutions to partial differential equations: Heat equation – Wave equation.	12
V	**OPTIMIZATION TECHNIQUES** Linear programming - Basic concepts – Graphical and simplex methods – Big M method - Transportation problems – Assignment problems.	12
	Total Instructional Hours	60

Course Outcomes

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

CO1: Understand the numerical solution algorithms applied to solve algebraic equations.
CO2: Apply Numerical methods to find the solution of ODE.
CO3: Apply Numerical methods to find the solution of PDE
CO4: Understand the fundamental ideas behind the Laplace transform.
CO5: Apply diverse optimization methods effectively.

TEXT BOOKS:

T1 - M. K. Jain ,S. R .K. Iyengar, R .K. Jain, Computational Methods for Partial differential Equations, 2nd Edition, New Age Publishers,2016.

T2 – Hamdy A Taha, Operations Research, 9 th Edition (Asia), Pearson Education, Asia, 2014.

REFERENCE BOOKS:

R1- S. K. Gupta, Numerical Methods for Engineers, 3 rd Edition, New Age International Pvt Ltd Publishers, 2015.

R2 - Mital. KV. Mohan and Chander, Optimization Methods in Operations Research and Systems Analysis, 4 th Edition, New Age International Publishers, 2016.

R3 - Dean G. Duffy, Transform Methods For Solving Partial Differential Equations, 2 nd Edition, Chapman & Hall/CRC,2004.

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	1	1	-	-	1	2	2	3	2
CO2	3	3	3	3	3	1	1	-	-	1	2	2	3	2
CO3	3	3	3	3	2	1	1	-	-	1	2	2	3	2
CO4	3	3	3	2	2	1	2	-	-	1	2	2	2	2
CO5	3	3	3	2	2	1	2	-	-	1	3	2	2	2
AVG	3	3	3	2.6	2.4	1	1.4			1	2.2	2	2.6	2

Chairman, Board of Studies

Chairman - BoS
MECH - HiCET

ACADEMIC COUNCIL * HINDUSTHAN COLLEGE OF ENGG & TECH * Chairman

Dean – Academics

Dean (Academics)
HiCET

Programme	Course Code	Name of the Course	L	T	P	C
M.E CAD/CAM	24RM1153	RESEARCH METHODOLOGY AND IPR	2	0	0	3

Course Objectives

1. To impart knowledge and skills required for research and IPR:
2. Problem formulation, analysis and solutions.
3. Technical paper writing / presentation without violating professional ethics
4. Patent drafting and filing patents.

Unit	Description	Instructional Hours
I	**RESEARCH PROBLEM FORMULATION** Meaning of research problem- Sources of research problem, criteria characteristics of a good research problem, errors in selecting a research problem, scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, necessary instrumentations	9
II	**LITERATURE REVIEW** Effective literature studies approaches, analysis, plagiarism, and research ethics.	9
III	**TECHNICALWRITING /PRESENTATION** Effective technical writing, how to write report, paper, developing a research proposal, format of research proposal, a presentation and assessment by a review committee.	9
IV	**INTRODUCTION TO INTELLECTUAL PROPERTY RIGHTS (IPR)** Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.	9
V	**INTELLECTUAL PROPERTY RIGHTS (IPR) 6** Patent Rights: Scope of Patent Rights. Licensing and transfer of technology.Patent information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System, IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.	9
	Total Instructional Hours	**45**

Course Outcomes

At the end of the course, student shall be able to
CO1: Understand and formulate research problem
CO2. Apply and carry out research analysis
CO3. Analyse research ethics
CO4. Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity
CO5. Understand about IPR and filing patents in R & D.

TEXT BOOKS:

T1- Asimov, "Introduction to Design", Prentice Hall, 2017.
T2. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2018.

REFERENCE BOOKS:

R1. Mayall, "Industrial Design", McGraw Hill, 1992.
R2. Niebel, "Product Design", McGraw Hill, 1974.
R3. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners" 2010.

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1	2	-	1	2	-	-	1	1	2	1	1
CO2	3	1	1	2	-	1	2	-	-	1	1	2	1	1
CO3	3	1	1	2	-	1	2	-	-	1	1	2	1	1
CO4	3	1	1	2	-	1	2	-	-	1	1	2	1	1
CO5	3	2	2	2	-	1	2	-	-	2	1	2	1	1
Avg	3	2.2	2.2	2	0	1	2	0	0	2.2	1	2	1	1

Chairman, Board of Studies

Chairman - BoS
MECH - HiCET

ACADEMIC COUNCIL * HICET * SRIVILLIPUTHUR * SRIVILLIPUTHUR KALVAN COLLEGE OF ENGG & TECH * Chairman

Dean – Academics

Dean (Academics)
HiCET

Programme	Course Code	Name of the Course	L	T	P	C
M.E CAD/CAM	24CC1201	COMPUTER AIDED DESIGN	3	0	1	3

Course Objectives

1. To acquire the knowledge on CAD/CAM software.
2. To familiarize about wireframe, surface and solid modeling techniques.
3. To enable the students to use the concepts of assembly and animation techniques.
4. To learn the techniques for Design applications.
5. To understand the principles of parametric, associative and feature based modeling concepts.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO CAD/CAM** Introduction, Product life cycle, CAD/CAM – Systems, applications, CAD – Methodology, uses, benefits, applications, 3D Modeling – Geometric models, coordinate systems. Sketching, parameters, dimensions, basic and datum features, geometric constraints, modeling operations.	9
II	**GEOMETRIC MODELING** Wireframe models - entities, Surface models - entities, representation, analytic surfaces, plane surface, ruled surface, surface of revolution, tabulated cylinder, synthetic surfaces, hermite bicubic surface, Bezier surface, B-spline surface, coons surface, blending surface, offset surface, triangular patches, surface manipulations, product data exchange.	9
III	**SOLID MODELLING** Solid models - entities, representation, Fundamentals of solid modeling, Basic elements and Building operations on boundary representation, constructive solid geometry and sweep representation, solid modeling based applications.	9
IV	**ASSEMBLY AND ANIMATION** Assembly modeling – Modeling, tree, planning, mating conditions, Bottom-Up assembly, Top-Down assembly, load options, managing and working, inference and orientation, analysis. Conventional and computer animation – Engineering animation, animation systems, animation types – frame buffer, real time playback and real time animation, key frame technique in animation, simulation technique.	9
V	**DESIGN APPLICATIONS** Limits and fits, Geometric tolerancing - datum's, types of geometric tolerances, drafting practices in dimensioning and tolerancing, design and engineering applications, finite element modeling.	9
	Total Instructional Hours	**45**

Course Outcomes

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

CO1: Understand the concepts of wireframe, surface and solid modeling.
CO2: Analyse and create the mechanisms of components.
CO3: Understand the concepts of geometric Dimensioning and Tolerance.
CO4: Apply the techniques of assemblage and animation.
CO5: Understand the concepts in applications of Design.

TEXT BOOKS:

T1- Ibrahim Zeid, "Mastering CAD/CAM" – McGraw Hill, International Edition, 2017.
T2- Dr.Sadhu Singh, Computer Aided Design and Manufacturing, Khanna Publishers 2018.

REFERENCE BOOKS:

R1- William M Neumann and Robert F.Sproul "Principles of Computer Graphics", Mc Graw Hill Book Co. Singapore, 1989.
R2- Ibrahim Zeid, CAD/CAM Theory and Practice, Tata McGraw-Hill, 1998.
R3- Donald Hearn and M. Pauline Baker "Computer Graphics", Prentice Hall, Inc., 1992.

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1	2	-	3	-	-	-	-	3	2	3	3	1
CO2	3	2	2	2	3	-	-	-	-	3	3	3	3	1
CO3	3	1	2	2	3	-	-	-	-	3	3	3	3	2
CO4	3	1	2	-	3	-	-	-	-	2	2	3	2	1
CO5	3	1	2	-	3	-	-	-	-	3	3	3	3	2
Avg	3	1.2	2	2	3	0	0	0	0	2.8	2.6	3	2.8	1.4

Chairman, Board of Studies

Chairman - BoS
MECH - HiCET

ACADEMIC COUNCIL * HINDUSTHAN COLLEGE OF ENGG & TECH * Chairman

Dean – Academics

Dean (Academics)
HiCET

Programme	Course Code	Name of the Course	L	T	P	C
M.E CAD/CAM	24CC1202	INTEGRATED MECHANICAL DESIGN	3	1	0	3

(Use of Approved Data Book Is Permitted)

Course Objectives

1. To familiarize the various steps involved in the Design Process and to use standard practices and standard data.
2. To understand the principles involved in evaluating the shape and dimensions of a component to satisfy functional and strength requirements.
3. To learn the usage of catalogues and standard machine components.
4. To acquire the knowledge of factor of safety and design procedures.
5. To enable the students to work in design calculations.

Unit	Description	Instructional Hours
I	**FUNDAMENTALS AND DESIGN OF SHAFTS** Phases of design – Standardization and interchangeability of machine elements - Process and Function Tolerances – Individual and group tolerances – Selection of fits for different design situations – Design for assembly and modular constructions – Concepts of integration –BIS, ISO,DIN, BS, ASTM Standards. Oblique stresses – Transformation Matrix – Principal stresses – Maximum shear stress – Theories of Failure – Ductile vs. brittle component design -Analysis and Design of shafts for different applications – integrated design of shaft, bearing and casing – Design for rigidity.	12
II	**BRAKES** Dynamics and thermal aspects of vehicle braking – Integrated design of brakes for machine tools, automobiles and mechanical handling equipments.	12
III	**DESIGN OF GEARS** Principles of gear tooth action – Gear correction – Gear tooth failure modes – Stresses and loads– Component design of spur, helical, bevel and worm gears.	12
IV	**DESIGN OF GEAR BOX** Design for sub assembly –Integrated design of speed reducers and multi-speed gear boxes – application of software packages.	12
V	**INTEGRATED DESIGN** Integrated Design of systems consisting of shaft, bearings, springs, motor, gears, belt, rope, chain, pulleys, Cam & Follower, flywheel etc. Example - Design of Elevators and Escalators.	12
	Total Instructional Hours	**60**

Course Outcomes

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

CO1: Understand the concepts of shaft and brake.
CO2: Analyse Design gear and gearbox components.
CO3: Understand the Integrated Design of Mechanical systems and Machines.
CO4: Understand the principles in real time problems.
CO5: Apply the concepts in automobile and automation components.

TEXT BOOKS:

T1- Norton L. Robert., "Machine Design – An Integrated Approach" Pearson Education, 2020.
T2- Newcomb T.P. and Spur R.T., "Automobile Brakes and Braking Systems", Chapman & Hall, 2018.

REFERENCE BOOKS:

R1- Shigley, J.E., "Mechanical Engineering Design", McGraw Hill, 1986.
R2- Prasad. L. V., "Machine Design", Tata McGraw Hill, New Delhi, 1992.
R3- Alexandrov, M., Materials Handling Equipments, MIR Publishers, 1981.

APPROVED DATA BOOKS

1. P.S.G. Tech., "Design Data Book", Kalaikathir Achchagam, Coimbatore, 2003.
2. Lingaiah. K. and Narayana Iyengar, "Machine Design Data Hand Book", Vol. 1 & 2, Suma Publishers, 1983.

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	2	-	2	1	2	1	-	1	2	3	2	2
CO2	3	1	2	-	2	1	2	1	-	1	2	3	2	2
CO3	3	1	2	-	2	1	2	1	-	1	2	3	2	2
CO4	3	1	2	-	2	1	2	1	-	1	2	3	2	2
CO5	3	1	2	-	2	1	2	1	-	1	2	3	2	2
Avg	3	1	2	0	2	1	2	1	0	1	2	3	2	2

Chairman, Board of Studies

Chairman - BoS
MECH - HiCET

ACADEMIC COUNCIL * HINDUSTHAN COLLEGE OF ENGG & TECH * Chairman

Dean – Academics

Dean (Academics)
HiCET

Programme	Course Code	Name of the Course	L	T	P	C
M.E CAD/CAM	24CC1203	COMPUTER AIDED MANUFACTURING	3	0	0	3

Course Objectives

1. To understand the principles of manufacturing and Numerical control Techniques.
2. To educate the students on CNC machine construction and its programming.
3. To familiarize the concept of advanced manufacturing techniques.
4. To know the principles of PDM and PLM concepts.
5. To enable the students to know the performance of CNC machines.

Unit	Description	Instructional Hours
I	**INTRODUCTION** Objectives of a manufacturing system-identifying business opportunities and problems classification production systems-linking manufacturing strategy and systems analysis of manufacturing operations. Automated Manufacturing Systems, Computerized Manufacturing Support Systems, Reasons for Automation, Automation Strategies, PDM & PLM.	9
II	**FUNDAMENTALS OF NUMERICAL CONTROL** Automation –Definition, Elements of CAM system, Product Development, Principles of Numerical control, Coordinate system for NC machine, Advantages and Limitations of NC ,CNC Technology, Types, Interpolation, Machine control unit, CNC Performance, Benefits, safety and Maintenance, DNC, Functions and Advantages.	9
III	**CONSTRUCTIONAL FEATURES OF CNC MACHINES** Design considerations of CNC machines for improving machining accuracy-Structural members-Slide ways-Sides linear bearings-Ball screws-Spindle drives and feed drives-work holding devices and tool holding devices-Automatic Tool changers. Feedback devices- Principles of Operation-Turning and Machining Centre's-Tooling for CNC machines.	9
IV	**PART PROGRAMMING FOR CNC MACHINES** Numerical control codes – Standards - Manual Programming - Canned cycles and subroutines-Computer Assisted Programming, CAD/CAM approach to NC part programming-APT language, machining from 3D models.	9
V	**ADVANCED CNC MACHINES AND MANUFACTURING** CNC grinders, CNC gear cutting machines, CNC wire cut EDM, CNC-CMM, CNC Molding Machines, Automated Welding, features of CAM packages, Tool path simulation, generation of NC code, Optimization of tool path using CAM software.	9
	Total Instructional Hours	**45**

Course Outcomes

At the end of the course student shall be able to

CO1: Understand the appropriate code for performing particular task in a CNC machine.
CO2: Understand the constructional features of CNC machines.
CO3: Analyse the program for Turning and Milling operations.
CO4: Understand the Numerical control techniques in CNC machines.
CO5: Understand the tool path simulation, generation of NC code and tool path optimization.

TEXT BOOKS:

T1- Radhakrishnan.P, "Computer Numerical Control CNC machines" New central book agency, 2018.
T2- Mikell P.Groover, "Automation production systems and computer – integrated manufacturing", Prentice Hall of India. Ltd.,2018

REFERENCE BOOKS:

R1- Rao P.N., N.K. Tewari & T.K. Kundra, "Computer Aided Manufacturing", Tata McGraw Hill, 2001.
R2- Kant Vajpayee.S, "Principles of CIM", Prentice Hall of India, 1995.
R3- Dr.Sadhu Singh, Computer Aided Design and Manufacturing, Khanna Publishers – Fifth Edition.

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	-	1	-	2	-	-	-	2	1
CO2	3	3	3	3	3		1		2				2	1
CO3	3	3	3	3	3		1		2				2	1
CO4	3	3	3	3	3		1		2				2	1
CO5	3	1	2	2	1								1	1
Avg	3	2.6	2.8	2.8	2.6	0	0	0	0	-0	0	0	1.8	1

Chairman, Board of Studies

Chairman - BoS
MECH - HiCET

ACADEMIC COUNCIL * TECH * Chairman * KARPAGAM COLLEGE OF ENGG

Dean – Academics

Dean (Academics)
HiCET

Programme	Course Code	Name of the Course	L	T	P	C
M.E CAD/CAM	24CC1001	COMPUTER AIDED DESIGN LAB	0	0	4	2

Course Objectives

1. To provide hands on training to create surface, two and three dimensional modeling of machine components using modeling software.
2. To educate training to simulate various simple mechanisms.
3. To understand the design concepts of all components.
4. To familiarize information about bill of materials, limits and tolerances.
5. To gain knowledge in assembling top down and bottom up approach.

Unit	Description	Instructional Hours
1	Assembly modeling of the center lathe.	
2	Assembly modeling of fixture parts.	
3	Assembly modeling of IC engine components.	
4	Surface modeling of a vehicle parts.	
5	Sheet metal modeling of a container.	
6	Detailing of center lathe with bill of materials, limits and tolerances.	
7	Mechanism of IC engine components.	
	Total Instructional Hours	**30**

Course Outcomes

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

CO1: Understand the design of given machine components.
CO2: Analyse and Assemble the machine components.
CO3: Evaluate the Detailing of given machine components.
CO4: Analyse and Simulate the machine components.
CO5: Understand the concepts of modeling techniques.

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	-	1	-	2	-	-	-	2	1
CO2	3	3	3	3	3		1		2				2	1
CO3	3	3	3	3	3		1		2				2	1
CO4	3	3	3	3	3		1		2				2	1
CO5	3	1	2	2	1								1	1
Avg	3	2.6	2.8	2.8	2.6	0	0	0	0	0	0	0	1.8	1

Chairman, Board of Studies

Chairman - BoS
MECH - HiCET

ACADEMIC COUNCIL * HINDUSTHAN COLLEGE OF ENGG & TECH * Chairman

Dean – Academics

Dean (Academics)
HiCET

Programme	Course Code	Name of the Course	L	T	P	C
M.E CAD/CAM	24CC1002	COMPUTER AIDED MANUFACTURING LAB	0	0	4	2

Course Objectives

1. To impart hands on training on CNC Machine tools, CMM and RPT.
2. To acquire practical knowledge through intensive practice on CNC Machines & related software.
3. To develop part programs for various components.
4. To create product using Rapid prototyping machine.
5. To know about the NC code generation.

Unit	Description	Instructional Hours
1	Manual part programming on CNC Lathe by using FANUC software.	
2	Manual part programming on CNC Milling and Drilling by using FANUC software.	
3	NC code generation for Lathe using CAM software.	
4	NC code generation for milling using CAM software.	
5	NC code generation for a component using CMM software.	
6	NC code generation in an Image Processing method for a component using CMM software.	
7	Prototype creation of a product using Rapid prototyping machine.	
	Total Instructional Hours	**30**

Course Outcomes

At the end of the course, student shall be able to
CO1: Understand the Tool and machine setting.
CO2: Analyse the CNC programming and tool path simulation.
CO3: Analyse the CNC lathe and milling machine Maintenance.
CO4: Apply the Hands on experience CMM and RPT.
CO5: Understand the NC code generation.

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	-	1	-	2	-	-	-	2	1
CO2	3	3	3	3	3		1		2				2	1
CO3	3	3	3	3	3		1		2				2	1
CO4	3	3	3	3	3		1		2				2	1
CO5	3	1	2	2	1								1	1
Avg	3	2.6	2.8	2.8	2.6	0	0	0	0	0	0	0	1.8	1

Chairman, Board of Studies

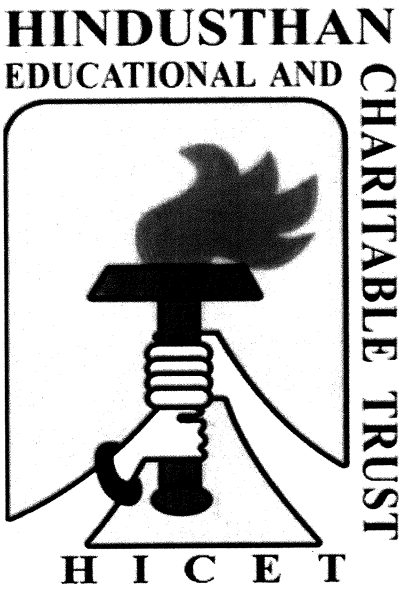
Chairman - BoS
MECH - HiCET

ACADEMIC COUNCIL * HINDUSTHAN COLLEGE OF ENGG & TECH * Chairman

Dean – Academics

Dean (Academics)
HiCET

HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY
An Autonomous Institution
Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai
Accredited by NBA (AERO, AUTO, CIVIL, CSE, ECE, EEE, IT, MECH & MCT)
Accredited with 'A++' Grade by NAAC.
Coimbatore - 641 032



CHOICE BASED CREDIT SYSTEM

Revised Curriculum and Syllabus for the ODD semester

Academic year 2024-25

CURRICULUM
2020

REGULATIONS - 2020
CHOICE BASED CREDIT SYSTEM
M.E. CAD/ CAM (FULL - TIME) CURRICULAM and SYLLABI
FOR I TO IV SEMESTERS

SEMESTER I

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1.	20MA1104	Applied Mathematics for Engineers	FC	3	1	0	4	40	60	100
2.	20CC1201	Computer Aided Design	PCC	3	0	1	3	40	60	100
3.	20CC1202	Integrated Mechanical Design	PCC	3	1	0	3	40	60	100
4.	20CC1203	Computer Aided Manufacturing	PCC	3	0	0	3	40	60	100
5.	20RM1153	Research Methodology and IPR	RMC	2	0	0	3	40	60	100
6.	20AC10XX	Audit Course – I*	AC	2	0	0	0	100	0	0
PRACTICALS										
7.	20CC1001	Computer Aided Design Lab	PCC	0	0	4	2	50	50	100
8.	20CC1002	Computer Aided Manufacturing Lab	PCC	0	0	4	2	50	50	100
			TOTAL	**16**	**2**	**9**	**20**			**700**

* Audit Course is optional.

SEMESTER II

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1.	20CC2201	Finite Element Analysis	PCC	3	1	0	4	40	60	100
2.	20CC2202	Integrated Product and Processes Development	PCC	3	1	0	3	40	60	100
3.	20CC2203	Design for Manufacture Assembly and Environment	PCC	3	0	0	3	40	60	100
4.	20CC23XX	Professional Elective I	PEC	3	0	0	3	40	60	100
5.	20CC23XX	Professional Elective II	PEC	3	0	0	3	40	60	100
6.	20CC20XX	Audit Course – II*	AC	2	0	0	0	100	0	0
PRACTICALS										
7.	20CC2001	Computer Aided Engineering Lab	PCC	0	0	4	2	50	50	100
8.	20CC2002	Inplant Training / Internship/ Mini Project	EEC	0	0	4	2	50	50	100
			TOTAL	**17**	**2**	**9**	**20**			**700**

* Audit Course is optional.

SEMESTER III

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1.	20CC33XX	Professional Elective III	PEC	3	0	0	3	40	60	100
2.	20CC33XX	Professional Elective IV	PEC	3	1	0	3	40	60	100
3.	20CC33XX	Professional Elective V/ Online Course	PEC	3	0	0	3	40	60	100
4.	20CC34XX	Open Elective / Online Course	OEC	3	0	0	3	40	60	100
PRACTICALS										
5.	20CC3901	Dissertation- I	EEC	0	0	12	6	50	50	100
			TOTAL	**12**	**1**	**12**	**18**			**500**

SEMESTER IV

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	L	T	P	C	CIA	ESE	TOTAL
PRACTICALS										
1.	20CC4901	Dissertation- II	EEC	0	0	24	12	100	100	200
			TOTAL	**0**	**0**	**24**	**12**			**200**

AUDIT COURSES (AC)

Registration for any of these courses is optional to students

AUDIT COURSES SEMESTER-I

SL.NO	COURSE CODE	COURSE TITLE	L	T	P	C	CIA	ESE	TOTAL
1.	20AC1091	English for Research Paper Writing	2	0	0	0	100	0	0
2.	20AC1092	Disaster Management	2	0	0	0	100	0	0
3.	20AC1093	Sanskrit for Technical Knowledge	2	0	0	0	100	0	0
4.	20AC1094	Constitution of India	2	0	0	0	100	0	0
5.	20AC1095	Pedagogy Studies	2	0	0	0	100	0	0

AUDIT COURSES SEMESTER-II

SL.NO	COURSE CODE	COURSE TITLE	L	T	P	C	CIA	ESE	TOTAL
1.	20AC2091	Value Education	2	0	0	0	100	0	0
2.	20AC2092	Stress Management by Yoga	2	0	0	0	100	0	0
3.	20AC2093	Personality Development through Life Enlightenment Skills	2	0	0	0	100	0	0
4.	20AC2094	Unnat Bharat Abhiyan	2	0	0	0	100	0	0

LIST OF ELECTIVES
SEMESTER II
ELECTIVE I

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	L	T	P	C	CIA	ESE	TOTAL
1.	20CC2301	Computer Aided Process Planning	PEC	3	0	0	3	40	60	100
2.	20CC2302	Additive Manufacturing	PEC	3	0	0	3	40	60	100
3.	20CC2303	Computer Integrated Production and Inventory Systems	PEC	3	0	0	3	40	60	100
4.	20CC2304	Design and Analysis of Experiments	PEC	3	0	0	3	40	60	100

ELECTIVE II

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	L	T	P	C	CIA	ESE	TOTAL
1.	20CC2305	Metrology and Non Destructive Testing	PEC	3	0	0	3	40	60	100
2.	20CC2306	Competitive Manufacturing Systems	PEC	3	0	0	3	40	60	100
3.	20CC2307	Design of Heat Exchanger	PEC	3	0	0	3	40	60	100
4.	20CC2308	Composite Materials and Mechanisms	PEC	3	0	0	3	40	60	100

SEMESTER III

ELECTIVE III

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	L	T	P	C	CIA	ESE	TOTAL
1.	20CC3301	Mechatronics Applications in Manufacturing	PEC	3	0	0	3	40	60	100
2.	20CC3302	Industrial Safety Management	PEC	3	0	0	3	40	60	100
3.	20CC3303	Supply Chain Management	PEC	3	0	0	3	40	60	100
4.	20CC3304	Industrial Robotics and Expert Systems	PEC	3	0	0	3	40	60	100

ELECTIVE IV

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	L	T	P	C	CIA	ESE	TOTAL
1.	20CC3305	Computational Fluid Dynamics	PEC	3	0	0	3	40	60	100
2.	20CC3306	Vibration Analysis and Control	PEC	3	0	0	3	40	60	100
3.	20CC3307	Optimization Techniques in Design	PEC	3	0	0	3	40	60	100
4.	20CC3308	Tribology in Design	PEC	3	0	0	3	40	60	100

ELECTIVE V

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	L	T	P	C	CIA	ESE	TOTAL
1.	20CC3309	Advanced Tool Design	PEC	3	0	0	3	40	60	100
2.	20CC3310	Manufacturing – Online Course Nptel/EDX/Mooc	PEC	3	0	0	3	40	60	100
3.	20CC3311	Design and Analysis of Thermal Energy Systems	PEC	3	0	0	3	40	60	100
4.	20CC3312	Basics and applications for Internet of Things	PEC	3	0	0	3	40	60	100

OPEN ELECTIVE COURSES [OEC]

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	L	T	P	C	CIA	ESE	TOTAL
1.	20CC3401	Micro Electro Mechanical Systems	OEC	3	0	0	3	40	60	100
2.	20CC3402	Quality –Online Course NPTEL /EDX/ MOOC	OEC	3	0	0	3	40	60	100

Semester	I	II	III	IV	Total
Credits	20	20	18	12	70

Chairman, BoS

Chairman - BoS
MECH - HiCET

Dean Academics

Dean (Academics)
HiCET

Principal

PRINCIPAL
Hindusthan College Of Engineering & Technology
COIMBATORE - 641 032.

SEMESTER – III

Programme	Course Code	Name of the Course	L	T	P	C
B.E	20CC3901	DISSERTATION I	0	0	12	6

OBJECTIVES:

The main objectives of the Project work Phase-I are:

- To identify a problem in the field of Mechanical Engineering and provide solutions, which are technically, economically and environmentally feasible.
- To train the students in preparing a project reports, presentations to face the reviews and final university viva examinations.

Project work assignment:

- Enable the students to form a convenient group with not more than four students.
- The project groups are assigned with a supervisor who is the faculty member of the respective department.
- In the case of industrial projects, one additional supervisor may be assigned as external supervisor.
- The students have to identify a technical problem related to the Mechanical Engineering based on the technical knowledge gained during the period of study.
- Four hours per week have been allotted in the time table.
- During project works, students can get the guidance from the supervisor(s), visiting library for literature review, conducting experiments related to the project work, computer simulation studies, field work, visiting industries (in the case of industry sponsored project works), case studies or basic research and development work assigned by the supervisor.
- The student has to make two presentations based on their project works.
- The solutions provided by the students should be technically, economically and environment friendly feasible.
- The project evaluation committee (constituted by the Head of Department) has evaluated the problem identification.
- The students has to consolidate the work as project report, which includes Introduction, Literature review, Modeling or simulation details, Experimental details, Results and discussions and Conclusions.
- The student should follow the guidelines for preparing the project work.

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	2	3		2	2			3		1	2	1	1
CO2	2	2	2		2	2			3		1	2	1	1
CO3	2		3	1	1	2			3		1	1	1	1
CO4	1	3	3		2	2			3		1	1		1
CO5	2	2	3	1	1	1			3			2	1	
Avg	1.4	2.25	2.8	1	1.6	1.8			3		1	1.6	1	1

Chairman, Board of Studies

Chairman - BoS
MECH - HiCET

ACADEMIC COUNCIL * Chairman * KARPAGAM COLLEGE OF ENGG & TECH

Dean – Academics

Dean (Academics)
HiCET

SEMESTER III - ELECTIVE III

Programme	Course Code	Name of the Course	L	T	P	C
M.E CAD/CAM	20CC3301	MECHATRONICS APPLICATIONS IN MANUFACTURING	3	0	0	3

Course Objective

1. To provide overview of various electrical and electronic control techniques used in modern manufacturing systems.
2. To know the basic working principle of sensors and transducers of use for manufacturing systems
3. To know the basic working principle of drives and actuators of use for manufacturing systems
4. To know the features, modules and interfaces of microcontrollers and microprocessors
5. To gain the knowledge of integration of mechatronic systems in automation of modern manufacturing systems

Unit	Description	Instructional Hours
I	**NTRODUCTION TO MECHATRONICS IN MODERN MANUFACTURING** Introduction to Process Parameters in Conventional Manufacturing – Assembly – Inspection – Transportation - Introduction to Systems - Subsystems of Mechatronics - Identification of Mechatronics' Entities in Modern Manufacturing - Mechanical, Fluid, Thermal, Electrical, Electronics, Communication, Control systems and Software Integration for Manufacturing - Classification of Manufacturing based on Mechatronics – CNC based Subtractive Manufacturing – Rapid Prototyping based Additive Manufacturing- Automated Assembly Stations – Modern Quality Inspection and Transportation Systems.	12
II	**SENSORS AND TRANSDUCERS** Introduction – Performance Terminology – Resistive Transducers – Inductive Transducers - Capacitance Transducers – Optical Sensors – Contact and Non-Contact Temperature Sensors – Eddy Current Sensor – Hall Effect Sensor – Piezo Electric Sensor - Ultrasonic Sensors – Proximity Sensors – Chemical and Gas Sensors - Signal Conditioning - Condition Monitoring	8
III	**DRIVES AND ACTUATORS** Role of Linear and Rotary Actuators - Electrical Actuators- Servo Concepts and Stepper Motors - Fluid Power – Piezo Actuators – Solenoids - Function of Drives - Mechanical Switching Devices – Solid State drives for various actuators	8
IV	**MICROPROCESSORS AND MICROCONTROLLERS** Requirement for Processor – Comparison of 8085 Microprocessor and 8051 Microcontrollers– 8051 Microcontrollers Architecture -Assembly Language Programming- Instruction Set, Addressing Modes, Basic Programming – Interfacing - Sensors, Keyboard, LED, LCD, A/D and D/A Converters, Actuators – Embedded Systems	8
V	**INTEGRATION OF MANUFACTURING SYSTEMS** Design Process - Stages of Design Process – Skeletal Structure and Block Diagram of CNC Based - Vertical Machining Centre, turning centre, Water Jet Machine, Electrical Discharge Machine, Serial Manipulator, hydraulic press, 3 D printers– Coordinate Measuring Machine –Automated conveyors - Extended Transportation System – Total Integration of Manufacturing Systems for Production Automation	9
	Total Instructional Hours	**45**

Course Outcome

CO1 : Imply the knowledge to study the mechatronics in modern manufacturing systems.
CO2 : Identify and select the sensors and transducers based on the application.
CO3 : Identify the principles and functions of drives and actuators.
CO4 : Get knowledge of microprocessor and microcontrollers and its functions.
CO5 : Apply the knowledge about integration of mechatronic systems in manufacturing.

TEXT BOOKS:

T1. Beno Benhabib, Manufacturing, design, production, automation and integration, Marcel Dekker, 2003
T2. Bolton W, — Mechatronics: Electronic control systems in mechanical and electrical engineering, 6thedition, Pearson Education Limited, 2015.

REFERENCE BOOKS:

R1. Devadas shetty, Richard A. Kolk, Mechatronics System Design, Cengage Learning, 2011.
R2. Mazidi M A and Mazidi J G, 8051 Microcontroller and Embedded Systems, 2002.
R3. Vijayaraghavan G.K., Balasundaram M S, Ramachandran K P, Mechatronics: Integrated Mechanical Electronic Systems, Wiley, 2008.

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	-	-	-	-	1	1	-	-	-	-	3	2	1	1
CO2	-	-	-	-	3	-	-	-	-	-	2	2	1	1
CO3	-	-	-	2	3	-	-	-	-	2	2	2	2	1
CO4	2	-	1	-	2	-	-	-	1	-	2	2	2	2
CO5	-	-	2	-	-	3	2	-	-	-	-	-	2	2
Avg	2	0	1.5	2	2.25	2	2	0	1	2	2.25	2	1.6	1.4

Chairman, Board of Studies

Chairman - BoS
MECH - HiCET

ACADEMIC COUNCIL * HINDUSTHAN COLLEGE OF ENGG & TECH * Chairman

Dean – Academics

Dean (Academics)
HiCET

Programme	Course Code	Name of the Course	L	T	P	C
M.E CAD/CAM	20CC3302	INDUSTRIAL SAFETY MANAGEMENT	3	0	0	3

Course Objective

1. To eliminate accidents causing work stoppage and production loss.
2. To reduce workman's compensation, insurance rate and all the cost of accidents.
3. To educate all members regarding the safety principles to avoid accidents in industry.
4. To achieve better morale of the industrial employees.
5. To increase production means to a higher standard of living.

Unit	Description	Instructional Hours
I	**SAFETY MANAGEMENT** Evaluation of modern safety concepts - Safety management functions - safety organization, safety department - safety committee, safety audit - performance measurements and motivation - employee participation in safety - safety and productivity.	9
II	**OPERATIONAL SAFETY** Hot metal Operation - Boiler, pressure vessels - heat treatment shop - gas furnace operation - electroplating-hot bending pipes - Safety in welding and cutting. Cold-metal Operation - Safety in Machine shop - Cold bending and chamfering of pipes - metal cutting - shot blasting, grinding, painting - power press and other machines.	9
III	**SAFETY MEASURES** Layout design and material handling - Use of electricity - Management of toxic gases and chemicals - Industrial fires and prevention - Road safety - highway and urban safety - Safety of sewage disposal and cleaning - Control of environmental pollution - Managing emergencies in Industries - planning, security and risk assessments, on- site and off site. Control of major industrial hazards.	9
IV	**ACCIDENT PREVENTION** Human side of safety - personal protective equipment - Causes and cost of accidents. Accident prevention programmes - Specific hazard control strategies - HAZOP - Training and development of employees - First Aid- Fire fighting devices - Accident reporting, investigation.	9
V	**SAFETY, HEALTH, WELFARE & LAWS** Safety and health standards - Industrial hygiene - occupational diseases prevention - Welfare facilities - History of legislations related to Safety-pressure vessel act-Indian boiler act - The environmental protection act - Electricity act - Explosive act.	9
	Total Instructional Hours	**45**

Course Outcome

At the end of this course, the students will have knowledge about:

CO1: Process safety management (PSM).
CO2: Maintenance principles and procedures.
CO3: Inspection engineering principles, procedures and instruments.
CO4: Safety in laboratories.
CO5: Hazards due to noise principles, measurement, safe limits and protective.

TEXT BOOKS:

T1-John V. Grimaldi and Rollin H.Simonds, "Safety Management", All India Travellers bookseller, Delhi-1989.
T2-Krishnan N.V., "Safety in Industry", Jaico Publisher House, 1996.

REFERENCE BOOKS:

R1- Managing emergencies in industries, Loss Prevention of India Ltd., Proceedings, 1999.
R2- Safety security and risk management by U.K. Singh & J.M. Dewan, A.P.H. Publishing Company, New Delhi, 1996.
R3-Occupational Safety Manual BHEL.

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1	3	3	3	1	-	-	3	3	3	1	3	1
CO2	3	3	3	3	3	2	1	-	3	3	3	1	3	1
CO3	3	3	3	3	3	1	1	-	3	2	2	1	3	2
CO4	3	3	3	3	3	-	2	1	2	1	2	1	3	1
CO5	3	3	3	3	2	3	3	3	2	1	1	1	3	3
Avg	3	2.6	3	3	2.8	1.4	1.4	0.8	2.6	2.0	2.2	1	3	1.6

Chairman, Board of Studies

Chairman - BoS
MECH - HiCET

Dean – Academics

Dean (Academics)
HiCET

Programme	Course Code	Name of the Course	L	T	P	C
M.E CAD/CAM	20CC3303	SUPPLY CHAIN MANAGEMENT	3	0	0	3

Course Objective

To provide the student with the knowledge of,
1. Logistics management, network design, sourcing, pricing, coordination and technology in supply chain management.
2. Customer service performance improvement.
3. Reduction of pre & post production inventory.
4. Flexible planning and control procedures.
5. Product Quantity control.

Unit	Description	Instructional Hours
I	**INTRODUCTION** Definition of Logistics and SCM: Evaluation, Scope Importance & Decision phases – Drivers of SC performance and Obstacles.	6
II	**LOGISTICS MANAGEMENT** Factors – Modes of transportation – Design options for transportation Networks - Routing and Scheduling – Inbound and outbound logistics –Reverse Logistics – 3PL – Integrated Logistics concepts- Integrated Logistics Model – Activities – Measuring logistics cost and performance – Warehouse Management – Case Analysis.	10
III	**SUPPLY CHAIN NETWORK DESIGN** Distribution in supply chain – Factors in Distribution network design – design Options – Network Design in supply chain – Framework for network Decisions – Managing cycle inventory and safety.	10
IV	**SOURCING AND PRICING IN SUPPLY CHAIN** Supplier Selection and contracts – design collaboration – Procurement process. Revenue management in supply chain.	9
V	**COORDINATION AND TECHNOLOGY IN SUPPLY CHAIN** Supply Chain Coordination – Bullwhip effect of lack of Coordination and obstacles – IT and SCM – supply Chain IT frame work. E Business & SCM. Metrics for SC performance – Case Analysis.	10
	Total Instructional Hours	**45**

Course Outcome

CO1: At the end of this course the student should be able to manage logistics and supply chain of a factory or an organization.
CO2: Solving supplier's problems and beyond level.
CO3: Minimizing variance by means of activities like standardization, variety reduction, etc.
CO4: Attain Minimum total cost of operation & procurement.
CO5: Achieving maximum efficiency in using labour, capital & plant through the company.

TEXT BOOKS:

T1- Chopra, S. and Meindl, P., "Supply chain management, Strategy, Planning, and Operation ", PHI, Second edition, 2004.
T2- Christopher, M., "Logistics and Supply Chain Management – Strategies for Reducing Cost and Improving Service", Pearson Education Asia, Second Edition.

REFERENCE BOOKS:

R1- Bloomberg, D.J., Lemay, S. and Hanna, J.B.,'Logistics", PHI 2002.
R2- Shapiro, J.F. and Duxbury, T., "Modeling the supply Chain", 2002.
R3- Ayers, J.B., "Handbook of Supply Chain Management", Taylor and Francis Group, 2006.

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1	1	1	1	-	-	-	-	1	-	1	-	1
CO2	3	1	1	2	1	-	-	-	-	1	-	1	-	1
CO3	3	2	2	2	1	-	-	-	-	1	-	1	-	1
CO4	3	1	1	1	2	-	-	-	-	2	-	1	3	1
CO5	3	1	2	1	2	-	-	-	-	2	-	1	3	1
Avg	3	1.2	1.4	1.4	1.4	0	0	0	0	1.4	0	1	3	1

Chairman, Board of Studies

Chairman - BoS
MECH - HiCET

Chairman

Dean – Academics

Dean (Academics)
HiCET

Programme	Course Code	Name of the Course	L	T	P	C
M.E CAD/CAM	20CC3304	INDUSTRIAL ROBOTICS AND EXPERT SYSTEMS	3	0	0	3

Course Objective

1. To understand the applications and concept of future trends in robotics.
2. To learn robot kinematics and its anatomy.
3. To acquire the knowledge of robot drives and control.
4. To educate about robot sensors and artificial intelligence.
5. To impart knowledge of robot programming.

Unit	Description	Instructional Hours
I	**INTRODUCTION AND ROBOT KINEMATICS** Definition need and scope of Industrial robots – Robot anatomy – Work volume – Precision movement – End effectors – Sensors. Robot Kinematics – Direct and inverse kinematics – Robot trajectories – Control of robot manipulators – Robot dynamics – Methods for orientation and location of objects.	10
II	**ROBOT DRIVES AND CONTROL** Controlling the Robot motion – Position and velocity sensing devices – Design of drive systems – Hydraulic and Pneumatic drives – Linear and rotary actuators and control valves – Electro-hydraulic servo valves, electric drives – Motors – Designing of end effectors – Vacuum, magnetic and air operated grippers.	9
III	**ROBOT SENSORS** Transducers and Sensors – Tactile sensor – Proximity and range sensors – Sensing joint forces – Robotic vision system – Image Representation - Image Grabbing –Image processing and analysis – Edge Enhancement – Contrast Stretching – Band Rationing - Image segmentation – Pattern recognition – Training of vision system.	9
IV	**ROBOT CELL DESIGN AND APPLICATION** Robot work cell design and control – Safety in Robotics – Robot cell layouts – Multiple Robots and machine interference – Robot cycle time analysis. Industrial application of robots.	9
V	**ROBOT PROGRAMMING AND ARTIFICIAL INTELLIGENCE** Methods of Robot Programming – Characteristics of task level languages lead through programming methods – Motion interpolation. Artificial intelligence – Basics – Goals of artificial intelligence – AI techniques – problem representation in AI – Problem reduction and solution techniques - Application of AI and KBES in Robots.	8
	Total Instructional Hours	**45**

Course Outcome

Students shall be able to

CO1: Understand about robot kinematics and dynamics.
CO2: Write basic program to control robot.
CO3: Understand about various sensors used in robotics field.
CO4: Prepare robot cell layout.
CO5: Execute the mechanism of robots.

TEXT BOOKS:

T1- Mikell, P. Groover, Mitchell Weis, Roger, N. Nagel, Nicholas G. Odrey," Industrial Robotics Technology, Programming and Applications", Mc Graw-Hill, Int. 1986.
T2- Deb, S.R." Robotics Technology and Flexible Automation", Tata Mc Graw-Hill, 1994.

REFERENCE BOOKS:

R1- Fu .K.S., R.C. Gonzalez and C.S.G. Lee, "Robotics Control, Sensing, Vision and Intelligence", Mc Graw Hill, 1987.
R2- Yoram Koren," Robotics for Engineers' Mc Graw-Hill, 1987.
R3- Richard. D, Klafter, Thomas, A, Chmielewski, Michael Negin, "Robotics Engineering – An Integrated Approach", Prentice-Hall of India Pvt. Ltd., 1984.

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	3	-	-	-	-	-	-	-	-	-	-	1
CO2	3	2	3	-	-	-	-	-	-	-	-	-	-	1
CO3	3	3	3	-	-	-	-	-	-	-	-	-	-	1
CO4	3	3	3	-	-	-	-	-	-	-	-	-	-	1
CO5	3	3	3	-	-	-	-	-	-	-	-	-	-	2
Avg	3	2.6	3	0	0	0	0	0	0	0	0	0	0	1.2

Chairman, Board of Studies

Chairman - BoS
MECH - HiCET

ACADEMIC COUNCIL * HINDUSTHAN COLLEGE OF ENGG. & TECH * Chairman

Dean – Academics

Dean (Academics)
HiCET

SEMESTER III - ELECTIVE IV

Programme	Course Code	Name of the Course	L	T	P	C
M.E CAD/CAM	20CC3305	COMPUTATIONAL FLUID DYNAMICS	3	1	0	3

Course Objective

1. To develop finite difference and finite volume discretization forms of the CFD equations.
2. To formulate explicit & implicit algorithms for solving the Euler and Navier Stokes Eqns.
3. To understand the concepts of modes of heat transfer.
4. To impart knowledge about turbulence models.
5. To educate the compressible and incompressible flow techniques.

Unit	Description	Instructional Hours
I	**GOVERNING DIFFERENTIAL EQUATION AND FDM** Classification, Initial and Boundary conditions – Initial and Boundary Value problems – Finite difference method, Central, Forward, Backward difference, Uniform and non-uniform Grids, Numerical Errors, Grid Independence Test.	10
II	**CONDUCTION HEAT TRANSFER** Steady one-dimensional conduction, Two and three dimensional steady state problems, Transient one-dimensional problem, Two-dimensional Transient Problems.	10
III	**INCOMPRESSIBLE FLUID FLOW** Governing Equations, Stream Function – Verticity method, Determination of pressure for viscous flow, SIMPLE Procedure of Patankar and Spalding, Computation of Boundary layer flow, finite difference approach.	10
IV	**CONVECTION HEAT TRANSFER AND FEM** Steady One-Dimensional and Two-Dimensional Convection – diffusion, unsteady one dimensional convection – diffusion, Unsteady two-dimensional convection – Diffusion – Introduction to finite element method – solution of steady heat conduction by FEM – Incompressible flow – simulation by FEM.	10
V	**TURBULENCE MODELS** Algebraic Models – One equation model, K – ε Models, Standard and High and Low Reynolds number models, Prediction of fluid flow and heat transfer using standard codes.	5
	Total Instructional Hours	**45**

Course Outcome

Students shall be able to

CO1: Understand about compressible and incompressible flow fluids.
CO2: Select the governing equations for conduction and convection fluid flow applications.
CO3: Acquire knowledge about grid generation, processing and applications of CFD.
CO4: Develop skills in finite element modeling techniques.
CO5: Execute the principles in real time thermal and fluid problems.

TEXT BOOKS:

T1- Muralidhar, K., and Sundararajan, T., "Computational Fluid Flow and Heat Transfer", Narosa Publishing House, New Delhi, 1995.
T2- Ghoshdasdidar, P.S., "Computer Simulation of flow and heat transfer" Tata McGraw-Hill Publishing Company Ltd., 1998.

REFERENCE BOOKS:

R1- Subas, V.Patankar "Numerical heat transfer fluid flow", Hemisphere Publishing Corporation, 1980.
R2- Anderson, D.A., Tannehill, J.I., and Pletcher, R.H., "Computational fluid Mechanics and Heat Transfer " Hemisphere Publishing Corporation, New York, USA,1984.
R3- Bose, T.X., "Numerical Fluid Dynamics" Narosa Publishing House, 1997.

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1	3	3	3	1	-	-	3	3	3	1	3	1
CO2	3	3	3	3	3	2	1	-	3	3	3	1	3	1
CO3	3	3	3	3	3	1	1	-	3	2	2	1	3	2
CO4	3	3	3	3	3	-	2	1	2	1	2	1	3	1
CO5	3	3	3	3	2	3	3	3	2	1	1	1	3	3
Avg	3	2.6	3	3	2.8	1.2	1.4	0.8	2.6	2	2.2	1	3	1.6

Chairman, Board of Studies

Chairman - BoS
MECH - HiCET

ACADEMIC COUNCIL * HiCET * Chairman

Dean – Academics

Dean (Academics)
HiCET

37

Programme	Course Code	Name of the Course	L	T	P	C
M.E CAD/CAM	20CC3306	VIBRATION ANALYSIS AND CONTROL	3	1	0	3

Course Objective

1. To understand the fundamentals of vibration and its practical applications.
2. To understand the working principle and operations of various vibration measuring instruments.
3. To expertise in vibration measurements and control.
4. To acquire knowledge of degrees of freedom.
5. To educate about experimental methods.

Unit	Description	Instructional Hours
I	**FUNDAMENTALS OF VIBRATION** Undammed Free Vibrations: Single Degrees of Freedom Systems - D Alembert's Principle, Energy method, Rayleigh method, simple applications, equivalent spring stiffness. Damped Free Vibrations: Single Degrees of Freedom System -different types of damping, Viscous damping, sub-critical, critical and over damping, logarithmic decrement, and frequency of damped oscillations. Forced Vibrations: Single Degrees of Freedom System - Solution for simple harmonic excitation, steady state vibrations, Rotating and reciprocating unbalance, base excitation, vibration isolation and transmissibility, whirling of shaft without friction.	9
II	**TWO DEGREE OF FREEDOM SYSTEM** Introduction-Free vibration of undamped and damped systems - Forced vibration with Harmonic excitation System –Coordinate couplings and Principal Coordinates.	9
III	**MULTI-DEGREE OF FREEDOM SYSTEMS** Lagrange's equation, Dunkerley's approximation method, Rayleigh method, matrix method, matrix iteration, orthogonality principle, modal analysis, Stodola method, Holzer method, Galerkin method, Rayleigh - Ritz method.	9
IV	**CONTINUOUS SYSTEMS AND VIBRATION CONTROL** Continuous Systems -Longitudinal vibrations of bar, transverse vibration of beam, torsion of vibrations of circular shaft with various end conditions. Vibration as condition Monitoring tool-Vibration Isolation methods- -Dynamic vibration absorber, Torsional and Pendulum Type absorber-Damped Vibration absorbers-Static and Dynamic balancing-Balancing machines-Field balancing - Active Vibration Control.	9
V	**EXPERIMENTAL METHODS IN VIBRATION ANALYSIS** Experimental Methods in Vibration Analysis.-Vibration Measuring Instruments - Selection of Sensors - Accelerometer Mountings-Vibration Exciters - Mechanical, Hydraulic, Electromagnetic and Electrodynamics – Frequency Measuring Instruments- System Identification from Frequency Response -Testing for resonance and mode shapes.	9
	Total Instructional Hours	**45**

Course Outcome

Student shall be able to

CO1: Detect the problem of machine tool vibration.
CO2: Analyze the problem to get rid of any machine vibration trouble.
CO3: Attain the vibration control methods.
CO4: Develop skills on experimental methods.
CO5: Execute the principles in real time vibration problems.

TEXT BOOKS:

T1- Singh V.P, "Mechanical Vibrations", Dhanpat Rai and Company Pvt. Ltd., 3rd ed., 2006.
T2- Rao S.S , "Mechanical Vibrations", Pearson Education, 2004

REFERENCE BOOKS:

R1- Thomson W.T, "Theory of Vibration with Applications", Prentice Hall of India, 1997.
R2- Ashok Kumar Mallik, "Principles of Vibration Control", Affiliated East-West Press Pvt. Ltd, 1990.
R3- Lewis H Bell, "Industrial Noise Control Fundamentals and Applications", Marcel Dekkev Inc. 1982.

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1	1	-	2	1	2	-	-	1	2	3	2	2
CO2	3	1	1	-	2	1	2	-	-	1	2	3	2	2
CO3	3	1	2	-	2	1	2	1	1	1	2	3	2	2
CO4	3	1	2	1	2	1	2	1	1	1	2	3	2	2
CO5	3	1	2	1	2	1	2	1	1	1	2	3	2	2
Avg	3	1	1.6	1	2	1	2	1	1	1	2	3	2	2

Chairman, Board of Studies

Chairman - BoS
MECH - HiCET

Chairm.

Dean – Academics

Dean (Academics)
HiCET

Programme	Course Code	Name of the Course	L	T	P	C
M.E CAD/CAM	20CC3307	OPTIMIZATION TECHNIQUES IN DESIGN	3	1	0	3

Course Objective

1. To understand the basic concepts of unconstrained optimization techniques.
2. To understand the basic concepts of constrained optimization techniques.
3. To implement optimization approaches and to select appropriate solution for design application.
4. To demonstrate selected optimization algorithms commonly used in static and dynamic applications

Unit	Description	Instructional Hours
I	**UNCONSTRAINED OPTIMIZATION TECHNIQUES** Introduction to optimum design - General principles of optimization – Problem formulation & their classifications - Single variable and multivariable optimization, Techniques of unconstrained minimization – Golden section, Random, pattern and gradient search methods – Interpolation methods.	10
II	**CONSTRAINED OPTIMIZATION TECHNIQUES** Optimization with equality and inequality constraints - Direct methods – Indirect methods using penalty functions, Lagrange multipliers - Geometric programming	10
III	**ADVANCED OPTIMIZATION TECHNIQUES** Multi stage optimization – dynamic programming; stochastic programming; Multi objective optimization, Genetic algorithms and Simulated Annealing techniques; Neural network & Fuzzy logic principles in optimization.	10
IV	**STATIC APPLICATIONS** Structural applications – Design of simple truss members - Design applications – Design of simple axial, transverse loaded members for minimum cost, weight – Design of shafts and torsionally loaded members – Design of springs.	8
V	**DYNAMIC APPLICATIONS** Dynamic Applications – Optimum design of single, two degree of freedom systems, vibration absorbers. Application in Mechanisms – Optimum design of simple linkage mechanisms.	7
	Total Instructional Hours	**45**

Course Outcome

CO1 Formulate unconstrained optimization techniques in engineering design application.
CO2. Formulate constrained optimization techniques for various application.
CO3. Apply genetic algorithms to combinatorial optimization problems.
CO4. Evaluate solutions by various static application design problem.

TEXT BOOKS:

T1 - Goldberg, D.E., "Genetic algorithms in search, optimization and machine", Barnen, Addison-Wesley, New York, 1989.
T2 - Johnson Ray, C., "Optimum design of mechanical elements", Wiley, John & Sons, 1990.

REFERENCE BOOKS:

R1 - Kalyanamoy Deb, "Optimization for Engineering design algorithms and Examples", Prentice Hall of India Pvt. 1995.
R2 - Rao, Singaresu, S., "Engineering Optimization – Theory & Practice", New Age International (P) Limited, New Delhi, 2000.

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	2		2							1	1
CO2	2	3	2	2		2		1		1			1	2
CO3	3	2	3	2		1		1					1	1
CO4	1	2	2	1		1							2	2
CO5	2	2	3	1		1							1	2
Avg	3	3	3	2		2							1	1

Chairman, Board of Studies

Chairman - BoS
MECH - HiCET

ACADEMIC COUNCIL
Chairman
RAJASTHAN COLLEGE OF ENGG & TECH

Dean – Academics

Dean (Academics)
HiCET

Programme	Course Code	Name of the Course	L	T	P	C
M.E CAD/CAM	20CC3308	TRIBOLOGY IN DESIGN	3	1	0	3

Course Objective

1. To impart knowledge in friction, wear and lubrication aspects of machine components.
2. To understand the material properties this influences the tribological characteristics of surfaces.
3. To understand the analytical behavior and design of bearings based on analytical /theoretical approach.
4. To learn the surface treatment methods.
5. To enable the students in learning with pressure contacts and elasto hydrodynamic lubrication.

Unit	Description	Instructional Hours
I	**SURFACE INTERACTION AND FRICTION** Topography of Surfaces – Surface features-Properties and measurement – Surface interaction – Adhesive Theory of Sliding Friction –Rolling Friction-Friction properties of metallic and non-metallic materials – friction in extreme conditions –Thermal considerations in sliding contact.	7
II	**WEAR AND SURFACE TREATMENT** Types of wear – Mechanism of various types of wear – Laws of wear –Theoretical wear models-Wear of Metals and Non metals – Surface treatments – Surface modifications –surface coatings methods- Surface Topography measurements –Laser methods – instrumentation – International standards in friction and wear measurements.	8
III	**LUBRICANTS AND LUBRICATION REGIMES** Lubricants and their physical properties- Viscosity and other properties of oils –Additives-and selection of Lubricants- Lubricants standards ISO,SAE,AGMA, BIS standards – Lubrication Regimes –Solid Lubrication-Dry and marginally lubricated contacts- Boundary Lubrication Hydrodynamic lubrication — Elasto and plasto hydrodynamic - Magneto hydrodynamic lubrication – Hydro static lubrication – Gas lubrication.	8
IV	**HYDRODYNAMIC AND HYDROSTATIC LUBRICATION** Reynolds Equation,-Assumptions and limitations-One and two dimensional Reynolds Equation-Reynolds and Sommerfeld boundary conditions- Pressure wave, flow, load capacity and friction calculations in Hydrodynamic bearings-Long and short bearings-Pad bearings and Journal bearings-Squeeze film effects-Thermal considerations-Hydrostatic lubrication of Pad bearing- Pressure , flow , load and friction calculations-Stiffness considerations- Various types of flow restrictors in hydrostatic bearings.	12
V	**PRESSURE CONTACTS AND ELASTO HYDRODYNAMIC LUBRICATION** Rolling contacts of Elastic solids- contact stresses – Hertzian stress equation- Spherical and cylindrical contacts-Contact Fatigue life- Oil film effects- Elasto Hydrodynamic lubrication theory-Soft and hard EHL-Reynolds equation for elasto hydrodynamic lubrication- - Film shape within and outside contact zones-Film thickness and friction calculation- Rolling bearings- Stresses and deflections-Traction drives.	10
	Total Instructional Hours	**45**

Course Outcome

Students shall be able to

CO1: Apply in long life product development areas.

CO2: Strengthen the skills in failure analysis and condition monitoring.

CO3: Acquire the knowledge of various lubrication techniques.

CO4: Calculate the friction, load and flow occurrence level over components.

CO5: Execute the Laser methods in the engineering field.

TEXT BOOKS:

T1- Rabinowicz.E, "Friction and Wear of materials", John Willey & Sons, UK, 1995

T2- Halling, J. (Editor) – "Principles of Tribology ", Macmillian – 1984.

REFERENCE BOOKS:

R1- Williams J.A. "Engineering Tribology", Oxford Univ. Press, 1994.

R2- S.K.Basu, S.N.Sengupta & B.B.Ahuja ,"Fundamentals of Tribology", PHI Pvt Ltd , New Delhi, 2005

R3- Stachowiak G.W. & A.W .Batchelor, Engineering Tribology, Butterworth-Heinemann, UK, 2005.

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3		1		2	1	1	1	2			3	2	2
CO2	3	1	2		2	1	1	1	1			1	2	2
CO3	2	1	2	1	3	2	2	1	1			1	2	2
CO4	3	1	1	1	2	1	1	1	1			1	3	3
CO5	2	1	1	1	3	2	2	1	2			3	2	2
Avg	2.6	1	1.4	1	2.4	1.4	1.4	1	1.4	0	0	1.8	2.2	2.2

Chairman, Board of Studies

Chairman - BoS
MECH - HiCET

ACADEMIC COUNCIL
Chairman
HICET - TAMILNADU COLLEGE OF ENGG & TECH

Dean – Academics

Dean (Academics)
HiCET

SEMSTER III - ELECTIVE V

Programme	Course Code	Name of the Course	L	T	P	C
M.E CAD/CAM	20CC3309	ADVANCED TOOL DESIGN	3	0	0	3

Course Objective

1. To understand the concepts of design procedures for machining.
2. To learn the concepts of cutting tools.
3. To know the information of jigs and fixtures.
4. To impart the knowledge of design of press tool dies.
5. To familiarize the concepts of tool design.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO TOOL DESIGN** Introduction –Tool Engineering – Tool Classifications– Tool Design Objectives – Tool Design in manufacturing- Challenges and requirements- Standards in tool design-Tool drawings –Surface finish – Fits and Tolerances - Tooling Materials- Ferrous and Non ferrous Tooling Materials-Carbides, Ceramics and Diamond -Non metallic tool materials-Designing with relation to heat treatment.	8
II	**DESIGN OF CUTTING TOOLS** Mechanics of Metal cutting –Oblique and orthogonal cutting- Chip formation and shear angle - Single-point cutting tools – Milling cutters – Hole making cutting tools- Broaching Tools - Design of Form relieved and profile relieved cutters-Design of gear and thread milling cutters.	9
III	**DESIGN OF JIGS AND FIXTURES** Introduction – Fixed Gages – Gage Tolerances –selection of material for Gages – Indicating Gages – Automatic gages – Principles of location – Locating methods and devices – Principles of clamping – Drill jigs – Chip formation in drilling – General considerations in the design of drill jigs – Drill bushings – Methods of construction –Thrust and Turning Moments in drilling - Drill jigs and modern manufacturing- Types of Fixtures – Vise Fixtures – Milling Fixtures – Boring Fixtures –Broaching Fixtures – Lathe Fixtures – Grinding Fixtures – Modular Fixtures – Cutting Force Calculations.	10
IV	**DESIGN OF PRESS TOOL DIES** Types of Dies –Method of Die operation–Clearance and cutting force calculations- Blanking and Piercing die design – Pilots – Strippers and pressure pads- Presswork materials – Strip layout –Short-run tooling for Piercing – Bending dies – Forming dies – Drawing dies-Design and drafting.	10
V	**TOOL DESIGN FOR CNC MACHINE TOOLS** Introduction –Tooling requirements for Numerical control systems – Fixture design for CNC machine tools- Sub plate and tombstone fixtures-Universal fixtures– Cutting tools– Tool holding methods– Automatic tool changers and tool petitioners – Tool presetting– General explanation of the Brown and Sharp machine.	8
	Total Instructional Hours	**45**

Course Outcome

Student shall be able to

CO1: Develop knowledge about cutting tools.
CO2: Design Jigs & fixtures.
CO3: Dies & Press tools for conventional & CNC machines.
CO4: know about the tool holding methods, Automatic tool changers and tool petitioners.
CO5: Execute the principles in real time problems.

TEXT BOOKS:

T1- Cyrll Donaldson, George H.LeCain, V.C. Goold, "Tool Design", Tata McGraw Hill Publishing Company Ltd., 2000.
T2- Hoffman E.G.," Jig and Fixture Design", Thomson Asia Pvt Ltd, Singapore, 2004

REFERENCE BOOKS:

R1- Prakash Hiralal Joshi, "Tooling data", Wheeler Publishing, 2000
R2- Venkataraman K., "Design of Jigs, Fixtures and Presstools", TMH, 2005
R3- Haslehurst M., "Manufacturing Technology", The ELBS, 1978

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	2	3		2	2			3		1	2	1	1
CO2	2	2	2		2	2			3		1	2	1	1
CO3	2		3	1	1	2			3		1	1	1	1
CO4	1	3	3		2	2			3		1	1		1
CO5	2	2	3	1	1	1			3			2	1	
Avg	1.4	2.25	2.8	1	1.6	1.8			3		1	1.6	1	1

Chairman, Board of Studies

Chairman - BoS
MECH - HiCET

ACADEMIC COUNCIL * KNSK * KINGSTON COLLEGE OF ENGG & TECH * Chairman

Dean – Academics

Dean (Academics)
HiCET

Programme	Course Code	Name of the Course	L	T	P	C
M.E CAD/CAM	20CC3312	BASICS AND APPLICATIONS FOR INTERNET OF THINGS	3	0	0	3

Course Objective

1. To expose the students to the evolution of IOT to the various applications.
2. To impart knowledge about IOT and its techniques.
3. Elucidate emerging needs in IOT technology and incorporate into basic education that can be immediately employed in industry.
4. Promote interdisciplinary interactions among engineering, engineering technology, science, and industrial management/technology majors.
5. Assess the effectiveness of the newly developed concepts of IOT technology.

Unit	Description	Instructional Hours
I	**INTRODUCTION** Machine to Machine (M2M) to IoT-The Vision-Introduction, From M2M to IoT, M2M towards IoT-the global context, A use case example, Differing Characteristics.	9
II	**IoT STRUCTURE** **M2M to IoT – A Market Perspective**– Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. **M2M to IoT-An Architectural Overview**– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.	9
III	**IoT NETWORKING** **M2M and IoT Technology Fundamentals-** Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service (XaaS), M2M and IoT Analytics, Knowledge Management.	9
IV	**IoT ARCHITECTURE** **IoT Architecture-State of the Art** – Introduction, State of the art, **Architecture Reference Model-** Introduction, Reference Model and architecture, IoT reference Model.	9
V	**ARCHITECTURE MODELING** **IoT Reference Architecture-** Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. **Real-World Design Constraints-** Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control. **Industrial Automation-** Service-oriented architecture-based device integration, SOCRADES: realizing the enterprise integrated Web of Things, IMC-AESOP: from the Web of Things to the Cloud of Things, **Commercial Building Automation-** Introduction, Case study: phase one-commercial building automation today, Case study: phase two-commercial building automation in the future.	9
	Total Instructional Hours	**45**

Course Outcome

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

CO1 Understand the vision of IoT from a global context.

CO2 Determine the Market perspective of IoT.

CO3 Use of Devices, Gateways and Data Management in IoT.

CO4 Build state of the art architecture in IoT.

CO5 Apply of IoT in Industrial and Commercial Building Automation and Real World Design Constraints.

TEXT BOOKS:

T1- Francis da Costa, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, A press Publications, 2013.

T2- Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.

REFERENCE BOOKS:

R1- Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1stEdition, VPT, 2014.

R2- Michael Miller, "The Internet of Things", Pearson Education, 2015.

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1	3	3	3	1	-	-	3	3	3	1	3	1
CO2	3	3	3	3	3	2	1	-	3	3	3	1	3	1
CO3	3	3	3	3	3	1	1	-	3	2	2	1	3	2
CO4	3	3	3	3	3	-	2	1	2	1	2	1	3	1
CO5	3	3	3	3	2	3	3	3	2	1	1	1	3	3
Avg	3	2.6	3	3	2.8	1.4	1.4	0.8	2.6	2.0	2.2	1	3	1.6

Chairman, Board of Studies

Chairman - BoS
MECH - HiCET

ACADEMIC COUNCIL
Chairman

Dean – Academics

Dean (Academics)
HiCET

OPEN ELECTIVE

Programme	Course Code	Name of the Course	L	T	P	C
ME CAD/CAM	20CC3401	MICRO ELECTRO MECHANICAL SYSTEMS	3	0	0	3

Course Objective

1. Understand various concepts of Micro Electro Mechanical Systems.
2. Study important methods of fabrication process and its materials.
3. Gain knowledge about the concepts of micromechanics.
4. To learn about micro system manufacturing.
5. Study the design considerations of micro system.

Unit	Description	Instructional Hours
I	**INTRODUCTION** Overview-Microsystems and microelectronics - Working principle of Microsystems -micro actuation techniques-micro sensors-types-micro actuators-types-micro pump-micro motors and micro valves-micro grippers-scaling laws-scaling in geometry-scaling in rigid body dynamics-scaling in electrostatic forces- scaling in electricity- scaling in fluid mechanics and scaling in heat transfer.	9
II	**MATERIALS AND FABRICATION PROCESS** Substrates and wafer-single crystal silicon wafer formation-ideal substrates-mechanical properties-silicon compounds - Sio2, SiC, Si3N4 and polycrystalline silicon – Silicon piezo resistors - Gallium arsenide, Quartz-piezoelectric crystals-polymers for MEMS - conductive polymers – Photolithography - Ion implantation - Diffusion – Oxidation –CVD - Physical vapor deposition - Deposition by epitaxy - etching process.	9
III	**MICROMECHANICS** Introduction-static bending of thin plates-circular plates with edge fixed - rectangular plate with all edges fixed and square plate with all edges fixed – Mechanical vibration-resonant vibration- micro accelerometers-design theory and damping coefficients- thermo mechanics thermal Stresses-fracture mechanics-stress intensity factors, fracture toughness and interfacial fracture mechanics.	9
IV	**MICRO SYSTEM MANUFACTURING** Clean room technology-Bulk Micro manufacturing- surface micro machining –LIGA-SLIGA Micro System packaging-materials-die level-device level-system level-packaging techniques-die preparation-surface bonding-wire bonding-sealing.	9
V	**MICRO SYSTEM DESIGN** Design considerations-process design-mask layout design- mechanical design-applications of micro system in -automotive industry-bio medical –aero space-telecommunications.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Understand the principles of Microsystems.
CO2: Identify the fabrication process and its materials.
CO3: Gain knowledge about structural and thermal micromechanics.
CO4: To analyze the micro system manufacturing.
CO5: Able to explain the design principles of Micro system techniques

TEXT BOOKS:

T1 - Mohamed Gad-el-Hak, The MEMS Hand book, CRC press 2002.
T2 - Julian W.Gardner,Vijay K.Varadan,Osama O.Awadel Karim,Microsensors MEMS and Smart Devices, John Wiby & sons Ltd.,2001.

REFERENCE BOOKS:

R1 – Fatikow .S, Rembold .U, Microsystem Technology and Microrobotics, Springer-Verlag Berlin Heidelberg, 1997.
R2 - Tai-Ran Hsu,MEMS & Microsystems Design and Manufacture,Tata McGraw-Hill,2006.
R3 – Francis E.H Tay and W.O Choong, Microfludics and BioMEMS Applications, Springer, 2002.

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	2	3		2	2			3		1	2	1	1
CO2	2	2	2		2	2			3		1	2	1	1
CO3	2		3	1	1	2			3		1	1	1	1
CO4	1	3	3		2	2			3		1	1		1
CO5	2	2	3	1	1	1			3			2	1	
Avg	1.4	2.25	2.8	1	1.6	1.8			3		1	1.6	1	1

Chairman, Board of Studies

Chairman - BoS
MECH - HiCET

Dean – Academics

Dean (Academics)
HiCET

PG - DETAILS OF COURSE REVISIONS & NEW COURSES INTRODUCED

SYLLABUS REVISION DETAILS FOR THE REGULATION 2024 & 2020 – SEMESTER I, III						
S.NO	**COURSE CODE/COURSE NAME**	**SUGGESTION BY EXPERTS**	**EXISTING CONTENT (IN THE AY 2023-24 ODD)**	**REVISED CONTENT (FOR AY 2024-25 ODD)**	**TYPE OF REVISION DELETION/ INSERTION/ MODIFICATION**	**PERCENT AGE OF REVISION**
1.	24MA1104 Applied mathematics for engineers	New course being introduced in First Semester Syllabus (for the batch admitted during 2024 – 2025)				
2.	24CC1202 Integrated Mechanical Design	New course being introduced in First Semester Syllabus (for the batch admitted during 2024 – 2025)				
3	22CC1203 Computer Aided Manufacturing	New course being introduced in First Semester Syllabus (for the batch admitted during 2024 – 2025)				
4	20CC3301 MECHATRONICS APPLICATIONS IN MANUFACTURING	III DRIVES AND ACTUATORS	Role of Linear and Rotary Actuators - Electrical Actuators- Servo Concepts and Stepper Motors -Fluid Power – Piezo Actuators – Solenoids - Mechanical Switching Devices –Solid State drives for various actuators	Role of Linear and Rotary Actuators - Electrical Actuators- Servo Concepts and Stepper Motors -Fluid Power – Piezo Actuators – Solenoids - Function of Drives - Mechanical Switching Devices –Solid State drives for various actuators	Deletion and inclusion of topics	5%
5	20CC3302 INDUSTRIAL SAFETY MANAGEMENT	I SAFETY MANAGEMENT	Evaluation of modern safety concepts - Safety management functions - safety organization, safety department - safety committee, safety audit - performance measurements and motivation – employee participation in safety - safety and productivity	Evaluation of modern safety concepts - Safety management functions - safety organization, safety department - safety committee, safety audit - performance measurements and motivation – employee participation in safety - safety and productivity	Deletion and inclusion of topics	5%

Chairman Bos

Chairman - BoS
MECH - HiCET

Dean Academics

Dean (Academics)
HiCET