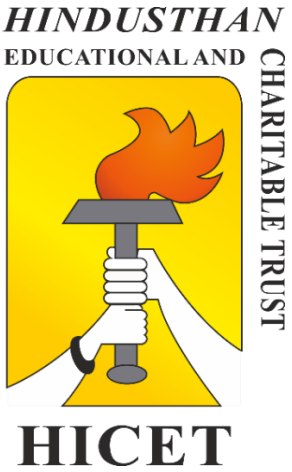
HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution Affiliated to Anna University, Chennai)

(Approved by AICTE, New Delhi, Accredited by NAAC with 'A' Grade)

Valley Campus, Pollachi Highway, Coimbatore - 641 032.

B. E. MECHATRONICS ENGINEERING



CHOICE BASED CREDIT SYSTEM

Curriculum & Syllabus

2022-2023

HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution Affiliated to Anna University, Chennai)

(Approved by AICTE, New Delhi, Accredited by NAAC with 'A' Grade)

Coimbatore - 641 032.

B.E. MECHATRONICS ENGINEERING

HINDUSTHAN
EDUCATIONAL AND CHARITABLE TRUST

HICET

CHOICE BASED CREDIT SYSTEM
CURRICULUM AND SYLLABUS

2022 REGULATIONS

VISION OF THE INSTITUTE

To become a premier institution by producing professional with strong technical knowledge, innovative research skills and high ethical values

MISSION OF THE INSTITUTE

- To provide academic excellence in technical education through novel teaching methods.
- To empower students with creative skills and leadership qualities.
- To produce dedicated professionals with social responsibility

VISION OF THE DEPARTMENT

To excel in Mechatronics engineering by imparting technical knowledge, innovation skills and ethics to fulfill the global needs with human values

MISSION OF THE DEPARTMENT

- To impart sound technical knowledge and produce highly proficient professionals in the mechatronics engineering domain.
- To empower students with strong competency skills to solve multi-disciplinary engineering problems using mechatronics approach.
- To inculcate human values and ethical responsibility to the students for social welfare

	PROGRAM EDUCATIONAL OBJECTIVE (PEOs)
PEO 1	To produce professional graduates with the ability to synergistically integrate multi-disciplinary domains to solve complex engineering problems with Mechatronics approach.
PEO 2	To produce professional graduates with the acumen for interdisciplinary research, entrepreneurship and higher studies to meet the local and global needs.
PEO 3	To produce professional graduates with ethical and moral values in rendering services to the society.

	PROGRAM OUTCOMES (POs)
PO 1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems:** Use research - based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO 6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

	PROGRAM SPECIFIC OUTCOMES (PSOs)
PSO1	To provide ability to analyze, design and develop mechatronic systems by integrating knowledge in sensors, actuators and controllers to solve complex engineering problems.
PSO2	To provide smart automation solutions for real time industrial problems using multidisciplinary approach

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL * HINDUSTHAN COLLEGE OF ENGG & TECH * Chairman

Dean Academics

Dean (Academics)
HiCET

PEO's – PO's& PSO's MAPPING

PEOs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	3	3	2	3	1	1	1	3	1	1	1	3	2
2	2	3	3	3	3	2	2	1	2	1	2	2	3	3
3	2	3	2	2	1	2	3	3	3	2	3	1	2	3

PROGRAM ARTICULATION MATRIX

Year	Sem	Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PS01	PS02
I	I	Matrices and Calculus	3	3	3	2.6	2.8	-	-	-	-	-	-	2	1.8	2
		Engineering Drawing	2.8	3	2.6	1	1	2	1	-	-	1	1	1	1	1.4
		English for Engineers	1	1.4	1	1.2	1	1.4	1.2	1.2	1.8	3	1	2.2	2.4	2.4
		Physics for Non-Circuit Engineering	3	2.2	2	1.6	2	1.3	-	-	-	-	-	1	2.4	2.4
		Python Programming and practices	2	3	3	-	2	-	-	-	2	-	-	2	2	2
		Entrepreneurship & Innovation	2	1.8	0.8	1.8	1.8	2	2.2	2	2.8	2.8	3	2	-	1
	II	Complex Analysis and Differential Equations	3	3	3	2.4	2.4	-	-	-	-	-	-	2	2	2
		Applied Mechanics	2.2	1.75	2						1	1		1	1	
		Environmental Studies	2	1	1.7	-	-	1	2	3	2	-	-	2	-	-
		Effective Technical Communication	1.6	1.6	1	1	1.2	2	1.8	1.8	2.2	3	1	2.8	1	1
		Applied Chemistry	3	2	2	2	2	1	1	-	-	-	-	1	1	1
		Fundamentals of Mechatronics	3	2	2						2	1	1	1	2	1
		Engineering Practices	3		3		3				1				1	2
		Industrial Motor Control	2.2	1.4	2	2	0.8	0.4	-	-	0.8	-	0.4	1.8	1.8	1.4
		Solid and Fluid Mechanics	3	2	2	2.8	1	1	-	-	1	-	-	2	1.2	1.4
		Digitronics	3	2	2	-	-	-	-	-	-	2	2	3	3	2
		Manufacturing Process	3	3	2	3	3	1	1	-	1	-	-	2	2	2
		Industrial Motor Control Lab	1.4	1.4	2.2	1.4	0.6	-	-	-	-	0.6	1	1	1.6	1.4
		Solid and Fluid Mechanics Lab	3	2	2	2.8	1	1	-	-	1	-	-	2	1.2	1.4
		Home Automation	3	2	2	2	2				2		2	2	2	3

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL * HINDUSTHAN COLLEGE OF ENGG & TECH * Chairman

Dean Academics

Dean (Academics)
HiCET

CURRICULUM
R2022

CHAIRMAN, BOARD OF STUDIES

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL
Chairman
HINDUSTHAN COLLEGE OF ENGG & TECH

DEAN ACADEMICS

Dean (Academics)
HiCET

DETAILS OF CHANGES CARRIED OUT IN CURRICULUM & SYLLABUS

CBCS PATTERN

UNDERGRADUATE PROGRAMMES

B.E. MECHATRONICS ENGINEERING (UG)

REGULATION-2022

For the students admitted during the academic year 2022-2023 and onwards

SEMESTER I

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1	22MA1101	Matrices and Calculus	BSC	3	1	0	4	4	40	60	100
2	22ME1201	Engineering Drawing	ESC	1	4	0	3	5	40	60	100
THEORY WITH LAB COMPONENT											
3	22HE1151	English for Engineers	HSC	2	0	2	3	4	40	60	100
4	22PH1151	Physics for Non-Circuit Engineering	BSC	2	0	2	3	4	50	50	100
5	22IT1151	Python Programming and practices	ESC	2	0	2	3	4	50	50	100
EEC COURSES (SE/AE)											
6	22HE1071	Universal Human Values II	AEC	2	0	0	2	2	40	60	100
7	22HE1072	Entrepreneurship & Innovation	AEC	1	0	0	1	1	100	0	100
MANDATORY COURSE											
8.	22MC1091/ 22MC1092	தமிழரும் தொழில் நுட்பமும் / Indian Constitution	MC	2	0	0	0	2	100	0	100
			TOTAL	**15**	**5**	**6**	**19**	**27**	**470**	**330**	**800**

CHAIRMAN, BOARD OF STUDIES

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL * HINDUSTHAN COLLEGE OF ENGG & TECH * Chairman

DEAN ACADEMICS

Dean (Academics)
HiCET

SEMESTER II

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1	**22MA2101**	Complex Analysis and Differential Equations	BSC	3	1	0	4	4	40	60	100
2	**22PH2102**	Applied Mechanics	BSC	2	0	0	2	2	40	60	100
3	**22CY2101**	Environmental Studies	ESC	2	0	0	2	2	40	60	100
THEORY WITH LAB COMPONENT											
4	22HE2151	Effective Technical Communication	HSC	2	0	2	3	4	50	50	100
5	**22CY2152**	Applied Chemistry	BSC	2	0	2	3	4	50	50	100
6	**22MT2251**	Fundamentals of Mechatronics	PCC	2	0	2	3	4	50	50	100
PRACTICAL COURSES											
7	**22ME2001**	Engineering Practices	ESC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
8	**22HE2071**	Design Thinking	AEC	1	0	2	2	3	100	0	100
9	**22HE2072**	Soft Skills -1	SEC	1	0	0	1	1	100	0	100
MANDATORY COURSE											
10.	**22MC2091/ 22MC2092**	தமிழர் மரபு / Heritage of Tamils	MC	2	0	0	0	2	100	0	100
11.	**22MC2093**	NCC */NSS / YRC / Sports / Clubs / Society Service - Enrollment (Common)	MC	All students shall enroll, on admission, in anyone of the personality and character development programmes and undergo training for about 80 hours							-
			TOTAL	**17**	**1**	**12**	**22**	**30**	**630**	**370**	**1000**

CHAIRMAN, BOARD OF STUDIES

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL * Chairman * HINDUSTHAN COLLEGE OF ENGG & TECH

DEAN ACADEMICS

Dean (Academics)
HiCET

SEMESTER III

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1	**22MA3105**	Fourier Series and Transforms	BSC	3	1	0	4	4	40	60	100
2	**22MT3201**	Industrial Motor Control	ESC	3	0	0	3	3	40	60	100
3	**22MT3202**	Solid and Fluid Mechanics	PCC	3	1	0	4	4	40	60	100
4	**22MT3203**	Digitronics	PCC	3	1	0	4	4	40	60	100
THEORY WITH LAB COMPONENT											
5	**22MT3251**	Manufacturing Process	PCC	2	0	2	3	4	50	50	100
PRACTICAL											
6	**22MT3001**	Industrial Motor Control Lab	ESC	0	0	4	2	4	60	40	100
7	**22MT3002**	Solid and Fluid Mechanics Lab	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
8	**22HE3071**	Soft Skills and Aptitude -II	SEC	1	0	0	1	1	100	0	100
9	**22MT3072**	Home Automation	AEC	0	0	4	2	4	60	40	100
			TOTAL	**15**	**3**	**14**	**25**	**32**	**490**	**410**	**900**

CHAIRMAN, BOARD OF STUDIES

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL • Chairman • MAHENDRA COLLEGE OF ENGG & TECH

DEAN ACADEMICS

Dean (Academics)
HiCET

SEMESTER IV

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1	**22HE4101**	IPR and Start-ups	HSC	2	0	0	2	2	40	60	100
2	**22MT4201**	Processor and controller	PCC	3	0	0	3	3	40	60	100
3	**22MT4202**	Metrology and Measurements	PCC	3	0	0	3	3	40	60	100
4	**22MT4203**	Theory of Machines	PCC	3	1	0	4	4	40	60	100
THEORY WITH LAB COMPONENT											
5	**22MT4251**	Sensors and Transducers	PCC	2	0	2	3	4	50	50	100
6	**22MT4252**	Fluid Power System	PCC	2	0	2	3	4	50	50	100
PRACTICAL											
7	**22MT4001**	Processor and controller Laboratory	PCC	0	0	4	2	4	60	40	100
8	**22MT4002**	CAD Laboratory	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
9	**22HE4071**	Soft Skills and Aptitude -II	SEC	1	0	0	1	1	100	0	100
			TOTAL	**16**	**1**	**12**	**23**	**29**	**480**	**420**	**900**

CHAIRMAN, BOARD OF STUDIES

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL Chairman

DEAN ACADEMICS

Dean (Academics)
HiCET

SEMESTER V

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1	**22MT5201**	Machine Design	PCC	3	1	0	4	4	40	60	100
2	**22MT5202**	Control System	PCC	3	0	0	3	3	40	60	100
3	**22MT53XX**	Professional Elective-1	PEC	3	0	0	3	3	40	60	100
4	**22MT53XX**	Professional Elective-2	PEC	3	0	0	3	3	40	60	100
5	**22MT53XX**	Professional Elective-3	PEC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
6	**22MT5251**	Embedded System with C	PCC	2	0	2	3	4	50	50	100
PRACTICAL											
7	**22MT5001**	Computer Aided Analysis Laboratory	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
8	**22HE5071**	Soft Skills -4/Foreign languages	SEC	1	0	0	1	1	100	0	100
			TOTAL	**18**	**0**	**6**	**21**	**25**	**410**	**390**	**800**

SEMESTER VI

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1	**22MT6201**	Industrial Automation	PCC	3	0	0	3	3	40	60	100
2	**22HE6101**	Professional Ethics	HSC	3	0	0	3	3	40	60	100
3	**22MT63XX**	Professional Elective-4	PEC	3	0	0	3	3	40	60	100
4	**22MT63XX**	Professional Elective-5	PEC	3	0	0	3	3	40	60	100
5	**22XX64XX**	Open Elective – 1*	OEC	3	0	0	3	3	40	60	100
6	**22XX64XX**	Open Elective – 2*	OEC	3	0	0	3	3	40	60	100
PRACTICAL											
7	**22MT6001**	Industrial Automation Laboratory	PCC	0	0	4	2	4	60	40	100
8	**22MT6002**	CAM Laboratory	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
9.	**22HE6071**	Soft Skills – 5	SEC	2	0	0	2	2	100	0	100
			TOTAL	**20**	**0**	**8**	**24**	**28**	**460**	**440**	**900**

CHAIRMAN, BOARD OF STUDIES

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL • HICET • KINATHUKADAVU • COIMBATORE
Chairman

DEAN ACADEMICS

Dean (Academics)
HiCET

SEMESTER VII

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1	**22MT7201**	Virtual Instrumentation	PCC	3	0	0	3	3	40	60	100
2	**22MT7202**	Robotics and Machine Vision	PCC	3	1	0	4	4	40	60	100
3	**22MT73XX**	Professional Elective-6	PEC	3	0	0	3	3	40	60	100
4	**22XX74XX**	Open Elective – 3*	OEC	3	0	0	3	3	40	60	100
5	**22XX74XX**	Open Elective – 4*	OEC	3	0	0	3	3	40	60	100
PRACTICAL											
6	**22MT7001**	Robotics Laboratory	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
7	**22MT7701**	Internship*	SEC	0	0	0	2	2	100	0	100
			TOTAL	**15**	**1**	**4**	**20**	**22**	**360**	**340**	**700**

*** - Four weeks internship carries 2 credit and it will be done in before Semester VI summer vacation/placement training and same will be evaluated in Semester VII.**

SEMESTER VIII

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
EEC COURSES (SE/AE)											
1	**22MT8901**	Project Work/Granted Patent	SEC	0	0	20	10	20	100	0	100
			TOTAL	**0**	**0**	**20**	**10**	**20**	**100**	**0**	**100**

Note:

1. **As per the AICTE guideline, in Semester I, II, III & IV NCC one credit subject is added as Value Added Course with Extra Credit. Further, the students' who enrolled his/her name in HICET NCC and Air Wing are eligible to undergo this subject. The earned extra credits printed in the Consolidated Mark sheet as per the regulation.**
2. **NCC course level 1 & Level 2 will be added in the list of open elective subjects in the appropriate semester. Further, the students' who have opted NCC subjects in Semester I, II, III & IV are eligible to undergo NCC Open Elective Subjects.**
3. **The above-mentioned NCC Courses will be offered to the students who are going to be admitted in the Academic Year 2022 – 23.**

CHAIRMAN, BOARD OF STUDIES

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL * MNM JAIN ENGINEERING COLLEGE * Chairman

DEAN ACADEMICS

Dean (Academics)
HiCET

OPEN ELECTIVE I AND II (EMERGING TECHNOLOGIES)

To be offered for the students other than CSE, IT, AI&ML, ECE & BIO MEDICAL

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	22AI6451	Artificial Intelligence and Machine Learning Fundamentals	OEC	2	0	2	4	3
2	22CS6451	Block chain Technology	OEC	2	0	2	4	3
3	22EC6451	Cyber security	OEC	2	0	2	4	3
4	22EC6452	IoT Concepts and Applications	OEC	2	0	2	4	3
5	22IT6451	Data Science and Analytics	OEC	2	0	2	4	3
6	22BM6451	Augmented and Virtual Reality	OEC	2	0	2	4	3

OPEN ELECTIVE I AND II

To be offered for the students other than AUTO, AERO, AGRI, MECH, MCTS, CIVIL, EEE, CHEMICAL, FOOD TECH, E&I

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	22AE6401	Space Science	OEC	3	0	0	3	3
2	22MT6401	Introduction to Industrial Engineering	OEC	3	0	0	3	3
3	22MT6402	Industrial Safety and Environment	OEC	3	0	0	3	3
4	22CE6401	Climate Change and its Impact	OEC	3	0	0	3	3
5	22CE6402	Environment and Social Impact Assessment	OEC	3	0	0	3	3
6	22ME6401	Renewable Energy System	OEC	3	0	0	3	3
7	22ME6402	Additive Manufacturing systems	OEC	3	0	0	3	3
8	22EI6401	Introduction to Industrial Instrumentation and Control	OEC	3	0	0	3	3
9	22EI6402	Graphical Programming using Virtual Instrumentation	OEC	3	0	0	3	3
10	22AU6401	Fundamentals of Automobile Engineering	OEC	3	0	0	3	3
11	22AU6402	Automotive Vehicle Safety	OEC	3	0	0	3	3
12	22EE6401	Digital Marketing	OEC	3	0	0	3	3
13	22EE6402	Research Methodology	OEC	3	0	0	3	3
14	22FT6401	Traditional Foods	OEC	3	0	0	3	3
15	22AG6401	Urban Agriculture and Organic Farming	OEC	3	0	0	3	3
16	22CH6401	Biomass and Biorefinery	OEC	3	0	0	3	3

Note: Non-Circuit Departments can add one Open Elective course in the above list to offer for the circuit branches

CHAIRMAN, BOARD OF STUDIES

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL * HNDU * TECH * Chairman

DEAN ACADEMICS

Dean (Academics)
HiCET

OPEN ELECTIVE III

Students shall choose any one of the open elective courses such that the course content or title not belong to their own programme.

(Note: Each programme in our institution is expected to provide one course only)

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	22MT7401	Project Management (Must in the list)	OEC	3	0	0	3	3

OPEN ELECTIVE IV

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	22LS7401	General studies for competitive examinations	OEC	3	0	0	3	3
2	22LS7402	Human Rights, Women Rights and Gender equity	OEC	3	0	0	3	3
3	22LS7403	Indian ethos and Human values	OEC	3	0	0	3	3
4	22LS7404	Financial independence and management	OEC	3	0	0	3	3
5	22LS7405	Yoga for Human Excellence	OEC	3	0	0	3	3
6	22LS7406	Democracy and Good Governance	OEC	3	0	0	3	3
7	22LS7407	NCC Level - II	OEC	3	0	0	3	3

PROFESSIONAL ELECTIVE COURSES: VERTICALS

Vertical I Information Systems	Vertical II Mechanical Engineering	Vertical III Management Studies	Vertical IV Manufacturing Process	Vertical V Vehicle Technology	Vertical VI Robotics and Automation
22MT5301 Database Management System	**22MT5304** Composite Materials	**22MT5307** Principles of Management	**22MT5310** Non-Traditional Machining Techniques	**22MT5313** Automobile System	**22MT5316** Mobile Robotics
22MT5302 Data Science	**22MT5305** Product Design and Development	**22MT5308** Disaster Management	**22MT5311** Computer Integrated Manufacturing	**22MT5314** Automotive Electronics	**22MT5317** Soft Robotics
22MT5303 Data Visualization	**22MT5306** Applied Thermodynamics	**22MT5309** Supply Chain Management	**22MT5312** Flexible Manufacturing System	**22MT5315** Electrical Vehicles	**22MT5318** Micro Robotics

CHAIRMAN, BOARD OF STUDIES
Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL Chairman

DEAN ACADEMICS
Dean (Academics)
HiCET

22MT6301 Cyber Safety	**22MT6303** Non-Destructive Testing	**22MT6305** Economics and Cost Management	**22MT6307** Micro Manufacturing	**22MT6309** Hybrid Vehicles	**22MT6311** Textile Automation
22MT6302 AI for Mechatronics	**22MT6304** Diagnostics Techniques	**22MT6306** Digital Management	**22MT6308** Industrial 4.0	**22MT6310** Unmanned Aerial Vehicles	**22MT6312** Factory Automation
22MT7301 Optimization Techniques	**22MT7302** Machineries in Agriculture	**22MT7303** Marketing Management	**22MT7304** Rapid Prototyping	**22MT7305** Modern Vehicles Technology	**22MT7306** Automatic System

Students are permitted to choose all Professional Electives from a particular vertical or from different verticals.

PROFESSIONAL ELECTIVE COURSES: VERTICALS

Details of Vertical I: Information Systems

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	**22MT5301**	Database Management System	PEC	3	0	0	3	3
2	**22MT5302**	Data Science	PEC	3	0	0	3	3
3	**22MT5303**	Data Visualization	PEC	3	0	0	3	3
4	**22MT6301**	Cyber Safety	PEC	3	0	0	3	3
5	**22MT6302**	AI for Mechatronics	PEC	3	0	0	3	3
6	**22MT7301**	Optimization Techniques	PEC	3	0	0	3	3

Details of Vertical II: Mechanical Engineering

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	**22MT5304**	Composite Materials	PEC	3	0	0	3	3
2	**22MT5305**	Product Design and Development	PEC	3	0	0	3	3
3	**22MT5306**	Applied Thermodynamics	PEC	3	0	0	3	3
4	**22MT6303**	Non Destructive Testing	PEC	3	0	0	3	3
5	**22MT6304**	Diagnostics Techniques	PEC	3	0	0	3	3
6	**22MT7302**	Machineries in Agriculture	PEC	3	0	0	3	3

CHAIRMAN, BOARD OF STUDIES

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL * HiCET * MADURAI
Chairman

DEAN ACADEMICS

Dean (Academics)
HiCET

Details of Vertical III: Management Studies

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	22MT5307	Principles of Management	PEC	3	0	0	3	3
2	22MT5308	Disaster Management	PEC	3	0	0	3	3
3	22MT5309	Supply Chain Management	PEC	3	0	0	3	3
4	22MT6305	Economics and Cost Management	PEC	3	0	0	3	3
5	22MT6306	Digital Management	PEC	3	0	0	3	3
6	22MT7303	Marketing Management	PEC	3	0	0	3	3

Details of Vertical IV: Manufacturing Process

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	22MT5310	Non-Traditional Machining Techniques	PEC	3	0	0	3	3
2	22MT5311	Computer Integrated Manufacturing	PEC	3	0	0	3	3
3	22MT5312	Flexible Manufacturing System	PEC	3	0	0	3	3
4	22MT6307	Micro Manufacturing	PEC	3	0	0	3	3
5	22MT6308	Industrial 4.0	PEC	3	0	0	3	3
6	22MT7304	Rapid Prototyping	PEC	3	0	0	3	3

Details of Vertical V: Vehicle Technology

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	22MT5313	Automobile System	PEC	3	0	0	3	3
2	22MT5314	Automotive Electronics	PEC	3	0	0	3	3
3	22MT5315	Electrical Vehicles	PEC	3	0	0	3	3
4	22MT6309	Hybrid Vehicles	PEC	3	0	0	3	3
5	22MT6310	Unmanned Aerial Vehicles	PEC	3	0	0	3	3
6	22MT7305	Modern Vehicles Technology	PEC	3	0	0	3	3

CHAIRMAN, BOARD OF STUDIES
Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL • HICET • Chairman

DEAN ACADEMICS
Dean (Academics)
HiCET

Details of Vertical VI: Robotics and Automation

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	22MT5316	Mobile Robotics	PEC	3	0	0	3	3
2	22MT5317	Soft Robotics	PEC	3	0	0	3	3
3	22MT5318	Micro Robotics	PEC	3	0	0	3	3
4	22MT6311	Textile Automation	PEC	3	0	0	3	3
5	22MT6312	Factory Automation	PEC	3	0	0	3	3
6.	22MT7306	Automatic System	PEC	3	0	0	3	3

Enrollment for B.E. / B. TECH. (HONOURS) / Minor Degree (optional)

A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E. / B. Tech. (Honours) or Minor Degree. For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only. For minor degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one of the other programmes.

Clause 4.10 of Regulation 2022 is applicable for the Enrolment of B.E. / B. TECH. (HONOURS) / Minor Degree (Optional).

VERTICALS FOR MINOR DEGREE

- Heads are requested to provide one vertical from their program to offer for other program students to register for additional courses (18 Credits) to become eligible for the B.E./B.Tech. Minor Degree.

  Note: Each programme should provide verticals for minor degree

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	22MT5601	Sem 5: Basics of Mechatronics System	MDC	3	0	0	3	3
2	22MT6601	Sem 6: Sensors and Interfacing	MDC	3	0	0	3	3
3	22MT6602	Sem6: Hydraulics and Pneumatics	MDC	3	0	0	3	3
4	22MT7601	Sem 7: PLC and SCADA	MDC	3	0	0	3	3
5	22MT7602	Sem 7: Industrial Robotics	MDC	3	0	0	3	3
6	22MT8601	Sem 8: Design of Mechatronics System	MDC	3	0	0	3	3

*MDC – Minor Degree Course

CHAIRMAN, BOARD OF STUDIES

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL Chairman

DEAN ACADEMICS

Dean (Academics)
HiCET

In addition to the above the following additional courses for Minor Degree can also be given to the student's common to all the branches.

Vertical I Fintech and Block Chain	Vertical II Entrepreneurship	Vertical III Environment and Sustainability
Financial Management	Foundations of Entrepreneurship	Sustainable infrastructure Development
Fundamentals of Investment	Introduction to Business Venture	Sustainable Agriculture and Environmental Management
Banking, Financial Services and Insurance	Team Building & Leadership Management for Business	Sustainable Bio Materials
Introduction to Blockchain and its Applications	Creativity & Innovation in Entrepreneurship	Materials for Energy Sustainability
Fintech Personal Finance and Payments	Principles of Marketing Management for Business	Green Technology
Introduction to Fintech	Human Resource Management for Entrepreneurs	Environmental Quality Monitoring and Analysis
	Financing New Business Ventures	

VERTICALS FOR HONOURS DEGREE

Vertical I Industrial Automation	Vertical II Medical Mechatronics	Vertical III Applied Robotics
22MT5203 Concepts of Machines and Mechanisms	22MT5204 Robotics in Medicine	22MT5205 Robots and Systems in Smart Manufacturing
22MT6202 Drives and Actuators for Automation	22MT6204 Brain Computer Interface and its Applications	22MT6206 Medical Robotics
22MT6203 Power Electronics	22MT6205 Digital Image Processing	22MT6207 Agricultural Robotics and Automation
22MT7203 Advanced PLC	22MT7205 Radiological Equipment	22MT7207 Collaborative Robotics
22MT7204 Distributed Control System	22MT7206 Biomaterials	22MT7208 Robot Operating Systems
22MT8201 HMI & SCADA	22MT8202 Bionics	22MT8203 Humanoid Robotics

B Tech (Hons) Mechatronics Engineering Specialization in Industrial Automation

S.No.	Course Code	Course Title	Category	Periods per Week				TCP	CIA	ESE	Total
				L	T	P	C				
1	22MT5203	Sem 5: Concepts of Machines and Mechanisms	PC	3	0	0	3	3	40	60	100
2	22MT6202	Sem 6: Drives and Actuators for Automation	PC	3	0	0	3	3	40	60	100
3	22MT6203	Sem 6: Power Electronics	PC	3	0	0	3	3	40	60	100
4	22MT7203	Sem 7: Advanced PLC	PC	3	0	0	3	3	40	60	100
5	22MT7204	Sem 7: Distributed Control System	PC	3	0	0	3	3	40	60	100
6	22MT8201	Sem 8: HMI & SCADA	PC	3	0	0	3	3	40	60	100

CHAIRMAN, BOARD OF STUDIES

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL Chairman

DEAN ACADEMICS

Dean (Academics)
HiCET

B Tech (Hons) Mechatronics Engineering Specialization in Medical Mechatronics

S.No.	Course Code	Course Title	Category	Periods per Week				TCP	CIA	ESE	Total
				L	T	P	C				
1.	22MT5204	Sem 5: Robotics in Medicine	PC	3	0	0	3	3	40	60	100
2.	22MT6204	Sem 6: Brain Computer Interface and its Applications	PC	3	0	0	3	3	40	60	100
3.	22MT6205	Sem 6: Digital Image Processing	PC	3	0	0	3	3	40	60	100
4.	22MT7205	Sem 7: Radiological Equipments	PC	3	0	0	3	3	40	60	100
5.	22MT7206	Sem 7: Biomaterials	PC	3	0	0	3	3	40	60	100
6.	22MT8202	Sem 8: Bionics	PC	3	0	0	3	3	40	60	100

B Tech (Hons) Mechatronics Engineering with Specialization in Thermal Engineering

S.No.	Course Code	Course Title	Category	Periods per Week				TCP	CIA	ESE	Total
				L	T	P	C				
1.	22MT5205	Sem 5: Thermal Engineering	PC	3	0	0	3	3	40	60	100
2.	22MT6206	Sem 6: Heat and Mass Transfer	PC	3	0	0	3	3	40	60	100
3.	22MT6207	Sem 6: Alternative Fuels for IC Engines	PC	3	0	0	3	3	40	60	100
4.	22MT7207	Sem 7: Power Plant Engineering	PC	3	0	0	3	3	40	60	100
5.	22MT7208	Sem 7: Environmental Engineering and Pollution Control	PC	3	0	0	3	3	40	60	100
6.	22MT8203	Sem 8: Energy Management in Thermal System	PC	3	0	0	3	3	40	60	100

Note: Each programme should provide verticals for Honours degree

CHAIRMAN, BOARD OF STUDIES
Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL
Chairman

DEAN ACADEMICS
Dean (Academics)
HiCET

SEMESTER-WISE CREDIT DISTRIBUTION

B.E. / B.TECH. PROGRAMMES										
S.No.	Course Area	Credits per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	HSC	3	3	-	2	-	3	-	-	11
2	BSC	7	9	4	-	-	-	-	-	20
3	ESC	6	4	5	-	-	-	-	-	15
4	PCC	-	3	13	20	12	7	9	-	64
5	PEC	-	-	-	-	9	9	-	-	18
6	OEC	-	-	-	-	-	3	9	-	12
7	EEC	3	3	3	1	1	2	2	10	25
8	MCC		✓	✓	✓					
Total		19	22	25	23	22	24	20	10	165

Credit Distribution R2022

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	19	22	25	23	22	24	20	10	165

CHAIRMAN, BOARD OF STUDIES
Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL Chairman

DEAN ACADEMICS
Dean (Academics)
HiCET

Semester I

CHAIRMAN, BOARD OF STUDIES
Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL
Chairman

DEAN ACADEMICS
Dean (Academics)
HiCET

Programme	Course code	Name of the course	L	T	P	C
B.Tech	22MA1101	MATRICES AND CALCULUS (COMMON TO NON-CIRCUIT BRANCHES)	3	1	0	4

		The student should be made
Course Objective	1	Construct the characteristic polynomial of a matrix and use it to identify eigenvalues and Eigenvectors
	2	To impart the knowledge of sequences and series
	3	Analyse and discuss the maxima and minima of the functions of several variables.
	4	Evaluate the multiple integrals and apply in solving problems.
	5	Apply vector differential operator for vector function and theorems to solve engineering problems.

Unit	Description	Instructional Hours
I	**Matrices** Eigen values and Eigen vectors – Properties of Eigen values and Eigen vectors (without proof) -Cayley - Hamilton Theorem (excluding proof) - Reduction of a quadratic form to canonical form by orthogonal transformation.	12
II	**Single Variate Calculus** Rolle's Theorem–Lagrange's Mean Value Theorem-Maxima and Minima–Taylor's and Maclaurin's Series.	12
III	**Functions of Several Variables** Partial derivatives-Total derivative, Jacobian, Maxima, minima and saddle points; Method of Lagrange multipliers.	12
IV	**Integral Calculus** Double integrals in Cartesian coordinates–Area enclosed by plane curves (excluding surface area)– Triple integrals in Cartesian co-ordinates – Volume of solids (Sphere, Ellipsoid, Tetrahedron) using Cartesian co-ordinates.	12
V	**Vector Calculus** Gradient, divergence and curl; Green's theorem, Stoke's and Gauss divergence theorem (statement only) for cubes only.	12
	Total Instructional Hours	60

Course Outcome	CO1	Compute Eigen values and Eigen vectors of the given matrix and transform given quadratic form into canonical form.
	CO2	Apply the concept of differentiation to identify the maximum and minimum values of curve.
	CO3	Compute partial derivatives of function of several variables and write Taylor's series for functions with two variables
	CO4	Evaluate multiple integral and its applications in finding area, volume.
	CO5	Apply the concept of vector calculus in two- and three-dimensional spaces.

TEXT BOOK:

T1	R.L.Finney,"Calculus andAnalyticalGeometry",9th Edition Addison Wesley Publishing company,201.
T2	ErwinKreyszig, "Advanced Engineering Mathematics", John Wiley&Sons,2019
T3	K.P.Umaand S.Padma, "Engineering Mathematics I (Matrices and Calculus) ",PearsonLtd,2022.

REFERENCES:

R1	JerroldE.Marsden, Anthony Tromba, "Vector Calculus", W.H.Freeman,2003
R2	StraussM.J,G.L.Bradleyand K.J.Smith,"Multivariablecalculus",PrenticeHall,2002.
R3	Veerarajan T, "Engineering Mathematics",McGrawHill Education (India)PvtLtd,NewDelhi,2016.

Mapping of COs with POs and PSOs

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	1	1	1	2	-	1	2	1	2	3	1	3	3	2
CO2	1	2	1	1	1	2	1	1	1	3	1	2	2	3
CO3	1	2	1	1	1	2	1	1	2	3	1	2	2	2
CO4	1	1	-	1	1	1	1	1	2	3	1	2	3	3
CO5	-	1	1	1	1	1	1	2	2	3	1	2	2	2
AVG	1	1.4	1	1.2	1	1.4	1.2	1.2	1.8	3	1	2.2	2.4	2.4

1-low, 2-medium, 3-high, '-'- no correlation

Note: The average value of this course is to be mapped for program articulation matrix.

CHAIRMAN, BOARD OF STUDIES

Chairman - BoS
MCT - HiCET

Chairman

DEAN ACADEMICS

Dean (Academics)
HiCET

Programme	Course code	Name of the course	L	T	P	C
B.Tech	22ME1201	ENGINEERING DRAWING	1	0	4	3

The student should be made

Course Objective

1	To gain the knowledge of Engineer's language of expressing complete details about objects and the construction of conics and special curves.
2	To learn about the orthogonal projections of straight lines and planes.
3	To acquire the knowledge of projections of simple solid objects in plan and elevation.
4	To learn about the projection of sections of solids and the development of surfaces.
5	To study the isometric projections of different objects.

Unit	Description	Instructional Hours
I	**PLANE CURVES** Importance of engineering drawing; drafting instruments; drawing sheets – layout and folding; Lettering and dimensioning, BIS standards, scales. Geometrical constructions, Engineering Curves Conic sections –Construction of ellipse, parabola and hyperbola by eccentricity method. Construction of cycloids and involutes of square and circle – Drawing of tangents and normal to the above curves.	12
II	**PROJECTIONS OF POINTS, LINES AND PLANE SURFACES:** Introduction to Orthographic projections- Projection of points. Projection of straight lines inclined to both the planes, Determination of true lengths and true inclinations by rotating line method. Projection of planes (polygonal and circular surfaces) inclined to both the planes by rotating object method (First angle projections only).	12
III	**PROJECTIONS OF SOLIDS** Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is perpendicular and inclined to one plane by rotating object method.	12
IV	**SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES:** Sectioning of simple solids with their axis in vertical position when the cutting plane is inclined to one of the principal planes and perpendicular to the other – Obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids, cylinder and cone. Development of lateral surfaces of truncated solids	12
V	**ISOMETRIC AND ORTHOGRAPHIC PROJECTIONS:** Isometric views and projections simple and truncated solids such as - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions. Free hand sketching of multiple views from a pictorial drawing. Basics of drafting using AutoCAD software.	12
	Total Instructional Hours	60

Course Outcome

CO1	Understand and interpret the engineering drawings in order to visualize the objects and draw the comics and special curves
CO2	Draw the orthogonal projections of straight lines and planes.
CO3	Interpret the projections of simple solid objects in plan and elevation.
CO4	Draw the projections of sections of solids and the development of surfaces of solids.
CO5	Draw the isometric projections and the perspective views of different objects.

TEXT BOOK:

T1	K.Venugopal, V.Prabu Raja, "Engineering Drawing, AutoCAD, Building Drawings", 5thedition New Age International Publishers, New Delhi 2016.
T2	K.V.Natarajan, "A textbook of Engineering Graphics", Dhanlaksmi Publishers, Chennai 2016.

REFERENCES:

R1	Basant Agrawal and C.M.Agrawal, "Engineering Drawing", Tata McGraw Hill Publishing company Limited,New Delhi 2013.
R2	N.S. Parthasarathy, Vela Murali, "Engineering Drawing", Oxford University PRESS, India 2015.

Mapping of COs with POs and PSOs

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

CHAIRMAN, BOARD OF STUDIES
Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL Chairman

DEAN ACADEMICS
Dean (Academics)
HiCET

CO5	3	3	3	1	1	3	1	-	-	1	1	1	1	1
AVG	2.8	3	2.6	1	1	2	1	-	-	1	1	1	1	1.4

1-low, 2-medium, 3-high, '-'- no correlation

Note: The average value of this course to be used for program articulation matrix.

CHAIRMAN, BOARD OF STUDIES

Chairman - BoS
MCT - HiCET

HINDUSTHAN ACADEMIC COUNCIL * TECH * Chairman

DEAN ACADEMICS

Dean (Academics)
HiCET

Programme	Course code	Name of the course	L	T	P	C
B.Tech	22HE1151	ENGLISH FOR ENGINEERS	2	0	2	3

Course Objective		The student should be made
	1	To improve the communicative proficiency of learners
	2	To help learners use language effectively in professional writing
	3	To advance the skill of maintaining the suitable tone of communication
	4	To introduce the professional life skills.
	5	To impart official communication etiquette.

Unit	Description	Instructional Hours
I	**Language Proficiency:** Types of Sentences, Functional Units, Framing question. **Writing:** process description, Writing Checklist. **Vocabulary** – words on environment. **Practical Component: Listening-** Watching short videos and answer the questions, **Speaking-** Self introduction, formal& semi-formal	7+2
II	**Language Proficiency**: Tenses, Adjectives and adverbs. **Writing:** Formal letters (letters conveying positive and negative news), Formal and informal email writing (using emoticons, abbreviations& acronyms), reading comprehension. **Vocabulary**– words on entertainment. **Practical Component: Listening-**Comprehensions based on TED talks **Speaking-** Narrating a short story or an even happened in their life	7+2
III	**Language Proficiency:** Prepositions, phrasal verbs. **Writing:** Formal thanks giving, Congratulating, warning and apologizing letters, cloze test. **Vocabulary** – words on tools. **Practical Component: Listening-**ListentosongsandanswerthequestionsSpeaking- Justaminute	5+4
IV	**Language Proficiency:** Subject verb concord, Prefixes & suffixes. **Writing:** Preparing agenda &minutes, writing an event report. **Vocabulary**– words on engineering process. **Practical Component: Listening-** Comprehensions based on Talk of orators or interview shows **Speaking-**Presentation on a general topic with ppt.	5+4
V	**Language Proficiency:** Modal Auxiliaries, Active & passive voice, **Writing:** Project report (proposal & progress), sequencing of sentences **Vocabulary** –words on engineering material. **Practical Component: Listening-** Listening- Comprehensions based on Nat Geo/Discovery channel videos **Speaking-** Preparing posters and presenting a sateam.	6+3
	Total Instructional Hours	60

Course Outcome	CO1	To communicate in a professional forum
	CO2	To speak or write a content in the proficient language
	CO3	To maintain and use appropriate tone of the communication
	CO4	To read, write and presenting professional way
	CO5	To follow the etiquettes informal communication.

TEXT BOOK:

T1	Norman Whitby, "Business Benchmark-Pre-intermediate to Intermediate", Cambridge University
T2	Press, 2016.T2-Raymond Murphy, "Essential English Grammar", Cambridge UniversityPress,2019.

REFERENCES:

R1	Meenakshi Raman and Sangeetha Sharma. "Technical Communication- Principles and Practice", Oxford University Press, 2009.
R2	Raymond Murphy, "EnglishGrammarinUse"-4thedition CambridgeUniversityPress,2004.
R3	Kamalesh Sadanan "A Foundation Course for the Speakers of Tamil-Part-I & II", Orient Blackswan,2010.

Mapping of COs with POs and PSOs

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	1	1	1	2	-	1	2	1	2	3	1	3	3	2
CO2	1	2	1	1	1	2	1	1	1	3	1	2	2	3
CO3	1	2	1	1	1	2	1	1	2	3	1	2	2	2
CO4	1	1	-	1	1	1	1	1	2	3	1	2	3	3
CO5	-	1	1	1	1	1	1	2	2	3	1	2	2	2
AVG	1	1.4	1	1.2	1	1.4	1.2	1.2	1.8	3	1	2.2	2.4	2.4

1-low, 2-medium, 3-high correlation

CHAIRMAN, BOARD OF STUDIES

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL * KHADJUSTHAN COLLEGE OF ENGINEERING * Chairman

DEAN ACADEMICS

Dean (Academics)
HiCET

Note: The average value of this course to be used for program articulation matrix.

CHAIRMAN, BOARD OF STUDIES

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL Chairman

DEAN ACADEMICS

Dean (Academics)
HiCET

Programme	Course code	Name of the course	L	T	P	C
B.Tech	22PH1151	PHYSICS FOR NON- CIRCUIT EGINEERING	2	0	2	3

Course Objective		The student should be made
	1	Gain knowledge about laser, their applications and Conversant with principles of optical fiber, types and applications of optical fiber
	2	Enhance the fundamental knowledge in properties of matter
	3	Extend the knowledge about wave optics
	4	Gain knowledge about magnetic materials.
	5	Acquire fundamental knowledge of nano materials which is related to the engineering program

Unit	Description	Instructional Hours
I	**LASER AND FIBRE OPTICS** Spontaneous emission and stimulated emission –Type of lasers – Nd:YAG laser - Laser Applications – Holography – Construction and reconstruction of images. Principle and propagation of light through optical fibers – Derivation of numerical aperture and acceptance angle – Classification of optical fibers (based on refractive index and modes) – Fiber optical communication link. **Determination of Wavelength and particle size using Laser**	6 3
II	**PROPERTIES OF MATTER** Elasticity – Hooke's law –Poisson's ratio – Bending moment – Depression of a cantilever – Derivation of Young's modulus of the material of the beam by Uniform bending theory and experiment. Twisting couple - torsion pendulum: theory and experiment. **Determination of Young's modulus by uniform bending method** **Determination of Rigidity modulus – Torsion pendulum**	6 3 3
III	**WAVE OPTICS** Interference of light – air wedge –Thickness of thin paper - Diffraction of light –Fraunhofer diffraction at single slit –Diffraction grating – Rayleigh's criterion of resolution power - resolving power of grating. **Determination of wavelength of mercury spectrum – spectrometer grating. Determination of thickness of a thin wire – Air wedge method**	6 3 3
IV	**QUANTUM PHYSICS** Black body radiation –Compton effect: theory and experimental verification – wave particle duality –concept of wave function and its physical significance – Schrödinger's wave equation – time independent and time dependent equations – particle in a one-dimensional rigid box.	6
V	**THERMAL PHYSICS** Transfer of heat energy –thermal conduction, convection and radiation – thermal conductivity - Lee's disc method: theory and experiment - conduction through compound media (series and parallel) – applications: solar water heaters.	6
	Total Instructional Hours	45

Course Outcome	CO1	Understand the advanced technology of LASER and optical communication in the field of Engineering
	CO2	Illustrate the fundamental properties of matter
	CO3	Discuss the Oscillatory motions of particles
	CO4	Understand the advanced technology of magnetic materials in the field of Engineering
	CO5	Develop the technology of smart materials and Nano materials in engineering field

TEXT BOOK:

T1	Rajendran V, Applied Physics, Tata McGraw Hill Publishing Company Limited, New Delhi, 2017.
T2	Gaur R.K. and Gupta S.L., Engineering Physics, 8th edition, DhanpatRai Publications (P) Ltd., New Delhi, 2015.

REFERENCES:

R1	M.N Avadhanulu and PG Kshirsagar "A Text Book of Engineering physics" S. Chand and Company ltd., New Delhi2016
R2	Dr. G. Senthilkumar "Engineering Physics – I" VRB publishers Pvt Ltd., 2021

Mapping of COs with POs and PSOs

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

CHAIRMAN, BOARD OF STUDIES
Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL Chairman

DEAN ACADEMICS
Dean (Academics)
HiCET

CO2	3	3	1	1	2	-	-	-	-	-	-	1	3	3
CO3	3	2	1	2	2	-	-	-	-	-	-	1	3	3
CO4	3	2	3	2	3	1	-	-	-	-	-	1	2	2
CO5	3	2	3	2	2	2	-	-	-	-	-	1	2	3
AVG	3	2.2	2	1.6	2	1.3	-	-	-	-	-	1	2.4	2.4

1-low, 2-medium, 3-high, '-'- no correlation

Note: The average value of this course to be used for program articulation matrix.

CHAIRMAN, BOARD OF STUDIES

Chairman - BoS
MCT - HiCET

HINDUSTHAN ACADEMIC COUNCIL
Chairman
HINDUSTHAN COLLEGE OF ENGG & TECH

DEAN ACADEMICS

Dean (Academics)
HiCET

Programme	Course code	Name of the course	L	T	P	C
B.Tech	22IT1151	PYTHON PROGRAMMING AND PRACTICES	2	0	2	3

	The student should be made	
Course Objective	1	To read and write simple Python programs
	2	To develop Python programs with conditionals and loops and to define Python functions and call them.
	3	To use Python data structures -lists, tuples, dictionaries.
	4	To do input/output with files in Python
	5	To develop Python programs with conditionals and loops and to define Python functions and call them

Unit	Description	Instructional Hours
I	**ALGORITHMIC PROBLEM SOLVING** Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). **Illustrative problems: To find the Greatest Common Divisor (GCD)oftwo numbers, Fahrenheit to Celsius, Perform Matrix addition.**	5 4
II	**DATA, STATEMENTS, CONTROL FLOW** Data Types, Operators and precedence of operators, expressions, statements, comments; Conditionals: Boolean values and operators, conditional (if), alternative (if -else), chained conditional (if –elif-else); Iteration: state, while, for, break, continue, pass; **Simple algorithms and programs: Area of the circle, check the given year is Leap year or not, Factorial of a Number.**	5 4
III	**FUNCTIONS, STRINGS** Functions, parameters and arguments; Fruitful functions: return values, local and global scope, function composition, recursive functions. Strings: string slices, immutability, string functions and methods, string module. **Illustrative programs: Perform Linear Search, Selection sort, Sum of all elements in a List, Pattern Programs**	5 4
IV	**LISTS, TUPLES, DICTIONARIES** Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, listparameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations andmethods; advanced list processing - list comprehension. **Illustrative programs: List Manipulation, Finding Maximum in a List, String processing.**	5 4
V	**FILES, MODULES, PACKAGES** Files and exception: text files, reading and writing files, errors and exceptions, handling exceptions, modules, packages **Illustrative programs: Reading writing in a file, word count, Handling Exceptions**	9
	Total Instructional Hours	45

Course Outcome	CO1	Develop algorithmic solutions to simple computational problems
	CO2	Read, write, execute by hand simple Python programs
	CO3	Structure simple Python programs for solving problems and Decompose a Python program into functions
	CO4	Represent compound data using Python lists, tuples, dictionaries
	CO5	Read and write data from/to files in Python Programs.

TEXT BOOK:

T1	Guido van Rossum and Fred L. Drake Jr, An Introduction to Python – Revised and updated for Python 3.6.2, Shroff Publishers, First edition (2017).
T2	S. Annadurai, S.Shankar, I.Jasmine, M.Revathi, Fundamentals of Python Programming, Mc-Graw Hill Education (India) Private Ltd, 2019

REFERENCES:

R1	CharlesDierbach, —Introduction to Computer Science using Python: A Computational Problem- Solving Focus, Wiley India Edition, 2013.
R2	Timothy A. Budd, —Exploring Pythonl, Mc-Graw Hill Education (India) Private Ltd., 2015
R3	Robert Sedgewick, Kevin Wayne, Robert Dondero, —Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016

CHAIRMAN, BOARD OF STUDIES

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL Chairman

DEAN ACADEMICS

Dean (Academics)
HiCET

Mapping of COs with POs and PSOs														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	2	3	3	-	2	-	-	-	-	-	-	2	2	2
CO2	2	3	3	-	2	-	-	-	2	-	-	2	2	2
CO3	2	3	3	-	2	-	-	-	2	-	-	2	2	2
CO4	2	3	3	-	2	-	-	-	2	-	-	2	2	2
CO5	2	3	3	-	2	-	-	-	2	-	-	2	2	2
AVG	2	3	3	-	2	-	-	-	2	-	-	2	2	2

1-low, 2-medium, 3-high, '-'- no correlation

Note: The average value of this course to be used for program articulation matrix.

CHAIRMAN, BOARD OF STUDIES

Chairman - BoS
MCT - 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
B.Tech	22HE1071	UNIVERSAL HUMAN VALUES –II	2	0	0	2

Course Objective

The student should be made

1. To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

Unit	Description	Instructional Hours
I	**Introduction to Value Education** Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)-Understanding Value Education - Self-exploration as the Process for Value Education - Continuous Happiness and Prosperity – the Basic Human Aspirations - Happiness and Prosperity – Current Scenario - Method to Fulfill the Basic Human Aspirations	6
II	**Harmony in the Human Being and Harmony in the Family** Understanding Human being as the Co-existence of the Self and the Body - Distinguishing between the Needs of the Self and the Body - The Body as an Instrument of the Self - Understanding Harmony in the Self- Harmony of the Self with the Body - Programme to ensure self-regulation and Health	6
III	**Harmony in the Family and Society** Harmony in the Family – the Basic Unit of Human Interaction. Values in Human-to-Human Relationship 'Trust' – the Foundational Value in Relationship Values in Human-to-Human Relationship 'Respect' – as the Right Evaluation Understanding Harmony in the Society	6
IV	**Harmony in the Nature / Existence** Understanding Harmony in the Nature. Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature- Understanding Existence as Co-existence of mutually interacting units in all pervasive space Realizing Existence as Co-existence at All Levels the Holistic Perception of Harmony in Existence. Vision for the Universal Human Order	6
V	**Implications of the Holistic Understanding – a Look at Professional Ethics** Natural Acceptance of Human Values Definitiveness of (Ethical) Human Conduct a Basis for Humanistic Education, Humanistic Constitution and Universal Human Order-Competence in Professional Ethics Holistic Technologies, Production Systems and Management Models-Typical Case Studies Strategies for Transition towards Value-based Life and Profession	6
	Total Instructional Hours	30

Course Outcome

CO1	To become more aware of holistic vision of life - themselves and their surroundings
CO2	To become more responsible in life, in the Society and in handling problems with sustainable Solutions
CO3	To sensitive towards their commitment towards what they understood towards environment and socially responsible behaviour.
CO4	To able to apply what have learnt to their own self in different day-to-day settings in real life and in handling problems with sustainable solutions.
CO5	To develop competence and capabilities for maintaining Health and Hygiene

TEXT BOOK:

T1	*A Foundation Course in Human Values and Professional Ethics*, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
T2	Teachers'Manual for *A Foundation Course in Human Values and Professional Ethics*, RRGaur, R Asthana,G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93- 87034-53-2

REFERENCES:

R1	Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak,1999.
R2	Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi,2004.

CHAIRMAN, BOARD OF STUDIES
Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL Chairman

DEAN ACADEMICS
Dean (Academics)
HiCET

Programme	Course code	Name of the course	L	T	P	C
B.Tech	22HE1072	ENTREPRENEURSHIP & INNOVATION	1	0	0	1

Course Objective

The student should be made

1. To acquire the knowledge and skills needed to manage the development of innovation
2. To recognize and evaluate potential opportunities to monetize these innovations
3. To plan specific and detailed method to exploit these opportunities
4. To acquire their sources necessary to implement these plans
5. To make students understand organizational performance and its importance.

Unit	Description	Instructional Hours
1.	Entrepreneurial Thinking	2
2.	Innovation Management	2
3.	Design Thinking	2
4.	Opportunity Spotting/Opportunity Evaluation	2
5.	Industry and Market Research	2
6.	Innovation Strategy and Business Models	2
7.	Financial Forecasting	2
8.	Business Plans/Business Model Canvas	2
9.	Entrepreneurial Finance	2
10.	Pitching to Resources Providers/Pitch Deck	2
11.	Negotiating Deals	2
12.	New Venture Creation	2
13.	Lean Start-ups	2
14.	Entrepreneurial Ecosystem	2
15.	Velocity Venture	2
	Total Instructional Hours	**30**

Course Outcome

CO1	Understand the nature of business opportunities, resources, and industries in critical and creative aspects
CO2	Understand the processes by which innovation is fostered, managed, and commercialized
CO3	Remember effectively and efficiently the potential of new business opportunities
CO4	Assess the market potential for a new venture, including customer need, competitors, and industry attractiveness
CO5	Develop business model for a new venture, including revenue. Margins, operations, Working capital, and investment

TEXT BOOK:

T1 AryaKumar "Entrepreneurship Creating and leading an Entrepreneurial Organization", Pearson, Second Edition (2012).

T2 EmrahYayici "Design Thinking Methodology", Artbiztech, First Edition (2016).

REFERENCES:

R1 Christopher Golis "Enterprise & Venture Capital", Allen &Unwin Publication, Fourth Edition (2007).

R2 Thomas LockWood & EdgerPapke "Innovation by Design", CareerPress.com, Second Edition (2017).

R3 Jonathan Wilson "Essentials of Business Research", Sage Publication, First Edition (2010).

WEB RESOURCES:

W1:https://blof.forgeforward.in/tagged/startup-lessons
W2:https://blof.forgeforward.in/tagged/entrepreurship
W3:https://blof.forgeforward.in/tagged/minimum-viable-product
W4:https://blof.forgeforward.in/tagged/minimum-viable-product
W5:https://blof.forgeforward.in/tagged/innovation

Mapping of COs with POs and PSOs

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

CHAIRMAN, BOARD OF STUDIES
Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL * HINDUSTHAN COLLEGE * Chairman

DEAN ACADEMICS
Dean (Academics)
HiCET

AVG	2	1.8	0.8	1.8	1.8	2	2.2	2	2.8	2.8	3	2	-	1
1-low, 2-medium, 3-high, '-"- no correlation Note: The average value of this course to be used for program articulation matrix.														

CHAIRMAN, BOARD OF STUDIES

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL * HINDUSTHAN COLLEGE OF ENGG & TECH * Chairman

DEAN ACADEMICS

Dean (Academics)
HiCET

Programme	Course Code	Course Title	L	T	P	C
BE/BTECH	22HE1073	INTRODUCTION TO SOFT SKILLS	0	0	0	1

Course Objectives:	1. To develop and nurture the soft skills of the students through instruction, knowledge acquisition, demonstration and practice. 2. To enhance the students ability to deal with numerical and quantitative skills. 3. To identify the core skills associated with critical thinking. 4. To develop and integrate the use of English language skills.

Unit	Description	Instructional Hours
I	Lessons on excellence Skill introspection, Skill acquisition, consistent practice	2
II	Logical Reasoning Problem Solving - Critical Thinking- Lateral Thinking - Coding and Decoding – Series – Analogy - Odd Man Out - Visual Reasoning - Sudoku puzzles - Attention to detail	11
III	Quantitative Aptitude Addition and Subtraction of bigger numbers - Square and square roots - Cubes and cube roots - Vedic maths techniques - Multiplication Shortcuts - Multiplication of 3 and higher digit numbers – Simplifications - Comparing fractions - Shortcuts to find HCF and LCM - Divisibility tests shortcuts - Algebra and functions	11
IV	Recruitment Essentials Resume Building - Impression Management	2
V	Verbal Ability Nouns and Pronouns – Verbs - Subject-Verb Agreement - Pronoun-Antecedent – Agreement - Punctuations	4
	Total Instructional Hours	30

Course Outcome:	CO1 :	Students will analyze interpersonal communication skills. public speaking skills.
	CO2 :	Students will exemplify tautology, contradiction and contingency by logical thinking.
	CO3 :	Students will be able to develop an appropriate integral form to solve all sorts of quantitative problems.
	CO4 :	Students can produce a resume that describes their education, skills, experiences and measurable achievements with proper grammar, format and brevity.
	CO5 :	Students will be developed to acquire the ability to use English language with an error while making optimum use of grammar.

CHAIRMAN, BOARD OF STUDIES

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL • HICET • Chairman

DEAN ACADEMICS

Dean (Academics)
HiCET

Programme	Course code	Name of the course	L	T	P	C
B.Tech	22MC1091	தமிழரும் தொழில்நுட்பமும்	2	0	0	0

Unit	Description	Instructional Hours

அலகு I நெசவு மற்றும் பானைத் தொழில்நுட்பம்: 3

சங்க காலத்தில் நெசவுத் தொழில் – பானைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் – பாண்டங்களில் கீறல் குறியீடுகள்.

அலகு II வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்: 3

சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு- சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் – சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும், கோவில்களும் – சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் – நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் – செட்டிநாட்டு வீடுகள் – பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ-சாரோசெனிக் கட்டிடக் கலை.

அலகு III உற்பத்தித் தொழில் நுட்பம்: 3

கப்பல் கட்டும் கலை – உலோகவியல் – இரும்புத் தொழிற்சாலை – இரும்பை உருக்குதல், எஃகு – வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் – நாணயங்கள் அச்சடித்தல் – மணி உருவாக்கும் தொழிற்சாலைகள் – கல்மணிகள், கண்ணாடி மணிகள் – சுடுமண் மணிகள் – சங்கு மணிகள் – எலும்புத்துண்டுகள் – தொல்லியல் சான்றுகள் – சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

அலகு IV வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்: 3

அணை, ஏரி, குளங்கள், மதகு – சோழர்காலக் குமுழித் தூம்பின் முக்கியத்துவம் – கால்நடை பராமரிப்பு – கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் – வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் – கடல்சார் அறிவு – மீன்வளம் – முத்து மற்றும் முத்துக்குளித்தல் – பெருங்கடல் குறித்த பண்டைய அறிவு – அறிவுசார் சமூகம்.

அலகு V அறிவியல் தமிழ் மற்றும் கணித்தமிழ்: 3

அறிவியல் தமிழின் வளர்ச்சி –கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் – தமிழ் மென்பொருட்கள் உருவாக்கம் – தமிழ் இணையக் கல்விக்கழகம் – தமிழ் மின் நூலகம் – இணையத்தில் தமிழ் அகராதிகள் – சொற்குவைத் திட்டம்.

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu)

CHAIRMAN, BOARD OF STUDIES
Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL Chairman

DEAN ACADEMICS
Dean (Academics)
HiCET

(Published by: International Institute of Tamil Studies).

8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Publishedby: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

CHAIRMAN, BOARD OF STUDIES

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL * MANAKULA VINAYAGAR INSTITUTION * COLLEGE OF ENGG & TECH * Chairman

DEAN ACADEMICS

Dean (Academics)
HiCET

Programme	Course code	Name of the course	L	T	P	C
B.Tech	22MC1092	INDIAN CONSTITUTION	2	0	0	0

	The student should be made	
Course Objective	1	Sensitization of student towards self, family(relationship), society and nature
	2	Understanding (or developing clarity) of nature, society and larger systems, on the basis of human relationships and resolved individuals
	3	Strengthening of self-reflection
	4	Development of commitment and courage to act

Unit	Description	Instructional Hours
I	**BASIC FEATURES AND FUNDAMENTAL PRINCIPLES** Meaning of the constitution law and constitutionalism–Historical perspective of the constitution of India salient features and characteristics of the constitution of India.	6
II	**FUNDAMENTAL RIGHTS** Scheme of the fundamental rights–fundamental duties and its legislative status–The directive principles of state policy–its importance and implementation-Federal structure and distribution of legislative and financial powers between the union and states.	6
III	**PARLIAMENTARY FORM OF GOVERNMENT** The constitution power sand the status of the president in India. –Amendment of the constitutional Powers and procedures–The historical perspective of the constitutional amendment of India–Emergency provisions: National emergency, President rule, financial emergency.	6
IV	**LOCAL GOVERNANCE** Local self-government-Rural Local Government-Panchayath Raj, Elections of Panchayat-State Election Commission-Urban Local Government-Amendment Act, Urban Local Government Structures in India	6
V	**INDIAN SOCIETY** Constitutional Remedies for citizens–Political Parties and Pressure Groups; Right of Women, Children and Scheduled Castes and Scheduled Tribes and other Weaker Sections.	6
	Total Instructional Hours	30

Course Outcome	CO1	Understand the functions of the Indian government
	CO2	Understand and abide the rules of the Indian constitution

TEXT BOOK:

T1	DurgaDasBasu, "Introduction to the Constitution of India ", Prentice Hallof India, New Delhi, 197.
T2	Agarwal R C., "Indian Political System", S.Chand and Company, NewDelhi,1997.
T3	Maciver and Page, "Society: An Introduction Analysis", Mac Milan India Ltd., New Delhi.
T4	Sharma K L., "Social Stratification in India: Issues and Themes", Jawaharlal Nehru University, NewDelhi,1997.

REFERENCES:

R1	Sharma, Brij Kishore, "Introduction to the Constitution of India: Prentice Hall of India, New Delhi.
R2	GahaiUR., "Indian Political System ", New Academic Publishing House, Jalandhar.
R3	Sharma RN., "Indian Social Problems ", Media Promoters and Publishers Pvt. Ltd.

CHAIRMAN, BOARD OF STUDIES

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL * HINDUSTHAN COLLEGE OF ENGG & TECH * Chairman

DEAN ACADEMICS

Dean (Academics)
HiCET

SEMESTER II

CHAIRMAN, BOARD OF STUDIES
Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL
Chairman
HINDUSTHAN COLLEGE OF ENGG & TECH

DEAN ACADEMICS
Dean (Academics)
HiCET

Programme	Course code	Name of the course	L	T	P	C
B.Tech	22MA2101	DIFFERENTIAL EQUATIONS AND COMPLEX ANALYSIS (AERO, AGRI, AUTO, MECH, MECT)	3	1	0	4

Course Objective		The student should be made
	1	Describe some methods to solve different types of first order differential equations
	2	Understand the various approach to find general solution of the ordinary differential equations
	3	Evaluate the various types of Partial differential equations and methods to find solution
	4	Introduction to analytic functions and its properties
	5	Understand Cauchy's theorem and its applications in evaluation of integral

Unit	Description	Instructional Hours
I	**ORDINARY DIFFERENTIAL EQUATIONS OF FIRST ORDER** Basic concepts, separable differential equations, exact differential equations, integrating factors, linear differential equations, Bernoulli equation.	12
II	**LINEAR DIFFERENTIAL EQUATIONS OF SECOND ORDER** Second order linear differential equations with constant with RHS of the form e^{ax}, x^n, sinax, cosax- – Cauchy's linear equations– Method of variation of parameters.	12
III	**PARTIAL DIFFERENTIAL EQUATIONS** Formation of partial differential equations by eliminating arbitrary constants and functions – Solution of first order partial differential equations of the form f(p,q)=0, Clairaut's equation – Lagrange's equation.	12
IV	**COMPLEX DIFFERENTIATION** (9) Functions of complex variables – Analytic functions – Cauchy's – Riemann equations and sufficient conditions (excluding proof) – Construction of analytic functions – Milne – Thomson's method – Conformal mapping w = A+z , Az, 1/z and bilinear transformations.	12
V	**COMPLEX INTEGRATION** (9) Cauchy's integral theorem – Cauchy's integral formula –Taylor's and Laurent's series (statement only) –Residues - Cauchy's Residue theorem - Contour Integration with unit circle only.	12
	Total Instructional Hours	60

Course Outcome	CO1	Apply few methods to solve different types of first order differential equations.
	CO2	Evaluate the solutions of higher order ordinary differential equations and its properties.
	CO3	Compute the solution of first order partial differential equations.
	CO4	Understand the concept of analytic functions and discuss its properties
	CO5	Evaluate various integrals by using Cauchy's residue theorem and classify singularities and derive Laurent series expansion

TEXT BOOK:

T1	Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 2019
T2	William E. Boyce, Richard C. DiPrima, Douglas B. Meade, Elementary Differential Equations and Boundary Value Problems, Wiley, 2017
T3	Veerarajan T, "Engineering Mathematics", McGraw Hill Education (India) Pvt Ltd, New Delhi, 2016

REFERENCES:

R1	James Ward Brown, Ruel Vance Churchill, Complex Variables and Applications, McGraw-Hill Higher Education, 2004
R2	Dennis Zill, Warren S. Wright, Michael R. Cullen, Advanced Engineering Mathematics, Jones & Bartlett Learning, 2011
R3	Ian N. Sneddon, Elements of Partial Differential Equations, Courier Corporation, 2013

Mapping of COs with POs and PSOs

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

CHAIRMAN, BOARD OF STUDIES

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL Chairman

DEAN ACADEMICS

Dean (Academics)
HiCET

AVG	3	3	3	2.4	2.4	-	-	-	-	-	-	2	2	2

1-low, 2-medium, 3-high, '-"- no correlation

Note: The average value of this course to be used for program articulation matrix.

CHAIRMAN, BOARD OF STUDIES

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL Chairman

DEAN ACADEMICS

Dean (Academics)
HiCET

Programme	Course code	Name of the course	L	T	P	C
B.Tech	22PH2102	APPLIED MECHANICS	2	0	0	2

The student should be made

Course Objective

1. To understand basic concepts of engineering mechanics and the force system
2. To understand the properties of surfaces and solids
3. To understand the dynamics of particles
4. To understand the basics of engineering mechanics on solids
5. To understand the basic concept of mechanics of fluid

Unit	Description	Instructional Hours
I	**BASICS AND STATICS OF PARTICLES** Definition of mechanics- statics, dynamic -fundamental units -S.I Units - Scalar and Vector - Definition of force- Laws of mechanics - Characteristics of a force – system of force– Lami's theorem- Principle of transmissibility – Method of Resolution	6
II	**PROPERTIES OF SURFACES AND SOLIDS** Centroids and center of mass– Centroids of lines and areas – T section, I section by using standard formula – Moment of Inertia -Parallel axis theorem and perpendicular axis theorem.	6
III	**DYNAMICS OF PARTICLES** Rectilinear and Curve linear motion, - Energy - potential energy- kinetic energy- conservation of energy-work done by a force - work energy method	6
IV	**MECHANICS OF SOLIDS** Free body diagram – types of beams - supports and their reactions- moments and couple – Varignon's theorem- equilibrium of rigid bodies in two dimensions- Hooke's Law	6
V	**MECHANICS OF FLUID** Fluid statistics – pascal's law- Euler's equation of fluid static - Viscosity- Relationship between stress and strain – rate for Newtonian fluids – laminar flow – turbulent flow - Introduction to fluid dynamics	6
	Total Instructional Hours	**30**

Course Outcome

CO1	Define and illustrate the basic concepts of engineering mechanics and force systems.
CO2	Calculate the Centre of gravity and moment of inertia of an object
CO3	Determine the displacement, velocity, and acceleration of particles and objects.
CO4	Identify the resultant force and couple, support reactions of the beam
CO5	Define basic terms, values, and laws in the areas of fluids properties, statics, kinematics, and dynamics of fluids

TEXT BOOK:

T1 F.P. Beer, and Jr. E.R.Johnston., "Vector Mechanics for Engineers (In SI Units): Statics and Dynamics", 8th Edition,Tata McGraw-Hill Publishing company, New Delhi (2004)

T2 NH.Dubey, "Engineering Mechanics", Tata Mcraw Hill, New Delhi, 2016.

T3 Rjucsh K. Kundu , "Fluid Mechanics" Academic Press, 2002

REFERENCES:

R1 R.C.Hibbeller, and Ashok Gupta, "Engineering Mechanics: Statics and Dynamics", 11th Edition, Pearson Education2010.

R2 S.S.Bhavikatti, and K.G.Rajashekarappa, "Engineering Mechanics", New Age International (P) Limited Publishers,1998.

R3 P. Jaget Babu, "Engineering Mechanics", Pearson Publisher, India Ltd, 2016

Mapping of COs with POs and PSOs

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3								1	1		1	1	
CO2	3	2								1			1	
CO3	1	3										1	1	
CO4	1	1	2									1	1	
CO5	3	1										1	1	
AVG	2.2	1.75	2						1	1		1	1	

1-low, 2-medium, 3-high, '-"- no correlation

Note: The average value of this course to be used for program articulation matrix.

CHAIRMAN, BOARD OF STUDIES
Chairman - BoS
MCT - HiCET

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

DEAN ACADEMICS
Dean (Academics)
HiCET

Programme	Course code	Name of the course	L	T	P	C
B.Tech	22CY2101	ENVIRONMENTAL STUDIES (common to all branches except CSE,IT & AIML)	3	0	0	2

Course Objective

The student should be made

1. Grasp the importance and issues related to ecosystem and biodiversity and their protection.
2. Acquire knowledge about environmental pollution – sources, effects and control measures of environmental pollution.
3. Identify the various natural resources, exploitation and its conservation
4. Gain knowledge on the scientific, technological, economic and political solutions to environmental problems
5. Become aware on the national and international concern for environment and its protection

Unit	Description	Instructional Hours
I	**ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY** Main objectives and scope of environmental studies-Importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – food chain, food web and ecological pyramids - energy flow in the ecosystem – ecological succession processes - Introduction, types, characteristic features, structure and function of the forest and ponds ecosystem – Introduction to biodiversity definition: types and value of biodiversity – hot-spots of biodiversity – threats to biodiversity– endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.	9
II	**NATURAL RESOURCES** Renewable and Non-renewable resources - Forest resources: Use and over-exploitation, deforestation, timber extraction, mining, dams and their effects on forests and tribal people - Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture – Energy resources: Renewable and non-renewable energy sources – Solar energy and wind energy - role of an individual in conservation of natural resources.	9
III	**ENVIRONMENTAL POLLUTION** Definition – causes, effects and control measures of: Air pollution- Water pollution – Water quality parameters- Soil pollution - Noise pollution- nuclear hazards – role of an individual in prevention of pollution.	9
IV	**SOCIAL ISSUES AND THE ENVIRONMENT** From unsustainable to sustainable development – urban problems related to energy-environmental ethics: Issues and possible solutions – 12 Principles of green chemistry-Municipal solid waste management. Global issues – Climatic change, acid rain, greenhouse effect and ozone layer depletion – Disaster Management – Tsunami and cyclones.	9
V	**HUMAN POPULATION AND THE ENVIRONMENT** Population growth, variation among nations – population explosion – family welfare programme – environment and human health – effect of heavy metals – human rights – value education – HIV / AIDS – women and child welfare –Environmental impact analysis (EIA)- GIS-remote sensing-role of information technology in environment and human health.	9
	Total Instructional Hours	45

Course Outcome

CO1	Discuss the importance of ecosystem and biodiversity for maintaining ecological balance
CO2	Identify the causes of environmental pollution and hazards due to manmade activities.
CO3	Develop an understanding of different natural resources including renewable resources.
CO4	Demonstrate an appreciation for need for sustainable development and understand the various social issues and solutions to solve the issues.
CO5	Describe about the importance of women and child education, existing technology to protect environment

TEXT BOOK:

T1 S.Annadurai and P.N. Magudeswaran, "Environmental studies", Cengage Learning India Pvt.Ltd, Delhi, 2020

T2 Anubha Kaushik and C. P. Kaushik, "Perspectives in Environmental studies", Sixth edition, New Age International Publishers, New Delhi, 2019

REFERENCES:

R1 Erach Bharucha, "Textbook of environmental studies" University Press (I) Pvt.ltd, Hyderabad, 2015

CHAIRMAN, BOARD OF STUDIES

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL * HINDUSTHAN COLLEGE * Chairman

DEAN ACADEMICS

Dean (Academics)
HiCET

R2	G.Tyler Miller, Jr and Scott E. Spoolman"Environmental Science" Thirteenth Edition, Cengage Learning, 2010..
R3	Gilbert M. Masters and Wendell P. Ela "Introduction to Environmental Engineering and Science", 3rd edition, Pearson Education, 2013.

Mapping of COs with POs and PSOs														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	2	-	-	-	-	2	3	3	2	-	-	2	-	-
CO2	2	-	-	-	-	2	3	3	2	-	-	2	-	-
CO3	2	1	1	-	-	2	3	3	2	-	-	2	-	-
CO4	2	1	2	-	-	2	3	3	2	-	-	2	-	-
CO5	2	1	2	-	-	2	3	3	2	-	-	2	-	-
AVG	2	1	1.7	-	-	1	2	3	2	-	-	2	-	-
1-low, 2-medium, 3-high, '-"- no correlation Note: The average value of this course to be used for program articulation matrix.														

CHAIRMAN, BOARD OF STUDIES

Chairman - BoS
MCT - 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
B.Tech	22HE2151	EFFECTIVE TECHNICAL COMMUNICATION (Common to all Branches)	2	0	2	3

Course Objective		The student should be made
	1	To improve essential business communication skills
	2	To enrich employability knowledge
	3	To acquire the crucial organizing ability in official forum.
	4	To impart important business writings
	5	To make effective presentation with essential etiquette

Unit	Description	Instructional Hours
I	Language Proficiency: Types of sentences in English according to structure Writing: writing definitions, Describing product, work place and service (purpose, appearance, function) Vocabulary – words on nature **Practical Component: Listening- Watching and interpreting advertisements/short films Speaking- Extempore speech**	9
II	Language Proficiency: Direct and Indirect speech. Writing: Formal memos, Job application and resume preparation Vocabulary - words on offense and ethics **Practical Component: Listening- Comprehensions based on telephonic conversation Speaking- Vote of thanks& welcome address**	9
III	Language Proficiency: Homophones and Homonyms, Writing: Preparing a detail plan for an official visit, schedule and Itinerary, reading comprehension, Vocabulary– words on society **Practical Component: Listening- Listening- paraphrasing the listened content Speaking- Group Discussion with preparation**	9
IV	Language Proficiency: Idioms Writing: Report writing (marketing, investigating) Vocabulary-words involved in business **Practical Component: Listening- Watching technical discussions and preparing MoM Speaking- On the spot Group Discussion**	9
V	Language Proficiency: spotting errors Writing: making /interpreting chart, sequencing of sentences Vocabulary- words involved in finance **Practical Component: Listening- Comprehensions based on announcements Speaking- Presentation on a technical topic with ppt.**	9
	Total Instructional Hours	45

Course Outcome	CO1	To the business procedure and promotion skills
	CO2	To make oral and written presentation in corporate forum.
	CO3	To schedule official events and participate in official discussions without reluctance
	CO4	To take an effective role and manage in an organizational sector.
	CO5	To prepare and demonstrate a professional presentation

TEXT BOOK:

T1	Norman Whitby, "Business Benchmark-Pre-intermediate to Intermediate",Cambridge University Press, 2016
T2	Ian Wood and Anne Willams. "Pass Cambridge BEC Preliminary", Cengage Learning press 2015.

REFERENCES:

R1	Michael Mc Carthy, "Grammar for Business", Cambridge University Press, 2009.
R2	Bill Mascull, "Business Vocabulary in use: Advanced 2nd Edition", Cambridge University Press, 2009
R3	Frederick T. Wood, "Remedial English Grammar For Foreign Students", Macmillan publishers, 2001.

Mapping of COs with POs and PSOs

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	1	2	1	1	1	2	1	2	2	3	-	3	1	-
CO2	2	1	1	1	1	2	2	2	2	3	-	2	-	1
CO3	2	2	1	1	1	2	2	2	2	3	1	3	1	-
CO4	2	2	1	1	2	2	2	2	3	3	1	3	1	1
CO5	1	1	1	1	1	2	2	1	2	3	1	3	1	1
AVG	1.6	1.6	1	1	1.2	2	1.8	1.8	2.2	3	1	2.8	1	1

1-low, 2-medium, 3-high, '-"- no correlation

Note: The average value of this course to be used for program articulation matrix.

CHAIRMAN, BOARD OF STUDIES

Chairman - BoS
MCT - 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
B.Tech	22CY2152	APPLIED CHEMISTRY (MECH,AERO,CIVIL,AUTO,MCT)	2	0	2	3

	The student should be made	
Course Objective	1	Acquire knowledge on the concepts of chemistry involved in day today life
	2	Identify the water related problems and water treatment techniques
	3	Enhance the fundamental knowledge on electro chemistry and the mechanism of corrosion and its control
	4	Acquire knowledge on various thermo dynamical laws and its importance in engineering applications
	5	Acquire knowledge on the types of fuels, calorific value calculations, and manufacture of various types of fuels

Unit	Description	Instructional Hours
I	**CHEMISTRY IN EVERYDAY LIFE** Chemicals in food – Food colors – Artificial sweeteners – Food preservatives. Soaps and Detergents – Soaps – Types of Soap – Detergents – Types of detergents. Drugs – Classification of drugs - Therapeutic Action of Different Classes of Drugs. Chemicals in Cosmetics – Creams – Talcum powders- Deodorants – Perfumes. Plastics – Thermoplastics- Preparation, properties and uses of PVC, Teflon and Thermosetting plastics - Preparation, properties and uses of Polyester and Polyurethane.	6
II	**WATER TECHNOLOGY** Impurities in Water, Hardness of Water, Boiler feed Water – Boiler troubles -Sludge and scale formation, Caustic embrittlement, priming and foaming, boiler corrosion- -Softening Methods (Zeolite & Ion-Exchange Methods)- Desalination of Brackish Water - Reverse Osmosis, Potable water and treatment. **Estimation of total, permanent and temporary hardness of water by EDTA Determination of Dissolved Oxygen in sewage water by Winkler's method. Estimation of alkalinity of water sample by indicator method.**	6
III	**ELECTROCHEMISTRY AND CORROSION** Electrochemical cells – reversible and irreversible cells - EMF- Single electrode potential – Nernst equation (derivation only) – Conductometric titrations. Chemical corrosion – Pilling – Bedworth rule – electro chemical corrosion – different types –galvanic corrosion – differential aeration corrosion – corrosion control – sacrificial anode and impressed cathodic current methods. **Conductometric titration of strong acid vs strong base (HCl vs NaOH). Estimation of Ferrous iron by Potentiometry.**	6
IV	**CHEMICAL THERMODYNAMICS** Terminology of thermodynamics - Second law: Entropy - entropy change for an ideal gas, reversible and irreversible processes; entropy of phase transitions; Clausius inequality. Free energy and work function: Helmholtz and Gibbs free energy functions; Criteria of spontaneity; Gibbs Helmholtz equation- Clausius-Clapeyron equation; Maxwell relations – Van't Hoff isotherm and isochore..	6
V	**FUELS AND COMBUSTION** Fuels : Classification of fuels - coal varieties - analysis of coal (proximate and ultimate analysis) - coke manufacture (Otto-Hoffman byproduct coke oven method) - characteristics of metallurgical coke - cracking (thermal and catalytic cracking definition only) – manufacturing of synthetic petrol (Fischer Tropsch method, Bergius process) – knocking (octane number, cetane number) - gaseous fuels (production, composition and uses of producer gas and water gas).Combustion : gross and net calorific value - explosive range - spontaneous ignition temperature - flue gas analysis (Orsat apparatus).	6
	Total Instructional Hours	30+30

Course Outcome	CO1	To the business procedure and promotion skills
	CO2	To make oral and written presentation in corporate forum.
	CO3	To schedule official events and participate in official discussions without reluctance
	CO4	To take an effective role and manage in an organizational sector.
	CO5	To prepare and demonstrate a professional presentation

TEXT BOOK:

T1	Norman Whitby, "Business Benchmark-Pre-intermediate to Intermediate",Cambridge University Press, 2016
T2	Ian Wood and Anne Willams. "Pass Cambridge BEC Preliminary", Cengage Learning press 2015.

CHAIRMAN, BOARD OF STUDIES

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL * HINDUSTHAN INSTITUTE OF TECHNOLOGY * Chairman

DEAN ACADEMICS

Dean (Academics)
HiCET

REFERENCES:	
R1	Michael Mc Carthy, "Grammar for Business", Cambridge University Press, 2009.
R2	Bill Mascull, "Business Vocabulary in use: Advanced 2nd Edition", Cambridge University Press, 2009
R3	Frederick T. Wood, "Remedial English Grammar For Foreign Students", Macmillan publishers, 2001.

Mapping of COs with POs and PSOs														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3	2	2	-	2	1	1	-	-	-	-	1	1	1
CO2	3	2	2	-	2	1	-	-	-	-	-	1	1	-
CO3	3	2	2	-	2	1	1	-	-	-	-	1	1	-
CO4	3	2	2	2	2	1	-	-	-	-	-	1	1	1
CO5	3	2	2	-	2	1	-	-	-	-	-	1	1	1
AVG	3	2	2	2	2	1	1	-	-	-	-	1	1	1

1-low, 2-medium, 3-high, '-"- no correlation

Note: The average value of this course to be used for program articulation matrix.

CHAIRMAN, BOARD OF STUDIES

Chairman - BoS
MCT - HiCET

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

DEAN ACADEMICS

Dean (Academics)
HiCET

Programme	Course code	Name of the course	L	T	P	C
B.Tech	22MT2251	FUNDAMENTAL OF MECHATRONICS	2	0	2	3

Course Objective

The student should be made

1. To familiarize the basic introduction of Mechatronics
2. To impart knowledge on basic measurements and its principles
3. To apply the basic laws used in Electrical circuits and the different components
4. To impart knowledge on Integrated circuits
5. To provide knowledge on the fundamentals of semiconductor devices and their applications

Unit	Description	Instructional Hours
I	**MECHATRONICS** Definition and concepts of Mechatronics, Conventional system vs. Mechatronics system, Key elements of Mechatronics, Mechatronics Design Process . Need and Role of Mechatronics in Design, Applications of Mechatronics.	6
II	**MEASUREMENTS** Unit & dimensions, standards. Errors, Characteristics of Instruments and measurement system, Voltmeters and Current Meters, Ohmmeters, Millimeters and Meter Protection..	6
III	**ELECTRICAL CIRCUITS** D.C. Voltage-current, power, Resistor, Pullup and Pull down resistor , Ohms law, series and parallel circuits ,Voltage and current division rule, Kirchhoff's laws , Mesh analysis . **Experimental Components :Verification of Ohm's Law and kirchoffs Law**	6+3
IV	**SIGNAL CONDITIONING** Introduction to signal processing & Op-Amp, Op-Amp as signal conditioner, Analogue to Digital Converter, Digital to Analogue Converter, Filters-Types, Sample and Hold Circuits. **Experimental Components: Design and Testing of Op-Amp- Measurement of Resistor, Capacitor and Inductor using Multimeter-Design and Testing of ADC and DAC.**	6+6
V	**SEMICONDUCTOR DEVICES** Study of switching devices, SCR, TRIAC, GTO, BJT, MOSFET, IGBT and IGCT-Static characteristics: SCR, MOSFET and IGBT. **Experimental Components: Characteristics study of SCR,MOSFET and IGBT.**	6+6
	Total Instructional Hours	**30+15**

Course Outcome

CO1	To construct Mechatronics design process with respect to needs and application.
CO2	To use appropriate instruments and meters for measurement.
CO3	To apply the ohms Law and Kirchoffs Law in electrical circuits
CO4	To explain the process of signal conditioning.
CO5	To use appropriate semiconductor devices for applications.

TEXT BOOK:

T1 Richard A. Kolk & Devdas Shetty , "Mechatronics System Design"- 2nd Edition **Cengage India Pvt. Ltd,** 2012.

T2 S. Salivahanan & S. Pravin Kumar, "Circuit Theory", Vikas Publishing House 2014

REFERENCES:

R1 D.Roy Choudhury, Shail B.Jain , "Linear Integrated Circuits", **New Age** Publisher,2018

R2 A.K. Sawhney, "A Course In Electronic Measurements And Instrumentation",Dhanpat Rai Publisher,2015

R3 Salivahanan.S, "Electronic Devices and Circuits", McGraw-Hill Education, 2017.

Mapping of COs with POs and PSOs

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

CHAIRMAN, BOARD OF STUDIES

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL • MAHENDHIRA COLLEGE OF ENGG & TECH • Chairman

DEAN ACADEMICS

Dean (Academics)
HiCET

1-low, 2-medium, 3-high, '-'- no correlation
Note: The average value of this course to be used for program articulation matrix.

CHAIRMAN, BOARD OF STUDIES
Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL
Chairman
CHOGM TECH

DEAN ACADEMICS
Dean (Academics)
HiCET

Programme	Course code	Name of the course	L	T	P	C
B.Tech	22ME2001	ENGINEERING PRACTICES (Common to all branches)	0	0	4	2

	The student should be made	
Course Objective	1	To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical and Electrical Engineering.

Unit	Description	Instructional Hours
	GROUP A (CIVIL AND MECHANICAL)	
1	Preparation of Single pipe line and Double pipe line connection by using valves, taps, couplings, unions, reducers and elbows.	
2	Arrangement of bricks using English Bond for one brick thick wall for right angle corner junction and T- junction	
3	Arrangement of bricks using English Bond for one and a half brick thick wall for right angle corner and T- junction	
4	Preparation of arc welding of Butt joints, Lap joints and Tee joints.	
5	Practice on sheet metal Models– Trays and funnels	
6	Hands-on-exercise in wood work, joints by sawing, planning and cutting.	
7	Practice on simple step turning, taper turning and drilling.	
8	Demonstration on Smithy operation.	
9	Demonstration on Foundry operation.	
10	Demonstration on Power tools.	
	GROUP B (ELECTRICAL ENGINEERING)	
1	Residential house wiring using switches, fuse, indicator, lamp and energy meter.	
2	Fluorescent lamp wiring.	
3	Stair case wiring.	
4	Measurement of Electrical quantities – voltage, current, power & power factor in single phase circuits.	
5	Measurement of energy using single phase energy meter.	
6	Soldering practice using general purpose PCB.	
7	Measurement of Time, Frequency and Peak Value of an Alternating Quantity using CRO and Function Generator.	
8	Study of Energy Efficient Equipment's and Measuring Instruments.	
	Total Instructional Hours	**45**

Course Outcome	CO1	Fabricate wooden components and pipe connections including plumbing works
	CO2	Fabricate simple weld joints
	CO3	Fabricate different electrical wiring circuits and understand the AC Circuits.

Mapping of COs with POs and PSOs

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

1-low, 2-medium, 3-high, '-"- no correlation

Note: The average value of this course to be used for program articulation matrix.

CHAIRMAN, BOARD OF STUDIES

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL * TECH * Chairman

DEAN ACADEMICS

Dean (Academics)
HiCET

Programme	Course code	Name of the course	L	T	P	C
B.Tech	22HE2071	DESIGN THINKING	2	0	0	2

	The student should be made	
Course Objective	1	To expose students to the design process
	2	To develop and test innovative ideas through a rapid iteration cycle.
	3	To provide an authentic opportunity for students to develop teamwork and leadership skills

Unit	Description	Instructional Hours
I	**DESIGN ABILITY** Asking Designers about what they Do – Deconstructing what Designers Do – Watching what Designers Do – Thinking about what Designers Do – The Natural Intelligence of Design Sources	6
II	**DESIGNING TO WIN** Formula One Designing – Radical Innovations – City Car Design – Learning From Failures – Design Process and Working Methods	5
III	**DESIGN TO PLEASE AND DESIGNING TOGETHER** Background – Product Innovations – Teamwork versus Individual work – Roles and Responsibilities – Avoiding and Resolving Conflicts.	6
IV	**DESIGN EXPERTISE** Design Process – Creative Design - Design Intelligence – Development of Expertise – Novice to Expert. Critical Thinking – Case studies: Brief history of Albert Einstein, Isaac Newton and Nikola Tesla	6
V	**DESIGN THINKING TOOLS AND METHODS** Purposeful Use of Tools and Alignment with Process - Journey Mapping - Value Chain Analysis - Mind Mapping – Brainstorming - Design Thinking Application: Design Thinking Applied to Product Development	7
	Total Instructional Hours	30

Course Outcome	CO1	Develop a strong understanding of the Design Process.
	CO2	Learn to develop and test innovative ideas through a rapid iteration cycle
	CO3	Develop teamwork and leadership skills

TEXT BOOK:

T1	Nigel Cross, "Design Thinking", Kindle Edition.

REFERENCES:

R1	Tom Kelley, "Creative Confidence", 2013.
R2	Tim Brown, "Change by Design", 2009

CHAIRMAN, BOARD OF STUDIES

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL * MNM JAIN ENGG COLLEGE * Chairman

DEAN ACADEMICS

Dean (Academics)
HiCET

Programme	Course code	Name of the course	L	T	P	C
B.Tech	22HE2072	SOFT SKILLS AND APTITUDE I	0	0	0	1

	The student should be made	
Course Objective	1	To develop and nurture the soft skills of the students through instruction, knowledge acquisition, demonstration and practice
	2	To enhance the student's ability to deal with numerical and quantitative skills
	3	To identify the core skills associated with critical thinking
	4	To develop and integrate the use of English language skills

Unit	Description	Instructional Hours
I	Lessons on excellence Skill introspection, Skill acquisition, consistent practice	2
II	Logical Reasoning Problem Solving - Critical Thinking- Lateral Thinking - Coding and Decoding – Series – Analogy - Odd Man Out - Visual Reasoning - Sudoku puzzles - Attention to detail	11
III	Quantitative Aptitude Addition and Subtraction of bigger numbers - square and square roots - Cubes and cube roots - Vedic maths techniques - Multiplication Shortcuts - Multiplication of 3 and higher digit numbers – Simplifications - Comparing fractions - Shortcuts to find HCF and LCM - Divisibility tests shortcuts - Algebra and functions	11
IV	Recruitment Essentials Resume Building - Impression Management	4
V	Verbal Ability Nouns and Pronouns – Verbs - Subject-Verb Agreement - Pronoun-Antecedent – Agreement - Punctuations	4
	Total Instructional Hours	**30**

Course Outcome	CO1	Students will analyze interpersonal communication skills. public speaking skills.
	CO2	Students will exemplify tautology, contradiction and contingency by logical thinking
	CO3	Students will be able to develop an appropriate integral form to solve all sorts of quantitative problems.
	CO4	Students can produce a resume that describes their education, skills, experiences and measurable achievements with proper grammar, format and brevity
	CO5	Students will be developed to acquire the ability to use English language with an error while making optimum use of grammar

REFERENCES:

R1	Quantitative Aptitude – Dr. R S Agarwal
R2	Speed Mathematics: Secret Skills for Quick Calculation - Bill Handley
R3	Verbal and Non – Verbal Reasoning – Dr. R S Agarwal
R4	Objective General English – S.P.Bakshi

CHAIRMAN, BOARD OF STUDIES

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL
Chairman
MAHENDHRA COLLEGE OF ENGG & TECH

DEAN ACADEMICS

Dean (Academics)
HiCET

Programme	Course code	Name of the course	L	T	P	C
B.Tech	22MC2091	தமிழர்மரபு	2	0	0	0

Unit	Description	Instructional Hours

அலகு I மொழி மற்றும் இலக்கியம் 3

இந்திய மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழ் செவ்விலக்கியங்கள் . சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை - சங்க இலக்கியத்தில் பகிர்தல் அறம் - திருக்குறளில் மேலாண்மைக் கருத்துக்கள் - தமிழ்க் காப்பியங்கள். தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம் ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றிலக்கியங்கள் - தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி - தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு

அலகு II மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக் கலை 3

நடுகல் முதல் நவீன சிற்பங்கள் வரை - ஐம்பொன் சிலைகள் - பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள். பொம்மைகள் - தேர் செய்யும் கலை - சுடுமண் சிற்பங்கள் - நாட்டுப்புறத் தெய்வங்கள் - குமரிமுனையில் திருவள்ளுவர் சிலை - இசைக் கருவிகள் - மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் - தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

அலகு III நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள் 3

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

அலகு IV தமிழர்களின் திணைக் கோட்பாடுகள் 3

தமிழகத்தின் தாவரங்களும், விலங்குகளும் - தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு - சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் - சங்ககால நகரங்களும் துறை முகங்களும் - சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.

அலகு V இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு 3

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை - ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL - (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Publishedby: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

CHAIRMAN, BOARD OF STUDIES

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL Chairman

DEAN ACADEMICS

Dean (Academics)
HiCET

Programme	Course code	Name of the course	L	T	P	C
B.Tech	22MC2093	SOCIAL SERVICES AND COMMUNITY DEVELOPMENT	1	0	0	1

		The student should be made
Course Objective	1	Acquire the knowledge and active participate in social service and community development activities
	2	Understand the concept of disaster management and role of NCC cadets in disaster management
	3	Understand the concept thinking and reasoning process
	4	Understand about maps and use of bearing and service protector
	5	Know about the principles of flight and Aero foil structure and ATC procedures

Unit	Description	Instructional Hours
I	**SOCIAL SERVICES AND COMMUNITY DEVELOPMENT** Basics of social services and its need - Rural development programs - Contribution of youth towards social welfare - NGOs in social services Swachh bharath Abhiyan - Social evils - Mission Indra danush - Beti bacho Beti pado - Digital awareness - Constitution day.	3
II	**DISASTER MANAGEMENT** Organization of Disaster management -Types of emergencies - Natural and manmade disasters - fire service and fire fighting - prevention of fire.	3
III	**PERSONALITY DEVELOPMENT** Introduction to personality development - public speaking Intra and Inter personal skills - self-awareness - critical thinking - Decision making and problem solving.	3
IV	**MAP READING** Types of maps - conventional signs - scales and Grid system - relief and contour gradient - cardinal points - Types of North - types of bearing and use of service protector - Prismatic compass and its uses - setting of map - finding North and own position.	3
V	**PRINCIPLES OF FLIGHT AND AIRMANSHIP** Introduction to principle of flight - Forces acting on the aircraft - Angle of attack - Angle of incidence - Newton's - law of motion - Bernauli's theorem and Venturi effect - Aerofoil - Airfield layout - ATC (Air Traffic Control) - circuit procedures - Aviation medicine.	3
	Total Instructional Hours	**15**

Course Outcome	CO1	Perform the social services on various occasions for better community and social life
	CO2	Appreciate the need and requirement for disaster management and NCC role in disaster management activities
	CO3	Define thinking, reasoning, critical thinking and creative thinking
	CO4	Use of bearing and service protector and locate the places and objects on the ground
	CO5	Understand the principles of flight and Aerofoil structure

REFERENCES:

R1	UGC and AICTE circulated syllabus

TEXT BOOKS:

T1	NCC cadet Guide (SD/SW) Army
T2	NCC cadet Guide (SD/SW) Airforce
T3	ANOs Guide (SD/SW) by DG NCC, Ministry of Defence, New Delhi
T4	Digital Forum App 1.0 & 2.0, by DG NCC DG NCC, Ministry of Defence, New Delhi

CHAIRMAN, BOARD OF STUDIES
Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL Chairman

DEAN ACADEMICS
Dean (Academics)
HiCET

HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST

HICET

HINDUSTHAN

COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution)

Coimbatore – 641032

DEPARTMENT OF MECHATRONICS ENGINEERING

Revised Curriculum and Syllabus for the Batch 2021-2025

(Academic Council Meeting Held on 13.08.2021)

2019 REGULATIONS

ACADEMIC COUNCIL • Chairman • HINDUSTHAN COLLEGE OF ENGG & TECH

HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY,COIMBATORE 641 032

(An Autonomous Institution Affiliated to Anna University, Chennai)

VISION OF THE INSTITUTE

To become a premier institution by producing professional with strong technical knowledge, innovative research skills and high ethical values

MISSION OF THE INSTITUTE

- To provide academic excellence in technical education through novel teaching methods.
- To empower students with creative skills and leadership qualities.
- To produce dedicated professionals with social responsibility

VISION OF THE DEPARTMENT

To excel in Mechatronics engineering by imparting technical knowledge, innovation skills and ethics to fulfill the global needs with human values

MISSION OF THE DEPARTMENT

- To impart sound technical knowledge and produce highly proficient professionals in the mechatronics engineering domain.
- To empower students with strong competency skills to solve multi-disciplinary engineering problems using mechatronics approach.
- To inculcate human values and ethical responsibility to the students for social welfare

PROGRAM EDUCATIONAL OBJECTIVE (PEOs)	
PEO 1	To produce professional graduates with the ability to synergistically integrate multi-disciplinary domains to solve complex engineering problems with Mechatronics approach.
PEO 2	To produce professional graduates with the acumen for interdisciplinary research, entrepreneurship and higher studies to meet the local and global needs.
PEO 3	To produce professional graduates with ethical and moral values in rendering services to the society.

PROGRAM OUTCOMES (POs)	
PO 1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems:** Use research - based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO 6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

	PROGRAM SPECIFIC OUTCOMES (PSOs)
PSO1	To provide ability to analyze, design and develop mechatronic systems by integrating knowledge in sensors, actuators and controllers to solve complex engineering problems.
PSO2	To provide smart automation solutions for real time industrial problems using multidisciplinary approach

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL
Chairman
HINDUSTHAN COLLEGE OF ENGINEERING & TECHNOLOGY

Dean (Academics)

Dean (Academics)
HiCET

PEO's – PO's& PSO's MAPPING

PEOs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	3	3	2	3	1	1	1	3	1	1	1	3	2
2	2	3	3	3	3	2	2	1	2	1	2	2	3	3
3	2	3	2	2	1	2	3	3	3	2	3	1	2	3

PROGRAM ARTICULATION MATRIX

Year	Sem	Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PS01	PS02
I	I	Technical English	1	-	-	-	-	1.8	0.8	1	2	3	1	3	-	-
		Calculus and Linear Algebra	2.2	2	2	1.6	1	-	-	-	2	-	-	2	1.8	1.8
		Applied Physics	3	2.4	1.2	1.8	1.8	0.6	0.4	-	-	-	-	1	2.4	2.4
		Chemistry for Engineers	2.2	2.4	2.2	2	-	-	2	-	2	-	-	2	1.8	1.8
		Python Programming and Practices	3	3	2	2	3	1	-	-	-	-	-	2	1	2
		Engineering Drawing	3	3	3	2	2	-	-	-	-	-	-	2.8	1.8	1.8
	II	Business English for Engineers	1.4	2	2	1.2	-	-	-	-	0.2	-	-	0.2	1.8	1.8
		Differential Equations and Complex Variables	1.75	2	2	1.5	-	-	-	-	1	-	-	1	1.8	1.8
		Engineering Mechanics	3	2	2	2	2	-	-	-	-	-	-	2	1.8	1.8
		Material Science	3	2.4	1.2	1.8	1.8	0.6	0.4	-	-	-	-	-	2.4	2.4
		Environmental Studies	3	2	-	-	-	3	2	2	-	-	-	2	-	-
		Basics of Mechatronics Engineering	2.6	1	1.6	0.4	0.6	0	0.2	0	0	0	0	1.4	2.6	2.2
		Engineering Practices Lab	3	3	3	3	2	1						2	1	1
II	III	Fourier Series and Statistics	3	3	2	3	3	1	1	-	1	-	-	2	2	2
		Mechanics of solids	3	3	2	2	2	-	-	-	1	-	-	2	2	1
		Industrial Motor Control	2.2	1.4	2	2	0.8	0.4	-	-	0.8	-	0.4	1.8	1.8	1.4
		Digital Applications in Mechatronics Systems	3	3	3	2	2	-	-	-	-	-	-	2	2	3
		Production Technology	3	3	2	3	3	1	1	-	1	-	-	2	2	2
		Computer Aided Drafting Laboratory	3	2	3	2.2	3	-	-	1	2	-	-	2	2.2	2
		Industrial Motor Control Laboratory	1.4	1.4	2.2	1.4	0.6	-	-	-	-	0.6	1	1	1.6	1.4
	IV	Numerical Methods	3	3	2	3	3	1	1	-	1	-	-	2	2	2
		Microcomputer Systems and Microcontroller	3	3	2	3	3	1	1	-	-	2	1	2	2	2

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Chairman

Dean (Academics)

Dean (Academics)
HiCET

		Thermodynamics and Fluid Engineering	3	3	3	2	2	2	2	0.8	-	-	-	2	1	2
		Theory of Machines	2.2	1.4	1.8	-	-	-	-	-	0.2	0.4	-	0.8	1.4	-
		Sensors and Signal Conditioning	3	2	2.8	2.8	2.8	2.2	1	-	-	1	1	1	2.6	2.6
		Assembly Programming and Interfacing Laboratory	3	3	3	3	3	1	1	-	-	2	1	2	2	2
		Solid and Fluid Mechanics & Machinery Laboratory	3	2	2	2.8	1	1	-	-	1	-	-	2	1.2	1.4
III	V	Machine Design	3	3	3	3	3	2	1	2	-	-	-	2	2	2
		Industrial Automation and Control	0.6	-	2.2	-	0.2	-	-	-	0.2	0.2	0.2	0.6	1.8	-
		Control of Mechatronics Systems	0.6	-	2.2	-	0.2	-	-	-	0.2	0.2	0.2	0.6	-	1.8
		Fluid Power Systems	3	2	2.2	2.8	2.8	1	-	-	-	-	-	2	2	3
		Object Oriented Programming	3	2	3	2	3	-	-	-	-	-	-	2	2	1
		Computer Aided Machine Drawing Laboratory	2.3	1.8	2	1.75	2	2	2	2	1.5	2	2	1.5	1.8	1.8
		Industrial Automation and Control Laboratory - I	0.8	-	2	-	1.2	-	-	-	1.2	-	1.6	-	1.8	-
		Engineering Metrology and Measurements	2	1.2	2.2	1	-	0.4	-	-	-	-	-	0.8	1.2	2.6
		Non Traditional Machining Techniques	3	2	3	2	3	-	1	-	-	-	-	2	2	2.4
		Automobile Systems	0.6	-	2.2	-	0.2	-	-	-	0.2	0.2	0.2	0.6	1.8	-
		Operations Research	3	3	2.2	1.2	1	1	-	-	-	-	1	1	1.8	1
		Materials Science and Applications	3	3	2	2	2	-	-	-	1	-	-	2	2	1
	VI	Total Quality Management	-	-	-	-	0.8	2	0.6	0.8	0.6	-	1.4	1.2	-	-
		Design of Mechatronics Systems	2.4	2	2.2	1.8	1	-	-	-	0.6	0.6	0.6	2	2.6	2.2
		CNC Technology	3	2	2	2	1	1	-	-	-	-	-	2	2	2
		Vetronics	2.4	1.4	2.2	2.2	1.2	2	2.4	-	-	-	-	3	2.4	-
		CNC Laboratory	2.3	1.8	2	1.75	2	2	2	2	1.5	2	2	1.5	1.8	1.8
		Industrial Automation and Control Laboratory - II	1.8	1.2	0.6	-	2	-	-	-	1	1.5	-	-	1.4	2
		Embedded System	3	2.2	3	2.2	3	-	-	-	1	-	-	3	3	2
		Discrete Event System Simulation	-	3	-	-	0.8	2	0.6	0.8	0.6	-	1.4	1.2	-	-
		Product Design and Development	3	3	2.2	1.2	1	1	-	1	2	-	1.4	1	1.8	1
		Non-Destructive Testing Techniques	3	2	3	2	3	-	1	-	-	-	-	2	2	2.4
		Distinctive Electrical Machines	3	2	3	2	2	1	-	-	-	-	1	2	2	2
IV	VII	Virtual Instrumentation and Human Machine Interface	3	1.8		1.2	1.6	-	-	1.2	1.8	-	0.8	1.8	2	2

Chairman, Board of Studies

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

Dean (Academics)

		Machine Vision Systems	1.4	-	2.2	-	1.2	-	-	-	1	1	1	1.2	1.8	1.6
		Industrial Robotics	0.6	-	2.2	-	0.2	-	-	-	0.2	0.2	0.2	0.6	-	1.8
		CAE Laboratory	2.3	1.8	2	1.75	2	2	2	2	1.5	2	2	1.5	1.8	1.8
		Project Phase – I	3	3	3	3	3	3	3	3	3	3	3	3	3	3
		Mobile Robotics	0.6	-	2.2	-	0.2	-	-	-	0.2	0.2	0.2	0.6	-	1.8
		Textile Automation	0.6	-	2.2	-	0.2	-	-	-	0.2	0.2	0.2	0.6	1.8	-
		Medical Mechatronics	2.4	2	2.2	1.8	1	-	-	-	0.6	0.6	0.6	2	2.6	2.2
		Disaster Management	3	3	2.2	1.2	1	1	-	-	-	-	1	1	1.8	1
		Factory Automation	3	3	2	2	3	-	-	-	-	2	1	3	2	2
	VIII	Project Phase – II	3	3	3	3	3	3	3	3	3	3	3	3	3	3
		Rapid Prototyping and Reverse Engineering	3	2.2	3	2.2	3	-	-	-	1	-	-	3	3	2
		Industrial IoT	3	2	3	2	3	-	-	-	-	-	-	2	2	1
		Artificial Intelligence for Mechatronics Engineering	3	2	3	2	3	-	-	-	-	-	-	2	2	1
		MEMS and Nano Technology	3	3	2	3	3	1	1	-	1	-	-	2	2	2
		Information System for Engineers	3	3	3	2	2	-	-	-	-	-	-	2	2	3
		Machineries in Agriculture	2.2	1.4	1.8	-	-	-	-	-	0.2	0.4	-	0.8	1.4	-
		Industrial Diagnostics and Maintenance Techniques	1.2	0.2	0.6	-	-	0.6	-	-	0.2	0.4	0.8	0.4	1.2	0.4
		Engineering Economics and Cost Analysis	2	1.2	2	1.2	1	1	1	1.2	1.2	1	1	1.2	1.4	1.6
		Principles of Management	-	-	-	-	0.8	2	0.6	0.8	0.6	-	1.4	1.2	-	-
		Professional Ethics in Engineering	2	1.8	0.8	1.8	1.8	2	2.2	2	2.8	2.8	3	2	-	1
		HONOURS DEGREE														
		Concepts of Machines and Mechanisms	2.2	1.4	1.8	-	-	-	-	-	0.2	0.4	-	0.8	1.4	-
		Robotics in Medicine	0.6	-	2.2	-	0.2	-	-	-	0.2	0.2	0.2	0.6	-	1.8
		Robots and Systems in Smart Manufacturing	0.6	-	2.2	-	0.2	-	-	-	0.2	0.2	0.2	0.6	-	1.8

Chairman - BoS
Chairman, Board of Studies
MCT - HiCET

ACADEMIC COUNCIL
Chairman
HINDUSTHAN COLLEGE OF ENGINEERING

Dean (Academics)
HiCET
Dean Academics

DETAILS OF CHANGES CARRIED OUT IN CURRICULUM & SYLLABUS

CBCS PATTERN

UNDERGRADUATE PROGRAMMES

B.E MECHATRONICS ENGINEERING

REGULATION-2019

(For the students admitted during the academic year 2020-2021 and onwards)

The course code 21 indicates that the students joined in the academic year 2021

SEMESTER I

S.No.	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
		THEORY								
1.	21HE1101	Technical English	HS	2	1	0	3	40	60	100
2.	21MA1102	Calculus and Linear Algebra	BS	3	1	0	4	40	60	100
		THEORY & LAB COMPONENT								
3.	21PH1151	Applied Physics	BS	2	0	2	3	50	50	100
4.	21CY1151	Chemistry for Engineers	BS	2	0	2	3	50	50	100
5.	21CS1151	Python Programming and Practices	ES	2	0	2	3	50	50	100
6.	21ME1152	Engineering Drawing	ES	1	0	4	3	50	50	100
7.	21HE1701	Language Competency Enhancement Course - I	HS	0	0	2	1	100	0	100
8.	21HE1072	Career Guidance – Level I Personality, Aptitude and Career Development	EEC	2	0	0	0	100	0	100
9.	21HE1073	Entrepreneurship & Innovation	EEC	1	0	0	0	100	0	100
			Total:	15	2	11	20	550	350	900

As Per AICTE Norms 3 Weeks Induction Programme is Added in The First Semester as an Audit Course

Chairman - BoS
Chairman, Board of Studies
MCT - HiCET

HINDUSTHAN COLLEGE OF ENGG. & TECH. ACADEMIC COUNCIL Chairman

Dean (Academics)
Dean Academics
HiCET

SEMESTER II

S.No.	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1.	21HE2101	Business English for Engineers	HS	2	1	0	3	40	60	100
2.	21MA2101	Differential Equations and Complex Variables	BS	3	1	0	4	40	60	100
3.	21ME2101	Engineering Mechanics	ES	3	0	0	3	40	60	100
THEORY & LAB COMPONENT										
4.	21PH2151	Material Science	BS	2	0	2	3	50	50	100
5.	21CY2151	Environmental Studies	BS	2	0	2	3	50	50	100
6.	21MT2153	Basics of Mechatronics Engineering	ES	2	0	2	3	50	50	100
PRACTICALS										
7.	21GE2001	Engineering Practices Lab	ES	0	0	4	2	60	40	100
8.	21HE2701	Language Competency Enhancement Course - II	HS	0	0	1	1	100	0	100
MANDATORY COURSES										
9.	21HE2072	**Career Guidance Level – II** Personality, Aptitude and Career Development	EEC	2	0	0	0	100	0	100
			Total:	**16**	**2**	**11**	**22**	**475**	**425**	**900**

SEMESTER III

S.No	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1.	21MA3101	Fourier Series and Statistics	BS	3	1	0	4	40	60	100
2.	21MT3201	Mechanics of solids	PC	3	1	0	4	40	60	100
3.	21MT3202	Industrial Motor Control	PC	3	0	0	3	40	60	100
4.	21MT3203	Digital Electronics in Mechatronics Systems	PC	3	0	0	3	40	60	100
THEORY AND LAB COMPONENT										
5.	21MT3251	Production Technology	PC	2	0	2	3	50	50	100
PRACTICALS										
6.	21MT3001	Computer Aided Drafting Laboratory	PC	0	0	3	1.5	60	40	100
7.	21MT3002	Industrial Motor Control Laboratory	PC	0	0	3	1.5	60	40	100
MANDATORY COURSES										
8.	21MC3191	Indian Constitution	MC	2	0	0	0	100	0	100
9.	21HE3072	**Career Guidance Level – III** Personality, Aptitude and CareerDevelopment	EEC	2	0	0	0	100	0	100
10.	21HE3073	Leadership Management Skills	EEC	1	0	0	0	100	0	100
			Total	**19**	**2**	**8**	**20**	**630**	**370**	**1000**

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL • HINDUSTHAN COLLEGE OF ENGG & TECH • Chairman

Dean (Academics)

Dean (Academics)
HiCET

SEMESTER IV

S.No	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1.	21MA4101	Numerical Methods	BS	3	1	0	4	40	60	100
2.	21MT4201	Microcomputer Systems and Microcontroller	PC	3	0	0	3	40	60	100
3.	21MT4202	Thermodynamics and Fluid Engineering	PC	3	1	0	4	40	60	100
4.	21MT4203	Theory of Machines	PC	3	1	0	4	40	60	100
THEORY AND LAB COMPONENT										
4.	21MT4251	Sensors and Signal Conditioning	PC	2	0	2	3	50	50	100
PRACTICALS										
6.	21MT4001	Assembly Programming and Interfacing Laboratory	PC	0	0	3	1.5	60	40	100
7.	21MT4002	Solid and Fluid Mechanics & Machinery Laboratory	PC	0	0	3	1.5	60	40	100
MANDATORY COURSES										
8.	21MC4191	Essence of Indian tradition knowledge/Value Education	MC	2	0	0	0	100	0	100
9.	21HE4072	**Career Guidance Level – IV** Personality, Aptitude andCareer Development	EEC	2	0	0	0	100	0	100
10.	21HE4073	Ideation Skills	EEC	2	0	0	0	100	0	100
			Total	**20**	**2**	**10**	**21**	**630**	**370**	**1000**

SEMESTER V

S. No	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	Total
1.	21MT5201	Machine Design	PC	3	1	0	4	40	60	100
2.	21MT5202	Industrial Automation and Control	PC	3	0	0	3	40	60	100
3.	21MT5203	Control of Mechatronics Systems	PC	3	0	0	3	40	60	100
4.	21MT53XX	**Professional Elective - I**	PE	3	0	0	3	40	60	100
THEORY WITH LAB COMPONENT										
7.	21MT5251	Fluid Power Systems	PC	2	0	2	3	50	50	100
8.	21MT5252	Object Oriented Programming	PC	2	0	2	3	50	50	100
PRACTICALS										
9.	21MT5001	Computer Aided Machine Drawing Laboratory	PC	0	0	3	1.5	60	40	100
10.	21MT5002	Industrial Automation and Control Laboratory - I	PC	0	0	3	1.5	60	40	100
MANDATORY COURSES										
11.	21HE5071	Soft Skills - I	EEC	1	0	0	1	100	0	100
12.	21HE5072	Design Thinking	EEC	1	0	0	1	100	0	100
			TOTAL	18	1	10	24	580	420	1000

Chairman Board of Studies
Chairman BOS
MCT - HiCET

ACADEMIC COUNCIL • MAHENDHIRA COLLEGE OF ENGG & TECH • Chairman

Dean Academics
Dean (Academics)
HiCET

SEMESTER VI

S. No	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	Total
THEORY										
1.	**21MT6181**	Total Quality Management	HS	3	0	0	3	40	60	100
2.	**21MT6201**	Design of Mechatronics Systems	PC	3	0	0	3	40	60	100
3.	**21MT6202**	CNC Technology	PC	3	0	0	3	40	60	100
4.	**21MT63XX**	**Professional Elective - II**	PE	3	0	0	3	40	60	100
5.	**21XX6401**	**Open Elective – I**	OE	3	0	0	3	40	60	100
THEORY WITH LAB COMPONENT										
6.	**21MT6251**	Vetronics	PC	2	0	2	3	50	50	100
PRACTICALS										
7.	**21MT6001**	CNC Laboratory	PC	0	0	3	1.5	60	40	100
8.	**21MT6002**	Industrial Automation and Control Laboratory - II	PC	0	0	3	1.5	60	40	100
9.	**21MT6701**	Inplant Training / Internship *	EEC	0	0	0	1	60	40	100
MANDATORY COURSES										
10.	**21HE6071**	Soft Skill II	EEC	1	0	0	1	100	0	100
11.	**21HE6072**	Intellectual Property Rights (IPR)	EEC	1	0	0	1	100	0	100
			TOTAL	**16**	**0**	**8**	**24**	**630**	**470**	**1100**

S.No.	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
PROFESSIONAL ELECTIVE I										
1	**21MT5301**	Engineering Metrology and Measurements	PE	3	0	0	3	40	60	100
2	**21MT5302**	Non-Traditional Machining Techniques	PE	3	0	0	3	40	60	100
3	**21MT5303**	Automobile Systems	PE	3	0	0	3	40	60	100
4	**21MT5304**	Operational Research	PE	3	0	0	3	40	60	100
5	**21MT5305**	Materials Science and Applications	PE	3	0	0	3	40	60	100
PROFESSIONAL ELECTIVE II										
1	**21MT6301**	Embedded System	PE	3	0	0	3	40	60	100
2	**21MT6302**	Discrete Event System Simulation	PE	3	0	0	3	40	60	100
3	**21MT6303**	Product Design and Development	PE	3	0	0	3	40	60	100
4	**21MT6304**	Non-Destructive Testing Techniques	PE	3	0	0	3	40	60	100
5	21MT6305	Distinctive Electrical Machines	PE	3	0	0	3	40	60	100

Chairman

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Dean

Dean Academics

OPEN ELECTIVE

S.No.	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
1.	21MT6401	Industrial Safety and Environment	OE	3	0	0	3	40	60	100

SEMESTER VII

S. No	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	Total
THEORY										
1.	21MT7201	Virtual Instrumentation and Human Machine Interface	PC	3	1	0	4	40	60	100
2.	21MT7202	Machine Vision Systems	PC	3	0	0	3	40	60	100
3.	21MT73XX	**Professional Elective - III**	PE	3	0	0	3	40	60	100
4.	21XX7401	**Open Elective – II**	OE	3	0	0	3	40	60	100
THEORY WITH LAB COMPONENT										
5.	21MT7251	Industrial Robotics	PC	2	0	3	3.5	50	50	100
PRACTICALS										
6.	21MT7001	CAE Laboratory	PC	0	0	3	1.5	60	40	100
PROJECT WORK										
7.	21MT7901	Project Phase – I	EEC	0	0	4	2	60	40	100
			TOTAL	**14**	**1**	**10**	**20**	**330**	**370**	**700**

SEMESTER VIII

S.No	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1.	21MT83XX	**Professional Elective - IV**	PE	3	0	0	3	40	60	100
2.	21MT83XX	**Professional Elective - V**	PE	3	0	0	3	40	60	100
PRACTICAL										
3.	21MT8901	Project Work – Phase II	EEC	0	0	16	8	100	0	100
			TOTAL	**6**	**0**	**16**	14	180	120	**300**

PROFESSIONAL ELECTIVE III

S.No.	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
1.	21MT7301	Mobile Robotics	PE	3	0	0	3	40	60	100
2.	21MT7302	Textile Automation	PE	3	0	0	3	40	60	100
3.	21MT7303	Medical Mechatronics	PE	3	0	0	3	40	60	100
4.	21MT7304	Disaster Management	PE	3	0	0	3	40	60	100
5.	21MT7305	Factory Automation	PE	3	0	0	3	40	60	100
PROFESSIONAL ELECTIVE IV										
1.	21MT8301	Rapid Prototyping and Reverse Engineering	PE	3	0	0	3	40	60	100
2.	21MT8302	Industrial IoT	PE	3	0	0	3	40	60	100
3.	21MT8303	Artificial Intelligence for Mechatronics	PE	3	0	0	3	40	60	100

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Chairman

Dean Academics

Dean (Academics)
HiCET

4.	21MT8304	MEMS and Nano Technology	PE	3	0	0	3	40	60	100
5.	21MT8305	Information System for Engineers	PE	3	0	0	3	40	60	100

PROFESSIONAL ELECTIVE V

S.No.	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
1.	21MT8306	Machineries in Agriculture	PE	3	0	0	3	40	60	100
2.	21MT8307	Industrial Diagnostics and Maintenance Techniques	PE	3	0	0	3	40	60	100
3.	21MT8308	Engineering Economics and Cost Analysis	PE	3	0	0	3	40	60	100
4.	21MT8181	Principles of Management	PE	3	0	0	3	40	60	100
5.	21MT8182	Professional Ethics in Engineering	PE	3	0	0	3	40	60	100

LIST OF OPEN ELECTIVES – MECHATRONICS ENGINEERING

S.No.	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
1.	21MT6401	Industrial Safety and Environment	OE	3	0	0	3	40	60	100
		LIFE SKILL COURSES								
1.	21LSZ401	General Studies for Competitive Examinations	OE	3	0	0	3	40	60	100
2.	21LSZ402	Human Rights, Women's Rights and Gender Equality	OE	3	0	0	3	40	60	100
3.	21LSZ403	Indian Ethos and Human Values	OE	3	0	0	3	40	60	100
4.	21LSZ404	Indian Constitution and Political System	OE	3	0	0	3	40	60	100
5.	21LSZ405	Yoga for Human Excellence	OE	3	0	0	3	40	60	100

Enrollment for B.E. / B. TECH. (HONOURS) / Minor Degree (optional)

A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E. / B. Tech. (Honours) or Minor Degree. For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only. For minor degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one of the other programmes.

Clause 4.10 of Regulation 2022 is applicable for the Enrolment of B.E. / B. TECH. (HONOURS) / Minor Degree (Optional).

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

HINDUSTHAN COLLEGE OF ENGG & TECH • ACADEMIC COUNCIL • Chairman

Dean (Academics)
HiCET

Dean Academics

VERTICALS FOR MINOR DEGREE

- Heads are requested to provide one vertical from their program to offer for other program students to register for additional courses (18 Credits) to become eligible for the B.E./B.Tech. Minor Degree.

Note: Each programme should provide verticals for minor degree

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	21MT5601	Sem 5: Basics of Mechatronics System	MDC	3	0	0	3	3
2.	21MT6601	Sem 6: Sensors and Interfacing	MDC	3	0	0	3	3
3.	21MT6602	Sem6: Hydraulics and Pneumatics	MDC	3	0	0	3	3
4.	21MT7601	Sem 7: PLC and SCADA	MDC	3	0	0	3	3
5.	21MT7602	Sem 7: Industrial Robotics	MDC	3	0	0	3	3
6.	21MT8601	Sem 8: Design of Mechatronics System	MDC	3	0	0	3	3

*MDC – Minor Degree Course

In addition to the above the following additional courses for Minor Degree can also be given to the student's common to all the branches.

Vertical I Fintech and Block Chain	Vertical II Entrepreneurship	Vertical III Environment and Sustainability
Financial Management	Foundations of Entrepreneurship	Sustainable infrastructure Development
Fundamentals of Investment	Team Building & Leadership Management for Business	Sustainable Agriculture and Environmental Management
Banking, Financial Services and Insurance	Creativity & Innovation in Entrepreneurship	Sustainable Bio Materials
Introduction to Blockchain and its Applications	Principles of Marketing Management for Business	Materials for Energy Sustainability
Fintech Personal Finance and Payments	Human Resource Management for Entrepreneurs	Green Technology
Introduction to Fintech	Financing New Business Ventures	Environmental Quality Monitoring and Analysis

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Chairman

Dean (Academics)
HiCET

Dean Academics

VERTICALS FOR HONOURS DEGREE

Vertical I Industrial Automation	Vertical II Medical Mechatronics	Vertical III Applied Robotics
21MT5204 Concepts of Machines and Mechanisms	21MT5205 Robotics in Medicine	21MT5206 Robots and Systems in Smart Manufacturing
21MT6203 Drives and Actuators for Automation	21MT6205 Brain Computer Interface and its Applications	21MT6207 Medical Robotics
21MT6204 Power Electronics	21MT6206 Digital Image Processing	21MT6208 Agricultural Robotics and Automation
21MT7203 Advanced PLC	21MT7205 Radiological Equipment	21MT7207 Collaborative Robotics
22MT7204 Distributed Control System	21MT7206 Biomaterials	21MT7208 Robot Operating Systems
22MT8201 HMI & SCADA	22MT8202 Bionics	22MT8203 Humanoid Robotics

B Tech (Hons) Mechatronics Engineering Specialization in Industrial Automation

S.No.	Course Code	Course Title	Category	Periods per Week				TCP	CIA	ESE	Total
				L	T	P	C				
1	21MT5204	Sem 5: Concepts of Machines and Mechanisms	PC	3	0	0	3	3	40	60	100
2	21MT6203	Sem 6: Drives and Actuators for Automation	PC	3	0	0	3	3	40	60	100
3	21MT6204	Sem 6: Power Electronics	PC	3	0	0	3	3	40	60	100
4	21MT7203	Sem 7: Advanced PLC	PC	3	0	0	3	3	40	60	100
5	21MT7204	Sem 7: Distributed Control System	PC	3	0	0	3	3	40	60	100
6	21MT8201	Sem 8: HMI & SCADA	PC	3	0	0	3	3	40	60	100

B Tech (Hons) Mechatronics Engineering Specialization in Medical Mechatronics

S.No.	Course Code	Course Title	Category	Periods per Week				TCP	CIA	ESE	Total
				L	T	P	C				
1.	21MT5205	Sem 5: Robotics in Medicine	PC	3	0	0	3	3	40	60	100
2.	21MT6205	Sem 6: Brain Computer Interface and its Applications	PC	3	0	0	3	3	40	60	100
3.	21MT6206	Sem 6: Digital Image Processing	PC	3	0	0	3	3	40	60	100
4.	21MT7205	Sem 7: Radiological Equipments	PC	3	0	0	3	3	40	60	100
5.	21MT7206	Sem 7: Biomaterials	PC	3	0	0	3	3	40	60	100
6.	21MT8202	Sem 8: Bionics	PC	3	0	0	3	3	40	60	100

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL
Chairman
HICET

Dean (Academics)
Dean Academics
HiCET

B Tech (Hons) Mechatronics Engineering with Specialization in Applied Robotics

S.No.	Course Code	Course Title	Category	Periods per Week				TCP	CIA	ESE	Total
				L	T	P	C				
1.	21MT5206	Sem 5: Robots and Systems in Smart Manufacturing	PC	3	0	0	3	3	40	60	100
2.	21MT6207	Sem 6: Medical Robotics	PC	3	0	0	3	3	40	60	100
3.	21MT6208	Sem 6: Agricultural Robotics and Automation	PC	3	0	0	3	3	40	60	100
4.	21MT7207	Sem 7: Collaborative Robotics	PC	3	0	0	3	3	40	60	100
5.	21MT7208	Sem 7: Robot Operating Systems	PC	3	0	0	3	3	40	60	100
6.	21MT8203	Sem 8: Humanoid Robotics	PC	3	0	0	3	3	40	60	100

Note: Each programme should provide verticals for Honours degree

SEMESTER-WISE CREDIT DISTRIBUTION

B.E. / B.TECH. PROGRAMMES

S.No.	Course Area	Credits per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	HSC	4	4	-	-	-	3	-	-	11
2	BSC	10	10	4	4	-	-	-	-	28
3	ESC	3	8	-	-	-	-	-	-	11
4	PCC	-	-	16	17	19	12	12	-	76
5	PEC	-	-	-	-	3	3	3	6	15
6	OEC	-	-	-	-	-	3	3	-	6
7	EEC	3	-	-	-	2	3	2	8	18
8	MCC		✓	✓	✓					
Total		20	22	20	21	24	24	20	14	165

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL Chairman

Dean (Academics)
HiCET

CREDIT DISTRIBUTION R2019 (BATCH 2021-2025)								
Semester	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**
Credits	**20**	**22**	**20**	**21**	**24**	**24**	**20**	**14**

Chairman, Board of Studies

Chairman - BoS
MCT - HICET

HINDUSTHAN ACADEMIC COUNCIL
Chairman
HINDUSTHAN COLLEGE OF ENGG & TECH

Dean (Academics)
Dean Academics
HICET

CREDIT DISTRIBUTION R2019 (BATCH 2021-2025)								
Semester	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**
Credits	**20**	**22**	**20**	**21**	**24**	**24**	**20**	**14**

Chairman, Board of Studies

Chairman - BoS
MCT - HICET

HINDUSTHAN ACADEMIC COUNCIL Chairman HINDUSTHAN COLLEGE OF ENGG & TECH

Dean (Academics)
Dean Academics
HICET

THEORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	21MA3101	Fourier Series and statistics (AERO, AUTO, MECH, and MCT)	3	1	0	4

Course Objective

1. Analyze Fourier series which is central to many applications in engineering.
2. Solve boundary value problems by applying Fourier series.
3. Demonstrate knowledge of large-sample statistical properties.
4. Apply basic concepts of statistical methods for testing the hypothesis.
5. Analyze design of experiment techniques to solve various engineering problem.

Unit	Description	Instructional Hours
I	**FOURIER SERIES** Dirichlet's conditions - General Fourier Series - Odd and Even Functions - Half range sine and cosine series - Change of Interval - Parseval's Identity - Harmonic analysis	12
II	**BOUNDARY VALUE PROBLEMS** Classification - Solution of one dimensional equation - One dimensional heat equation - Fourier series solution in Cartesian coordinates.	12
III	**TESTS BASED ON LARGE SAMPLES** Large sample tests based on Normal distribution - Test of significance for single proportion - Test of significance for difference of proportions - Test of significance for single means -Test of significance for difference of means.	12
IV	**TESTS BASED ON SMALL SAMPLES** Tests based on t (for single mean and difference of means) - F distribution for testing difference of variance, Chi-Square test for Contingency table (Test for Independency) - Goodness of fit.	12
V	**ANOVA** Introduction, assumptions of analysis of variance - Completely randomized design – Randomized block design – Latin square design.	12
	Total Instructional Hours	60

Course Outcome

On completion of the course the students will be able to

- CO1: Understand the mathematical principles of Fourier series which would provide them the ability to formulate and solve some of the physical problems of engineering.
- CO2: Apply the concept of application of Fourier series in solving the heat and wave equations.
- CO3: Understand the mix proportioning techniques for field applications.
- CO4: Understand the concepts of statistical methods for testing the hypothesis.
- CO5: Apply design of experiment techniques to solve various engineering problem.

TEXT BOOKS:

T1- Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, Wiley India Private Ltd., New Delhi, 2018

T2- Gupta, S.C., & Kapoor, V.K., Fundamentals of Mathematical Statistics, Sultan Chand & Sons,Reprint 2019.

REFERENCE BOOKS:

R1- Veerarajan. T.,"Transforms and Partial Differential Equations", Tata McGraw Hill Education Pvt. Ltd., Reprint, New Delhi, 2016.

R2- Kandasamy P., Thilagavathy K. and Gunavathy K.,"Engineering Mathematics Volume III", S.Chand & Company Ltd., New Delhi, 2015.

R3- Walpole. R.E., Myers. R.H., Myers. S.L., and Ye. K., "Probability and Statistics for Engineers and Scientists", 9th Edition, Pearson Education, Asia, 2018.

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

HINDUSTHAN ACADEMIC COUNCIL * Chairman * COLLEGE OF ENGG & TECH

Dean Academics

Dean (Academics)
HiCET

Mapping of COs with POs and PSOs														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3	3	2	3	3	1	1		1			2	2	2
CO2	3	3	2	3	3	1	1		1			2	2	2
CO3	3	3	2	3	3	1	1		1			2	2	2
CO4	3	3	2	3	3	1	1		1			2	2	2
CO5	3	3	2	3	3	1	1		1			2	2	2
AVG	3	3	2	3	3	1	1	-	1	-	-	2	2	2

- 1-low, 2-medium, 3-high, '-'- no correlation
- Note: The average value of this course to be used for program articulation matrix.

Chairman - BoS
Chairman Board of Studies
M.O.T HiCET

HINDUSTHAN ACADEMIC COUNCIL Chairman HINDUSTHAN COLLEGE OF ENGG & TECH

Dean Academics
Dean (Academics)
HiCET

THEORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	21MT3201	Mechanics of Solids	3	1	0	4

Course Objective

6. To impart the basic elastic response of the engineering materials
7. To find out the concept of shear force and bending moment in beams
8. To familiarize the concept of torsion in shafts and stresses in different springs
9. To impart knowledge on stresses and load structural members
10. To impart the concepts of structural elements and pressure vessels

Unit	Description	Instructional Hours
I	**STRESS STRAIN AND DEFORMATION OF SOLIDS** Introduction to Materials - Classification - Properties of Engineering Materials - Hooke's Law - Types of Stresses - Deformation of Simple and Composite Bars - Thermal Stresses - Elastic Constants and their Relations - Factor of Safety.	9
II	**SHEAR FORCE AND BENDING MOMENT** Beams and its Types -Types of Loading on Beams - Shear Force and Bending Moment in Beams - Cantilevers, Simply Supported Beams and Over Hanging Beams - Theory of Simple Bending - Bending Formula - Bending Stress Distribution - Shear Stress Distribution.	9
III	**TORSION OF SHAFT AND SPRINGS** Introduction to Torsion Stresses and Deformation in Circular and Hollows Shafts - Composite Shafts - Stresses in Helical Springs - Deflection of Helical Springs and Leaf Springs.	9
IV	**DEFLECTION OF BEAMS AND COLUMNS** Slope and Deflection of Cantilever and Simply Supported Beams by Double Integration and Macaulay's Methods - Column - Buckling of column - Euler's and Rankine's Formula for Different End Condition.	9
V	**THIN ANDTHICK CYLINDERS** Stresses in Thin Cylindrical Shell due to Internal Pressure Circumferential and Longitudinal Stresses and Deformation in Thin and Thick cylinders - Applications - Design of Mechatronics System Components - Spring - Shaft - Rope - Case Study of Stress Distribution in Automobile Tyres - Case Study of Automation Systems used in Investigating Strength of the Engineering Materials.	9
	Total Instructional Hours	45

Course Outcome

On completion of the course the students will be able to

CO6: Compute stresses and strain under different load conditions
CO7: Sketch the shear force and bending moment diagrams of different beams
CO8: Analyse the stresses and strains in shafts subjected torsion
CO9: Design standard beams for safe working conditions
CO10: Investigate the mode of failure in pressurevessels

TEXT BOOKS:

T3- Bansal, R.K., "Strength of Materials", 6th Edition, Laxmi Publications (P) Ltd., New Delhi, 2017.
T4- Ferdinand P. Beer "Mechanics of solids", 7th Edition, McGraw Hill Education, New Delhi, 2014.

REFERENCE BOOKS:

R4- Khrumi R S "Strength of Materials", 21ST Edition, s Chand. Ltd., New Delhi, 2008.
R5- Rajput, R. K, "A Textbook of Strength of Materials", 7th Edition, S. Chand and company Ltd., New Delhi, 2016.
R6- Hibbeler, R.C., "Mechanics of Materials", 8th Edition, Pearson Education, New Delhi, 2011.

WEB REFERENCES:

1. http://www.timeattack.co.uk/chassis-stiffening-basics/#sthash.kzqhpA2W.dpbs
2. http://www.totalconstructionhelp.com/columns.html

Chairman, Board of Studies

Chairman - BoS
HiCET

ACADEMIC COUNCIL * HICET * Chairman

Dean Academics

Dean (Academics)
HiCET

Mapping of COs with POs and PSOs														
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO-1**	**PSO-2**
CO1	3	3	2	2	2	-			1			2	2	1
CO2	3	3	2	2	2	-			1			2	2	1
CO3	3	3	2	2	2				1			2	2	1
CO4	3	3	2	2	2				1			2	2	1
CO5	3	3	2	2	2				1			2	2	1
AVG	3	3	2	2	2	-	-	-	1	-	-	2	2	1

- 1-low, 2-medium, 3-high, '-"- no correlation
- Note: The average value of this course to be used for program articulation matrix.

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Chairman

Dean Academics

Dean (Academics)
HiCET

THEORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	21MT3202	Industrial Motor Control	3	0	0	3

Course Objective

1. To identify the control circuit components used in electrical circuit
2. To illustrate the basic control circuits for industrial motors
3. To select the suitable starting and braking methods for electrical machines
4. To find the different types of power switching devices
5. To impart knowledge on operation, switching techniques and basics topologies for power electronics

Unit	Description	Instructional Hours
I	**Basic Control Circuit Components** General Principles of Motor Control - Symbols and Schematic Diagrams - Manual Starters, AC starters and DC starters (2 point 3 point) - overload relays - Relays, Contactors- Basic Control Circuits components and switches.	9
II	**Basic Control Circuits** START - STOP Push Button Control - Multiple Push Button Stations – Forward - Reverse Control - Jogging and Inching - Timing Relays - Sequence Control	9
III	**Starting and Braking Methods** DOL Starter - Automatic Auto Transformer Starter, Star/Delta Starter (Semi Automatic and Automatic) Three Step Rotor Resistance Starter - Plugging - Dynamic Braking	9
IV	**Power Semi-Conductor Devices** Study of switching devices: SCR, TRIAC, GTO, BJT, MOSFET, IGBT and IGCT - Static characteristics: SCR, MOSFET and IGBT - Triggering and commutation circuit for SCR - Introduction to Driver and Snubber circuits.	9
V	**Power Electronics Applications** Half bridge and Full bridge: Single phase and Three phase converter - Choppers types - Serial and Parallel Inverter - Single phase and Three phase cycloconverters – Applications - Induction heating, UPS.	9
	Total Instructional Hours	45

Course Outcome

On completion of the course the students will be able to

- CO1: Recognize the control circuit components used in electrical wiring
- CO2: Apply the control circuits in industrial motor control
- CO3: Sketch the control circuits for Starting and Braking Methods
- CO4: Analyze the power semi-conductor devices
- CO5: Ability to choose the converters and inverters for real time applications

TEXT BOOKS:

T1- Stephen L. Herman, "Understanding Motor Controls" Third Edition. Cengage Learning, 2017.

T2- M.H. Rashid, "Power Electronics: Circuits, Devices and Applications", Pearson Education, fourth Edition, New Delhi, 2014

REFERENCE BOOKS:

R1- Stephen L. Herman, "Industrial Motor Control" Seventh Edition, Cengage Learning,2013

R2- Bhattacharya.S.K & Brijinder Singh, "Control of Electrical Machines", 2nd Edition, New Age International (P) Ltd., New Delhi, 2010.

R3- M.D. Singh and K.B. Khanchandani, "Power Electronics," 2nd Edition Mc Graw Hill India, 2013.

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

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

Dean Academics

Dean (Academics)
HiCET

Mapping of COs with POs and PSOs														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3	1	3	3	2				2			2	2	2
CO2	3	1	2	1	2							2	2	1
CO3	2	1	1	2								2	1	1
CO4	1	1	2	2		2			2		2	3	2	1
CO5	2	3	2	2									2	2
AVG	2.2	1.4	2	2	0.8	0.4	-	-	0.8	-	0.4	1.8	1.8	1.4

- 1-low, 2-medium, 3-high, '-'- no correlation
- Note: The average value of this course to be used for program articulation matrix.

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Chairman

Dean Academics

Dean (Academics)
HiCET

THEORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	21MT3203	Digital Electronics in Mechatronics Systems	3	0	0	3

Course Objective

1. To impart knowledge about the fundamentals of logic gates and boolean algebra
2. To build up various combinational circuits
3. To describe various flip-flops used in sequential circuits
4. To familiarize the basics of memory devices
5. To illustrate the digital concepts in mechatronics applications

Unit	Description	Instructional Hours
I	**LOGIC GATES AND MINIMIZATION TECHNIQUES** Minimization Techniques: Boolean Algebra - Simplification of Boolean Functions - Minterm – Maxterm - Sum of Product - Product of Sum - Karnaugh Map – Quine McClusky Method Binary Number System-Logic Gates: Logic Functions using Gates - NAND - NOR Implementations - Multi Level Gate Implementations - Multi Output Gate Implementations	9
II	**COMBINATIONAL CIRCUITS** Half and Full Adders - Half and Full Subtractors - Code Converters - Encoder - Decoder - Multiplexer - Demultiplexer - Carry Look Ahead Adder - Parity Checker - Parity Generators - Magnitude Comparator	9
III	**SEQUENTIAL CIRCUITS** Latches - Flip-Flops SR, JK, D, T, and Master - Slave - Asynchronous & Synchronous Up/Down Counters. Design of Synchronous Counters: State Diagram - State Table - State Minimization - State Assignment - Excitation Table and Maps - Modulo-n Counter	9
IV	**MEMORY DEVICES** Classification of Memories - ROM Organization - RAM Organization. Programmable Logic Devices - Programmable Logic Array (PLA) - Programmable Array Logic (PAL) - Field Programmable Gate Arrays (FPGA)	9
V	**APPLICATIONS** Digital Electronics on Engine Management – FADEC - Industrial Automation - Process Monitoring and Control - Distributed Control Systems in Robotics - 3C - Communications, Command and Control - Automotive Industry - Electronic Control Unit.	9
	Total Instructional Hours	45

Course Outcome

On completion of the course the students will be able to

- CO1: Design the logic circuits and to evaluate its function realizations using gates
- CO2: Develop combinational circuit systems using flip flops
- CO3: Apply the minimization techniques in sequential circuits
- CO4: Compare the memory devices and its functions
- CO5: Enumerate the applications of digital electronics in various fields

TEXT BOOKS:

T1- M. Morris Mano, Michel D. Ciletti, "Digital Design", 5th Edition, Pearson Education, New Delhi, 2012.
T2- John.M Yarbrough, "Digital Logic Applications and Design", 2nd Edition, Thomson Learning, 2006.

REFERENCE BOOKS:

R1- John F.Wakerly, "Digital Design", 4th Edition, PHI Learning Private Limited, New Delhi, 2006.
R2- Thomas L. Floyd, "Digital Fundamentals", 11th Edition, PHI Learning Private Limited, New Delhi, 2014.
R3- Charles H.Roth, "Fundamentals of Logic Design", 7th Edition, Thomson Learning, 2003.

WEB REFERENCES:

1. http://www.experimentalaircraft.info/articles/aircraft-engines-fadec.php
2. http://www.mouser.com/applications/distributed-control-systems-robotics/
3. http://embedded-computing.com/articles/automotive-industry-innovation-driven-electronics

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL * Chairman * HINDUSTHAN COLLEGE OF ENGG & TECH

Dean Academics

Dean (Academics)
HiCET

Mapping of COs with POs and PSOs														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3	3	3	2	2							2	2	3
CO2	3	3	3	2	2							2	2	3
CO3	3	3	3	2	2							2	2	3
CO4	3	3	3	2	2							2	2	3
CO5	3	3	3	2	2							2	2	3
AVG	3	3	3	2	2	-	-	-	-	-	-	2	2	3

- 1-low, 2-medium, 3-high, '-'- no correlation
- Note: The average value of this course to be used for program articulation matrix.

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Chairman

Dean Academics

Dean (Academics)
HiCET

Mapping of COs with POs and PSOs														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3	3	2	3	3	1	1		1			2	2	2
CO2	3	3	2	3	3	1	1		1			2	2	2
CO3	3	3	2	3	3	1	1		1			2	2	2
CO4	3	3	2	3	3	1	1		1			2	2	2
CO5	3	3	2	3	3	1	1		1			2	2	2
AVG	3	3	2	3	3	1	1	-	1	-	-	2	2	2

- 1-low, 2-medium, 3-high, '-'- no correlation
- Note: The average value of this course to be used for program articulation matrix.

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Dean Academics

Dean (Academics)
HiCET

THEORY WITH LAB COMPONENT COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	21MT3251	Production Technology	2	0	2	3

Course Objective

1. To develop the knowledge about the casting and molding process
2. To list the fundamentals and various methods of manufacturing process
3. To choose the suitable welding process for manufacturability
4. To identify the different forming operations
5. To identify the finishing operations

Theory

Unit	Description	Instructional Hours
I	**CASTING** Patterns - Cores - Moulding - Green Sand Moulding - Special Casting Process, Shell Mould Casting - Investment Casting - Centrifugal Casting - Casting Defects.	9
II	**MACHINING** Lathe Machine - Lathe Operations - Drilling Machines - Reaming and Tapping Operations - Shaper - Milling Machine. **Experimental Components: Lathe - Facing, Step Turning and Taper Turning**	6+3
III	**WELDING** Arc Welding - Gas Welding - Thermit Welding - Friction Welding - TIG & MIG Welding - Welding Defects. **Experimental Components: Lathe - Grooving, Thread Cutting and Knurling**	6+3
IV	**FORMING** Rolling Operations - Forging Operations - Extrusion and Types - Piercing - Punching - Trimming. **Experimental Components: Drilling, Tapping and Reaming**	6+3
V	**FINISHING OPERATIONS AND APPLICATIONS OF PRODUCTION TECHNOLOGY** Grinding - Lapping - Honing - Broaching. Applications: Marine Propeller Manufacturing - PCB Board Manufacturing. **Experimental Components: Surface Grinding and Slot Cutting**	6+3
	Instructional Hours	33 +12
	Total Instructional Hours	**45**

Course Outcome

On completion of the course the students will be able to

CO1: Choose the suitable casting process based on the product requirements
CO2: Justify the most appropriate manufacturing process and material for a given product
CO3: Interpret the different welding processes used in manufacturing
CO4: Design the process parameters for rolling and sheet metal operations
CO5: Perform a variety of finishing operations on manufacturing products

TEXT BOOKS:

T1- Kalpak Jain, "Manufacturing Engineering and Technology", 4th Edition, Addison Wesley Congmen Pvt. Ltd., Singapore, 2013.

T2- Jain.R.K, "Production Technology: Manufacturing Processes, Technology and Automation", 17th Edition, Khanna Publishers, New Delhi, 2011..

REFERENCE BOOKS:

R1- Hajra Choudhury, "Elements of Workshop Technology", Vol - I and II, 3rd Edition, Media Promoters and Publishers Pvt. Ltd., Mumbai, 2012

R2- Sharma.P.C. "Production Technology: Manufacturing Processes", 7th Edition, S. Chand and Company Ltd., New Delhi, 2008.

R3- Chapman.W.A.J, "Workshop Technology Vol. I and II", 6th Edition, Arnold Publisher, New Delhi, 2006.

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Chairman
HINDUSTHAN COLLEGE OF ENGG & TECH

Dean Academics

Dean (Academics)
HiCET

LABORATORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	21MT3001	Computer Aided Drafting Laboratory	0	0	3	1.5

Course Objective

1. To develop skills on using software for preparing 2D Drawings.
2. To illustrate basic engineering drawing formats
3. To provide the importance of computer aided drawing in engineering society.
4. To develop surface model of given engineering problems
5. To apply the knowledge of engineering graphics

Concepts and Conventions:

Understand the basic idea of software and its features like draw panel, modify panel, line types, creating dimensions, hatching techniques, layer Creations, text styles, and template drawings, use of Blocks, Design Center, Tool Palettes and Plotting.

Unit	Description of the Experiments	Practical Hours
1	Study of drafting software– Coordinate systems (absolute, relative, polar, etc.) – Creation of simple geometries like polygon and general multi-line figures.	
2	Drawing the conic and special curves.	
3	Draw the orthographic projections of simple solids like Prism, Pyramid, Cylinder, Cone and it's dimensioning.	
4	Draw the symbols of fasteners, weld, rivets, bolts nuts and screws.	
5	Drawing Isometric projection of simple objects.	
6	Draw the orthographic projections of Bush bearing.	
7	Draw the orthographic projections of Oldham's coupling.	
8	Draw the orthographic projections of cotter joint.	
9	Draw the orthographic projections of simple gate valve.	
10	Draw the Plan and Elevation of simple Residential Building.	
11	Drawing of simple steel truss	
12	Drawing sectional views of prism, pyramid, cylinder and cone	
	Total Practical Hours	45

On completion of the course the students will be able to

Course Outcome

CO1: Sketch simple figures with title block using AutoCAD software commands

CO2: Use the software package for drafting

CO3: Create 2D Drawing of Engineering Components

CO4: Apply basic concepts to develop construction drawing techniques

CO5: Design and modeling the given engineering problem

Chairman

ACADEMIC COUNCIL • HINDUSTHAN COLLEGE OF ENGG

Chairman, Board of Studies

Chairman BoS
MCT - HiCET

Dean Academics

Dean (Academics)
HiCET

Mapping of COs with POs and PSOs														
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO-1**	**PSO-2**
CO1	3	2	3	3	3			1	2			2	2	2
CO2	3	2	3	2	3	-	-	1	2	-	-	2	2	2
CO3	3	2	3	2	3	-	-	1	2	-	-	2	2	2
CO4	3	2	3	2	3	-	-	1	2	-	-	2	2	2
CO5	3	2	3	2	3	-	-	1	2	-	-	2	3	2
AVG	3	2	3	2.2	3	-	-	1	2	-	-	2	2.2	2

- 1-low, 2-medium, 3-high, '-"- no correlation
- Note: The average value of this course to be used for program articulation matrix.

ACADEMIC COUNCIL • HICET • HINDUSTHAN COLLEGE OF ENGG & TECH
Chairman

Chairman, Board of Studies
Chairman BoS
MCT - HiCET

Dean Academics
Dean (Academics)
HiCET

Mapping of COs with POs and PSOs														
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO-1**	**PSO-2**
CO1	2	1	3	1							1	1	2	1
CO2	1	2	3	1							1	1	1	1
CO3	1	2	3	3							1	1	2	1
CO4	2	1	1	1	3						1	1	2	1
CO5	1	1	1	1						3	1	1	1	3
AVG	1.4	1.4	2.2	1.4	0.6	-	-	-	-	0.6	1	1	1.6	1.4

- 1-low, 2-medium, 3-high, '-"- no correlation
- Note: The average value of this course to be used for program articulation matrix.

ACADEMIC COUNCIL * HINDUSTHAN COLLEGE OF ENGINEERING * Chairman

Chairman - BoS

Chairman, Board of Studies

Dean Academics

Dean (Academics)
HiCET

LABORATORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	21MT3002	Industrial Motor Control Laboratory	0	0	3	1.5

Course Objective

1. To provide hands-on training for automatic starters of electrical motors
2. To impart knowledge on control circuits for jogging and reversing operations
3. To understand solid state devices by conducting experiments
4. To identify the proper gating sequence and control circuit
5. To construct timer using IC 555

Unit	Description of the Experiments	
1	Starting and control of cage motor by jogging method.	
2	Starting and control of motor by DOL Starter method.	
3	Study the effect of Forward and Reverse Operations control in cage motors.	
4	Wire and Test the Control Circuit for Automatic Star-Delta Starter	
5	Wire and Test the Control Circuit for Semi-Automatic Star-Delta Starter	
6	Control Circuit for Single Phase Preventer.	
7	Study of SCR characteristics	
8	Study of MOSFET characteristics	
9	Study of IGBT characteristics	
10	UJT firing circuits for SCR	
11	R and RC firing circuits for SCR	
12	Electronics timer using IC 555	
	Total Practical Hours	45

Course Outcome

On completion of the course, the students will be able to

CO1: To explain the various types of starters using contactors and relays
CO2: To develop the control circuits for jogging and reversing operations
CO3: To analyze solid state switches
CO4: To develop the firing circuit for SCR
CO5: To infer the IC555 timer circuits.

Chairman, Board of Studies
Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL * Chairman * PRATHYUSHA INSTITUTE OF ENGG & TECH

Dean Academics
Dean (Academics)
HiCET

MANDATORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	21MC3191	Indian Constitution	2	0	0	0

Course Objective

1. To Sensitization of student towards self, family (relationship), society and nature.
2. Understanding (or developing clarity) of nature, society and larger systems, on the basis of human relationships and resolved individuals.
3. Strengthening of self reflection.
4. Development of commitment and courage to act.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO INDIAN CONSTITUTION** Meaning of the constitution law and constitutionalism – Historical perspective of the constitution of India – salient features and characteristics of the constitution of India.	6
II	**FUNDAMENTAL RIGHTS** Scheme of the fundamental rights - Right to Equality - Fundamental Right under Article 19 - Scope of the Right to Life and Liberty - Fundamental Duties and its legal status - Directive Principles of State Policy – Its importance and implementation	6
III	**FEDERAL STRUCTURE** The constitution powers and the status of the president in India. – Amendment of the constitutional powers and procedures – The historical perspective of the constitutional amendment of India – Emergency provisions: National emergency, President rule, Financial emergency	6
IV	**AMENDMENT TO CONSTITUTION** Amendment of the Constitutional Powers and Procedure - The historical perspectives of the constitutional amendments in India	6
V	**EMERGENCY PROVISIONS** National Emergency, President Rule, Financial Emergency Local Self Government – Constitutional Scheme in India.	6
	Total Instructional Hours	30

Course Outcome

On completion of the course the students will be able to

CO1: Understand the functions of the Indian government

CO2: Understand and abide the rules of the Indian constitution

TEXT BOOKS:

T1- Durga Das Basu, "Introduction to the Constitution of India ", Prentice Hall of India, New Delhi.

T2- R.C.Agarwal, (1997) "Indian Political System", S.Chand and Company, New Delhi.

T3- Maciver and Page, " Society: An Introduction Analysis ", Mac Milan India Ltd., New Delhi.

T4- K.L.Sharma, (1997) "Social Stratification in India: Issues and Themes", Jawaharlal Nehru University, New Delhi.

REFERENCE BOOKS:

R1- Sharma, Brij Kishore, " Introduction to the Constitution of India:, Prentice Hall of India, New Delhi.Stenerson

R2- U.R.Gahai, "Indian Political System ", New Academic Publishing House, Jalaendhar.

R3- R.N.Sharma, "Indian Social Problems ", Media Promoters and Publishers Pvt. Ltd.

ACADEMIC COUNCIL Chairman MAHENDRA COLLEGE OF ENGG & TECH

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Dean Academics

Dean (Academics)
HiCET

THEORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	21MA4101	Numerical Methods (AERO, AUTO, MECH, and MCT)	3	1	0	4

Course Objective

1. Solve algebraic, transcendental and system of linear equations by using various techniques.
2. Apply various methods to find the intermediate values for the given data.
3. Explain concepts of numerical differentiation and numerical integration of the unknown functions.
4. Explain single and multi step methods to solve Ordinary differential equations
5. Describe various methods to solve ordinary differential equations and partial differential equations.

Unit	Description	Instructional Hours
I	**SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS** Solution of Algebraic and Transcendental equations: Newton Raphson method . Solution of linear system: Gauss Elilmination - Gauss Jordan method -Gauss seidei method. Matrix inversion by Gauss Jordan method.	12
II	**INTERPOLATION** Interpolation - Newton's forward and backward difference formulae – Newton's divided difference formula and Lagrangian interpolation for unequal intervals..	12
III	**NUMERICAL DIFFERENTIATION AND INTEGRATION** Numerical Differentiation: Newton's forward and backward interpolation formulae for equal intervals - Newton's divided difference formula for unequal intervals. Numerical integration: Trapezoidal and Simpson's 1/3 rule - Double integration using Trapezoidal and Simpson's rules	12
IV	**INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS** Single step methods for solving first order equations: Taylor's series method - Euler and Modified Euler methods - Fourth order Runge-kutta method - Multi step method: Milne's predictor and corrector method.	12
V	**BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS** Solution of second order ordinary differential equation by Finite difference method - Solution of partial differential equation: one dimensional heat equation by Bender schmidt method - One dimensional Wave equation by Explicit method– Poisson Equations by Finite difference method.	12
	Total Instructional Hours	60

Course Outcome

On completion of the course the students will be able to

- CO1: Solve the system of linear algebraic equations representing steady state models and non linear equations arising in the field of engineering.
- CO2: Apply various methods to find the intermediate values for the given data.
- CO3: Identify various methods to perfrom numerical differentiation and t integration
- CO4: Classify and solve ordinary differential equations by using single and multi step methods.
- CO5: Illustrate various methods to find the solution of ordinary and partial differential equations.

TEXT BOOKS:

T1- Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, Wiley India Private Ltd., New Delhi, 2018.
T2- Kreyszig.E. "Advanced Engineering Mathematics", Eight Edition, John Wiley and sons (Asia) limited.

REFERENCE BOOKS:

R1- M.K.Jain,S.R.K.Iyengar, R.K.Jain "Numerical methods for Scientific and Engineering Computation", Fifth Edition, New Age International publishers 2010.
R2- Grewal B.S. and Grewal J.S. " Numerical Methods in Engineering and Science ", 6th Edition , Khanna publishers, New Delhi 2015.
R3- S.K.Gupta, Numerical Methods for Engineers ", New Age International Pvt.Ltd Publishers,2015.

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL • Chairman • HINDUSTHAN COLLEGE OF ENGG & TECH

Dean Academics

Dean (Academics)
HiCET

Mapping of COs with POs and PSOs														
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO-1**	**PSO-2**
CO1	3	3	2	3	3	1	1		1			2	2	2
CO2	3	3	2	3	3	1	1		1			2	2	2
CO3	3	3	2	3	3	1	1		1			2	2	2
CO4	3	3	2	3	3	1	1		1			2	2	2
CO5	3	3	2	3	3	1	1		1			2	2	2
AVG	3	3	2	3	3	1	1	-	1	-	-	2	2	2

- 1-low, 2-medium, 3-high, '-'- no correlation
- Note: The average value of this course to be used for program articulation matrix.

Chairman, Board of Studies

Chairman
BoS
MCT - HiCET

Chairman

Dean Academics

Dean (Academics)
HiCET

THEORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	21MT4201	Microcomputer Systems and Microcontroller	3	0	0	3

Course Objective

1. To impart knowledge on the basics of microcomputer systems
2. To introduce commonly used peripheral / interfacing ICs and simpleapplications
3. To familiarize about the basics of 8051 microcontroller
4. To learn the programming language of 8051 microcontroller
5. To list out the applications of microprocessor and microcontroller in various fields

Unit	Description	Instructional Hours
I	**MICROCOMPUTER SYSTEMS** Microcomputer - Components - Microprocessor 8085: Architecture, Internal Register Organization and Pin Configuration - Instruction Set of 8085 - Addressing Modes - Methods of 8085 Programs - Interrupts.	9
II	**INTERFACING DEVICES** Need for Interfacing - Programmable Peripheral Device (8255) - Programmable Communication Interface (8251) (USART) - Programmable Interrupt Controller - Programmable DMA Controller (8257) - A/D and D/A Converters.	9
III	**8051 MICROCONTROLLER** Selection of Microcontrollers - 8051 Microcontroller Architecture - Pin Configuration - Memory Organization - Special Function Registers - Instruction Set of 8051 - Addressing Modes.	9
IV	**ASSEMBLY LANGUAGE PROGRAMMING** I/O Port Programming - Timer Programming - Counter Programming - Serial Communication Programming - Interrupt Programming.	9
V	**MICROPROCESSOR AND MICROCONTROLLER APPLICATIONS** Interfacing of Sensors - Temperature - Pressure - Level - Proximity Switches - Stepper Motor Control - DC Motor Speed Control - Case Studies: Automotive Applications, Microcontrollers, Robotics and Aerospace Applications.	9
	Total Instructional Hours	45

Course Outcome

On completion of the course the students will be able to

CO1: Interpret the configuration and constructional details of 8085 microprocessor
CO2: Implement different microprocessor interfacing techniques
CO3: Apply basic skills for interfacing common devices to microcontroller
CO4: Develop skill in programming for 8051 Microcontroller
CO5: Enumerate various applications interfacing with microcontroller

TEXT BOOKS:

T1- A. NagoorKani, "Microprocessors & Microcontrollers", 2nd Edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 2012.

T2- Mazidi Muhammad Ali, Mazidi Janice Gillispie and McKinlayRolin, "The 8051 Microcontroller and Embedded Systems", 2nd Edition, PHI Learning Private Limited, New Delhi, 2013.

REFERENCE BOOKS:

R1- V. Douglas Hall, "Microprocessors and Interfacing Programming and Hardware", 2nd Edition, Tata McGraw Hill Publishing CompanyLimited,New Delhi, 2002.

R2- Ramesh Goankar, "Microprocessor Architecture, Programming and Applications with 8085", 5th Edition, Penram International, Mumbai, 2013.

R3- Kennath Ayala, "The 8051 Microcontroller", 3rd Edition, Thomos Delmar Learning, 2014.

WEB REFERENCES:

1. https://www.ecnmag.com/article/2013/03/lockstep-microcontrollers-advance-aerospace-electronics-safety.
2. http://home.roboticlab.eu/en/microcontrollers.

Chairman - Board of Studies

Chairman - BOS
MCT - HiCET

ACADEMIC COUNCIL * HINDUSTHAN COLLEGE OF ENGG & TECH * Chairman

Dean Academics

Dean (Academics)
HiCET

Mapping of COs with POs and PSOs														
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO-1**	**PSO-2**
CO1	3	3	3	3	3	1	1			2	1	2	2	2
CO2	3	3	3	3	3	1	1			2	1	2	2	2
CO3	3	3	3	3	3	1	1			2	1	2	2	2
CO4	3	3	3	3	3	1	1			2	1	2	2	2
CO5	3	3	3	3	3	1	1			2	1	2	2	2
AVG	3	3	3	3	3	1	1	-	-	2	1	2	2	2

- 1-low, 2-medium, 3-high, '-"- no correlation
- Note: The average value of this course to be used for program articulation matrix.

Chairman

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Dean Academics

Dean (Academics)
HiCET

THEORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	21MT4202	Thermodynamics and Fluid Engineering	3	1	0	4

Course Objective

1. To interpret the basic concepts of thermodynamics
2. To express the basic concepts of heat engines and gas laws
3. To explain the refrigeration systems
4. To identify the properties of fluids and dynamics of fluids
5. To solve the problems in fluid dimensions and incompressible fluid dynamics

Unit	Description	Instructional Hours
I	**BASIC CONCEPTS AND FIRST LAW OF THERMODYNAMICS** Working Substance - System - Ideal Gas Laws - Perfect Gas - Property - State, Process, Path and Cycle - Equilibrium - Zero law of Thermodynamics - Point and Path Functions - Quasi Static Process, Reversible and Irreversible Processes - First law of Thermodynamics - Energy - Specific Heat - Internal Energy and Enthalpy - Energy Changes in Non-flow Processes - Flow Equation.	9+3
II	**SECOND LAW OF THERMODYNAMICS** Kelvin - Plank and Clausius Statements - Basic Concepts of Heat Engines and Heat pumps (Efficiency and COP) - Corollaries of II Law - Absolute Temperature Scale, Entropy, Entropy Change for a Perfect Gas, Principle of Entropy Increase, Clausius Inequality.	9+3
III	**REFRIGERATION** Principles of Refrigeration - Refrigerator - Refrigerant Properties - Refrigerant Selection and Vapor Compression Refrigeration Cycle. Vapor Absorption Cycle - Dry Bulb Temperature, Wet Bulb Temperature, Comfort Air Conditioning, Psychometric Chart, Humidification, De Humidification	9+3
IV	**FLUID PROPERTIES AND DYNAMICS OF FLUIDS** Definition of Fluid - Properties of Fluids - Mass Density, Specific Weight, Specific Volume, Specific Gravity, Viscosity, Compressibility, Vapour Pressure, Surface Tension and Capillarity, Continuity Equation - Application of Control Volume to Continuity - Energy Equation - Euler's Equation - Bernoulli Equation - Applications of Bernoulli's Equation and Momentum Equation	9+3
V	**INCOMPRESSIBLE FLUID FLOW AND DIMENSIONAL ANALYSIS** Darcy Weisbach Equation - Laminar Flow and Turbulent Flow - Minor Losses - Introduction to Flow Through Pipes - Flow through Pipes in Series and in Parallel. Need for Dimensional Analysis - Buckingham's π Theorem.	9+3
	Total Instructional Hours	45+15=60

Course Outcome

On completion of the course the students will be able to

CO1: Identify the different concepts in thermodynamics
CO2: Analyze the processes on TV diagrams to solve engineering problems
CO3: Describe the principles of, refrigeration and psychometric relations
CO4: Analyze the properties of fluids
CO5: Interpret the flow of fluid through pipes in series and parallel

TEXT BOOKS:

T1- Nag.P.K, "Engineering Thermodynamics", 5th Edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 2014.

T2- Yunus A. Cengel , John M. Cimbala , " Fluid Mechanics" , 2nd Edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 2011.

REFERENCE BOOKS:

R1- Kumar.D.S, "Engineering Thermodynamics", 2nd Edition, S.K. Kataria & Sons, 2012.

R2- Bansal.R.K, "Fluid Mechanics and Hydraulic Machines", Laxmi Publications (P) Ltd., New Delhi, 2010.

R3- Streeter, V. L. and Wylie E. B., "Fluid Mechanics", Tata McGraw Hill Publishing Company Limited, New Delhi, 2010.

Chairman - BoS
MCT - HiCET
Chairman, Board of Studies

ACADEMIC COUNCIL • Chairman • HINDUSTHAN COLLEGE OF ENGG & TECH •

Dean Academics

Dean (Academics)
HiCET

Mapping of COs with POs and PSOs														
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO-1**	**PSO-2**
CO1	3	3	3	2	2	2	2	1				2	1	2
CO2	3	3	3	2	2	2	2	1				2	1	2
CO3	3	3	3	2	2	2	2	2				2	1	2
CO4	3	3	3	2	2	2	2					2	1	2
CO5	3	3	3	2	2	2	2					2	1	2
AVG	3	3	3	2	2	2	2	0.8	-	-	-	2	1	2

- 1-low, 2-medium, 3-high, '-"- no correlation
- Note: The average value of this course to be used for program articulation matrix.

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

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

Dean Academics

Dean (Academics)
HiCET

THEORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	21MT4203	Theory of Machines	3	1	0	4

Course Objective

1. To impart the basic components and layout of linkages in the assembly of a system / machine
2. To manipulate the linkages and cam mechanisms and express the basic concepts of toothed gearing and kinematics of gear trains
3.
4. To express the basic concepts of toothed gearing and kinematics of gear trains
5. To familiarize the concepts of balancing of masses for different machine components
6. To classify the vibration occurrence on different machines

Unit	Description	Instructional Hours
I	**MECHANISMS** Introduction - Kinematic Links, Joints, Pairs and Chains - Degree of Freedom - Mobility - Kutzbach Criterion - Grashoff's Law - Inversions of Mechanism - Single Slider Mechanism - Double Slider Mechanism – Velocity and Acceleration diagram for simple mechanism	9+3
II	**CAMS, GEARS AND GEAR TRAINS** Classification of Cams - Classification of Followers - Terminology used in Radial cams - Gears classification - Law of Toothed Gearing - Terminology - Gear Tooth Action - Interference - Simple Gear Trains - Compound Gear Trains - Epicyclic Gear Trains - Compound Epicyclic Gear Trains.	9+3
III	**FOURCE ANALYSIS** Rigid Body dynamics in general plane motion – Equations of motion.- Static force analysis – D'Alemberts principle –The principle of superposition – Inertia force and Inertia torque – Introduction to Dynamic Analysis in Reciprocating Engines.	9+3
IV	**BALANCING** Balancing of Rotating Masses - Single Mass Rotating in the Same Plane - Single Rotating Mass By Two Masses Rotating in Different Planes - Several Masses Rotating in the Same Plane - Several Masses Rotating in Different Planes - Case Study: Partial Balancing of Unbalanced Primary Force in a Reciprocating Engine	9+3
V	**VIBRATION** Introduction - Types - Free Longitudinal Vibrations - Free Transverse Vibrations - Whirling Speed of the Shaft - Free Damped Vibration - Damping Factor - Logarithmic decrement - Under damped forced vibration - Vibration isolation and Transmissibility.	9+3
	Total Instructional Hours	45+15=60

Course Outcome

On completion of the course the students will be able to

- CO1: Design single and double slider mechanism
- CO2: Classifications of cam mechanisms and solve kinematics aspects of gears and gear trains.
- CO3: Force analysis of static and dynamic condition
- CO4: Analyze the concept of balancing of masses
- CO5: Interpret the principles of vibration and mechanism for its control

TEXT BOOKS:

T1- L.Robert Norton, "Design of Machinery", 7th Edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 2013.

T2- J.E.Shigley and J.J.Uicker, "Theory of Machines and Mechanisms", 3rd Edition, Oxford University Press India, 2014.

REFERENCE BOOKS:

R1- H.David Myszka, "Machines and Mechanism - Applied Kinematic Analysis", 4th Edition, Pearson Education, New Jersey, 2010.

R2- S.S.Rattan, "Theory of Machines", 4th Edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 2016.

R3- R.S.Khurmi and J.K.Gupta , "Theory of Machines", 14th Edition, S. Chand and Company Ltd., New Delhi, 2010.

Chairman - BoS
M.C.T., HiCET

Chairman, Board of Studies

ACADEMIC COUNCIL • HINDUSTHAN COLLEGE OF ENGG & TECH • Chairman

Dean Academics

Dean (Academics)
HiCET

Mapping of COs with POs and PSOs														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3		3						1	1		1	2	
CO2	3	2	1							1			2	
CO3	1	3	2									1	1	
CO4	1	1	2									1	1	
CO5	3	1	1									1	1	
AVG	2.2	1.4	1.8	-	-	-	-	-	0.2	0.4	-	0.8	1.4	-

- 1-low, 2-medium, 3-high, '-'- no correlation
- Note: The average value of this course to be used for program articulation matrix.

Chairman, Board of Studies

Chairman BoS
MCT - HiCET

Chairman

Dean Academics

Dean (Academics)
HiCET

THEORY WITH LAB COMPONENT COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	21MT4251	Sensors and Signal Conditioning	2	0	2	3

Course Objective

1. To explain the fundamentals of measurements and classify the transducers and instruments
2. To impart knowledge in selection of inductive and capacitive transducers
3. To describe the vacuum and flow measuring methods
4. To acquire knowledge on optoelectronic sensors and modern sensors
5. To observe the information about data acquisition and data logging

THEORY

Unit	Description	Instructional Hours
I	**INTRODUCTION** Generalized Measurement System - Classification of Transducers - General transducers characteristics, Criteria for transducer selection - Resistive Transducer: Potentiometer - RTD - Thermistor – Thermocouple. **Experimental Components: Thermistor**	6+3
II	**INDUCTIVE AND CAPACITIVE TRANSDUCERS** Inductive Transducer: LVDT - RVDT - Capacitive Transducer - Piezoelectric Transducer - Hall Effect Sensor. **Experimental Components: LVDT and Capacitive Transducer.**	6+3
III	**PRESSURE AND FLOW TRANSDUCERS** Elastic Transducers: Diaphragm, Bourdon tube - Vacuum Measurement: McLeod Gauge - Thermal Conductivity Gauge - Ionization Gauge - Flow Measurement: Turbine Flow Meter, Hot Wire Anemometer - Speed & Load Measurements: Motor Speed sesor using Magnetic Pickup - Load Cell **Experimental Components: Servomotor Position Control**	6+3
IV	**OPTO ELECTRONICS AND MODERN SENSORS** Photo Conductive - Photo Voltaic Cells - Semiconductor Photodiode - Photo Transistors Smart Sensors - Film Sensors - MEMS and Nano Sensors.	9
V	**DATA ACQUISITION** Introduction - Signals - Amplification - Inverting and Non Inverting Amplifier - Filtering - Low Pass and High Pass Filter - Sample and Hold Circuits - Data Acquisition - Single Channel and Multi-Channel Data Acquisition - Data Logging. **Experimental Components: Voltage to Frequency Converter, Inverting & Non-inverting amplifiers and Sample and Hold Circuit**	6+3
	Instructional Hours	33 +12
	Total Instructional Hours (Theory + Practical)	45

Course Outcome

On completion of the course the students will be able to

CO1: Analyze the performance of thermistor and thermocouple
CO2: Classify the capacitive and inductive transducers
CO3: Describe elastic transducer, vacuum and flow measurement
CO4: Apply various electrical and electronic sensors in real time applications
CO5: Analyze the operations of various data acquisition systems

TEXT BOOKS:

T1- Beckwith, Marangoni and Lienhard, "Mechanical Measurements", 2nd Edition, Pearson Education, New Jersey, 2013
T2- AK Sawney, Puneet Sawney, "A Course in Electrical and Electronic Measurements and Instrumentation", 2nd Edition, Dhanpat Rai& Company, 2010

REFERENCE BOOKS:

R1- Patranabis.D, "Sensors and Transducers", 2nd Edition, PHI Learning Private Limited, New Delhi, 2003
R2- Doeblin E.O, "Measurements Systems - Applications and Design", 2nd Edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 2011
R3- Murthy D V S, "Transducers & Instrumentation", 2nd Edition, PHI Learning Private Limited, New Delhi, 2010

Chairman - Board of Studies
Chairman BoS
MCT - HiCET

ACADEMIC COUNCIL * HINDUSTHAN COLLEGE OF ENGG & TECH * Chairman

Dean Academics
Dean (Academics)
HiCET

Mapping of COs with POs and PSOs														
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO-1**	**PSO-2**
CO1	3	2	3	3	3	2	1			1	1	1	3	3
CO2	3	2	3	3	3	2	1			1	1	1	3	3
CO3	3	2	3	3	3	2	1			1	1	1	3	3
CO4	3	2	3	3	3	2	1			1	1	1	3	3
CO5	3	2	2	2	2	3	1			1	1	1	1	1
AVG	3	2	2.8	2.8	2.8	2.2	1	-	-	1	1	1	2.6	2.6

- 1-low, 2-medium, 3-high, '-'- no correlation
- Note: The average value of this course to be used for program articulation matrix.

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL • HINDUSTHAN COLLEGE OF ENGG & TECH • Chairman

Dean Academics

Dean (Academics)
HiCET

LABORATORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	21MT4001	Assembly programming and Interfacing Laboratory	0	0	3	1.5

Course Objective

1. To impart the knowledge about microprocessor and microcontroller programs
2. To !ist the different interfacing I/O devices with microprocessor and microcontroller
3. To familiarize the ADC and DAC interfacing
4. To describe the stepper motor control using microcontroller
5. To study DC motor control interface using microcontroller

Unit	Description of the Experiments
1	Addition & Subtraction of Two 8 - Bit Numbers using 8085 Microprocessor
2	Multiplication & Division of Two 8 - Bit Numbers using 8085 Microprocessor
3	Analog to Digital Conversion (ADC) using 8085 Microprocessor
4	Digital to Analog Conversion (DAC) using 8085 Microprocessor
5	Largest Element in an Array using 8051 Microcontroller
6	Smallest Element in an Array using 8051 Microcontroller
7	Sourcing an Array in Descending order using 8051 Microcontroller
8	Sourcing an Array in Ascending order using 8051 Microcontroller
9	Timer programming using 8051 microcontroller
10	Counter Timer programming using 8051 microcontroller
11	Stepper Motor Control using 8051 Microcontroller
12	DC Motor Control Interface using 8051 Microcontroller
	Total Practical Hours 45

Course Outcome

On completion of the course the students will be able to

CO1: Compile programs for 8085 microprocessor and 8051 microcontroller
CO2: Design the interfacing circuits with 8085 microprocessor & 8051 microcontroller
CO3: Develop a ADC and DAC interfacing
CO4: Infer the stepper motor interfacing with microprocessor
CO5: Demonstrate DC motor control using microcontrolle

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

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

Dean Academics

Dean (Academics)
HiCET

Mapping of COs with POs and PSOs														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3	3	3	3	3	1	1			2	1	2	2	2
CO2	3	3	3	3	3	1	1			2	1	2	2	2
CO3	3	3	3	3	3	1	1			2	1	2	2	2
CO4	3	3	3	3	3	1	1			2	1	2	2	2
CO5	3	3	3	3	3	1	1			2	1	2	2	2
AVG	3	3	3	3	3	1	1	-	-	2	1	2	2	2

- 1-low, 2-medium, 3-high, '-'- no correlation
- Note: The average value of this course to be used for program articulation matrix.

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Chairman

Dean Academics

Dean (Academics)
HiCET

LABORATORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	21MT4002	Solid and Fluid Mechanics & Machinery Laboratory	0	0	3	1.5

Course Objective

1. To demonstrate various performance tests on engineering materials
2. To provide knowledge on deflection test and compression test on materials
3. To impart knowledge of various flow meters and the concept of fluid mechanics
4. To obtain knowledge on the performance characteristics of various pumps
5. To impart knowledge of pelton wheel and Kaplan turbine

Unit	Description of the Experiments
1	Tension and Torsion test on a Mild Steel Rod
2	Deflection test on Beams
3	Compression test on Helical Springs
4	Impact test on Mild Steel Rod (Izod & charpy)
5	Hardness test on Metals by Brinell and by Rockwell Hardness
6	Double Shear test on Mild Steel Rod
7	Determination of Coefficient of Discharge by Venturimeter
8	Determination of Coefficient of Discharge by Orificemeter
9	Experimental and Verification of Bernoulli's Equation.
10	Conducting the experiments and drawing the characteristic curves of Centrifugal Pump and Gear Pump
11	Conducting the experiments and drawing the characteristic curves of Pelton Wheel Turbine
12	Conducting the experiments and drawing the characteristic curves of Kaplan Turbine
	Total Practical Hours 45

Course Outcome

On completion of the course the students will be able to

CO1: Evaluate the different types of mechanical properties of engineering materials
CO2: Calculate the different stresses and strain of engineering materials

CO3: Apply the concepts of fluid energy in fluid flow applications
CO4: Calculate the performance characteristics of various pumps
CO5: Apply the measurement equipments for flow in turbines

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

HINDUSTHAN ACADEMIC COUNCIL Chairman HINDUSTHAN COLLEGE OF ENGG & TECH

Dean Academics

Dean (Academics)
HiCET

Mapping of COs with POs and PSOs														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3	2	2	2	1	1			1			2		1
CO2	3	2	2	3	1	1			1			2	2	1
CO3	3	2	2	3	1	1			1			2	1	1
CO4	3	2	2	3	1	1			1			2	1	2
CO5	3	2	2	3	1	1			1			2	2	2
AVG	3	2	2	2.8	1	1	-	-	1	-	-	2	1.2	1.4

- 1-low, 2-medium, 3-high, '-"- no correlation
- Note: The average value of this course to be used for program articulation matrix.

HINDUSTHAN ACADEMIC COUNCIL Chairman HINDUSTHAN COLLEGE OF ENGG & TECH

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Dean Academics

Dean (Academics)
HiCET

MANDATORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	21MC4191	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	2	0	0	0

Course Objective

1. To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system.
2. To make the students understand the traditional knowledge and analyze it and apply it to their day to day life.
3. To impart basic principles of thought process, Itihas and Dharma Shastra and connecting society and nature.
4. To understand the concept of Intellectual and intellectual property rights with special reference
5. To focus on introduction to Indian Knowledge System, Indian perspective of modern scientific world-view and basic principles of Yoga and Indian philosophy

Unit	Description	Instructional Hours
I	**Introduction to traditional knowledge:** Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, Indigenous Knowledge (IK), characteristics, traditional knowledge vs indigenous knowledge, traditional knowledge vs western knowledge	6
II	**Protection of traditional knowledge:** The need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK	6
III	**Itihas and Dharma-Shastra** **Itihas:** The Mahabharata - The Puranas - The Ramayana **Dharma-Shastra**: Manu Needhi - The Tirukkural – Thiru Arutpa	6
IV	**Traditional knowledge and intellectual property:** Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge	6
V	**Indian philosophy** Jain – Buddhist – Charvaka – Samkhya - Yoga - Nyaya - Vaisheshika - Saiva Siddhanta	6
	Total Instructional Hours	30

Course Outcome

On completion of the course the students will be able to

CO1: Identify the concept of Traditional knowledge and its importance
CO2: Explain the need and importance of protecting traditional knowledge.
CO3: Explain the need and importance of Itihas and Dharma Shastra.
CO4: Interpret the concepts of Intellectual property to protect the traditional knowledge.
CO5: Interpret the concepts of indian philosophy to protect the traditional knowledge.

TEXT BOOKS:

T1- Traditional Knowledge System in India, by Amit Jha, 2009.
T2- Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002.
T3- "Knowledge Traditions and Practices of India" Kapil Kapoor1, Michel Danino2.

REFERENCE BOOKS:

R1- V. Sivaramakrishna (Ed.), Cultural Heritage of India-Course Material, Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014.
R2- V N Jha (Eng. Trans.), Tarkasangraha of Annam Bhatta, Inernational Chinmay Foundation, Velliamad, Amakuam.

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL • HINDUSTHAN COLLEGE OF ENGG & TECH • Chairman

Dean Academics

Dean (Academics)
HiCET

Course code	Course title	L	T	P	C
21HE4072	Career Guidance – Level IV Personality, Aptitude and Career Development	2	0	0	0

Pre-requisite None **Syllabus version** 1

Course Objectives:

- Solve Logical Reasoning questions of easy to intermediate level [SLO 6]
- Solve Quantitative Aptitude questions of easy to intermediate level [SLO 7]
- Solve Verbal Ability questions of easy to intermediate level [SLO 8]
- Crack mock interviews with ease [SLO 13]
- Be introduced to problem-solving techniques and algorithms [SLO 14]

Expected Course Outcome:

Enable students to solve Aptitude questions of placement level with ease, as well as write effective essays.

Student Learning Outcomes (SLO): 6, 7, 8, 13, 14

Module:1 Logical Reasoning **3 hours** **SLO:**6

Logical connectives, Syllogism and Venn diagrams

- Logical Connectives
- Syllogisms
- Venn Diagrams – Interpretation
- Venn Diagrams - Solving

Module:2 Quantitative Aptitude **6 hours** **SLO:** 7

Logarithms, Progressions, Geometry and Quadratic equations

- Logarithm
- Arithmetic Progression
- Geometric Progression
- Geometry
- Mensuration
- Coded inequalities
- Quadratic Equations

Permutation, Combination and Probability

- Fundamental Counting Principle
- Permutation and Combination
- Computation of Permutation
- Circular Permutations
- Computation of Combination
- Probability

Verbal Ability **2 hours** **SLO:** 8

Chairman, Board of Studies

Chairman - BOS
MCT - HiCET

Chairman

Dean Academics

Dean (Academics)
HiCET

Module:3

Critical Reasoning

- Argument – Identifying the Different Parts (Premise, assumption, conclusion)
- Strengthening statement
- Weakening statement
- Mimic the pattern

Module:4 Recruitment Essentials **1 hour** **SLO:** 12

Cracking interviews - demonstration through a few mocks
Sample mock interviews to demonstrate how to crack the:

- HR interview
- MR interview
- Technical interview

Cracking other kinds of interviews

- Skype/ Telephonic interviews
- Panel interviews
- Stress interviews

Resume building – workshop
A workshop to make students write an accurate resume

Module:5 Problem solving and Algorithmic skills **8 hours** **SLO:** 12

- Logical methods to solve problem statements in Programming
- Basic algorithms introduced

Total Lecture hours: 20 hours

Chairman - BoS
MCT - HiCET

HINDUSTHAN COLLEGE OF ENGG. & TECH. ACADEMIC COUNCIL Chairman

Dean (Academics)
HiCET

HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST

HICET

HINDUSTHAN

COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution)

Coimbatore – 641032

DEPARTMENT OF MECHATRONICS ENGINEERING

CURRICULUM & SYLLABUS

2019 REGULATIONS

Chairman

HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY,COIMBATORE 641 032

(An Autonomous Institution Affiliated to Anna University, Chennai)

VISION OF THE INSTITUTE
To become a premier institution by producing professional with strong technical knowledge, innovative research skills and high ethical values

MISSION OF THE INSTITUTE
• To provide academic excellence in technical education through novel teaching methods. • To empower students with creative skills and leadership qualities. • To produce dedicated professionals with social responsibility

VISION OF THE DEPARTMENT
To excel in Mechatronics engineering by imparting technical knowledge, innovation skills and ethics to fulfill the global needs with human values

MISSION OF THE DEPARTMENT
• To impart sound technical knowledge and produce highly proficient professionals in the mechatronics engineering domain. • To empower students with strong competency skills to solve multi-disciplinary engineering problems using mechatronics approach. • To inculcate human values and ethical responsibility to the students for social welfare

PROGRAM EDUCATIONAL OBJECTIVE (PEOs)	
PEO 1	To produce professional graduates with the ability to synergistically integrate multi-disciplinary domains to solve complex engineering problems with Mechatronics approach.
PEO 2	To produce professional graduates with the acumen for interdisciplinary research, entrepreneurship and higher studies to meet the local and global needs.
PEO 3	To produce professional graduates with ethical and moral values in rendering services to the society.

PROGRAM OUTCOMES (POs)	
PO 1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems:** Use research - based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO 6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

	PROGRAM SPECIFIC OUTCOMES (PSOs)
PSO1	To provide ability to analyze, design and develop mechatronic systems by integrating knowledge in sensors, actuators and controllers to solve complex engineering problems.
PSO2	To provide smart automation solutions for real time industrial problems using multidisciplinary approach

Chairman

Chairman, Board of Studies

Chairman BoS
MCT - HiCET

Dean Academics

Dean (Academics)
HiCET

PEO's – PO's& PSO's MAPPING

PEOs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	3	3	2	3	1	1	1	3	1	1	1	3	2
2	2	3	3	3	3	2	2	1	2	1	2	2	3	3
3	2	3	2	2	1	2	3	3	3	2	3	1	2	3

PROGRAM ARTICULATION MATRIX

Year	Sem	Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PS01	PS02
I	I	Technical English	1	-	-	-	-	1.8	0.8	1	2	3	1	3	-	-
		Calculus and Linear Algebra	2.2	2	2	1.6	1	-	-	-	2	-	-	2	1.8	1.8
		Applied Physics	3	2.4	1.2	1.8	1.8	0.6	0.4	-	-	-	-	1	2.4	2.4
		Chemistry for Engineers	2.2	2.4	2.2	2	-	-	2	-	2	-	-	2	1.8	1.8
		Python Programming and Practices	3	3	2	2	3	1	-	-	-	-	-	2	1	2
		Engineering Drawing	3	3	3	2	2	-	-	-	-	-	-	2.8	1.8	1.8
	II	Business English for Engineers	1.4	2	2	1.2	-	-	-	-	0.2	-	-	0.2	1.8	1.8
		Differential Equations and Complex Variables	1.75	2	2	1.5	-	-	-	-	1	-	-	1	1.8	1.8
		Engineering Mechanics	3	2	2	2	2	-	-	-	-	-	-	2	1.8	1.8
		Material Science	3	2.4	1.2	1.8	1.8	0.6	0.4	-	-	-	-	-	2.4	2.4
		Environmental Studies	3	2	-	-	-	3	2	2	-	-	-	2	-	-
		Basics of Mechatronics Engineering	2.6	1	1.6	0.4	0.6	0	0.2	0	0	0	0	1.4	2.6	2.2
		Engineering Practices Lab	3	3	3	3	2	1						2	1	1
II	III	Fourier Series and Statistics	3	3	2	3	3	1	1	-	1	-	-	2	2	2
		Mechanics of solids	3	3	2	2	2	-	-	-	1	-	-	2	2	1
		Industrial Motor Control	2.2	1.4	2	2	0.8	0.4	-	-	0.8	-	0.4	1.8	1.8	1.4
		Digital Applications in Mechatronics Systems	3	3	3	2	2	-	-	-	-	-	-	2	2	3
		Production Technology	3	3	2	3	3	1	1	-	1	-	-	2	2	2
		Computer Aided Drafting Laboratory	3	2	3	2.2	3	-	-	1	2	-	-	2	2.2	2
		Industrial Motor Control Laboratory	1.4	1.4	2.2	1.4	0.6	-	-	-	-	0.6	1	1	1.6	1.4
	IV	Numerical Methods	3	3	2	3	3	1	1	-	1	-	-	2	2	2
		Microcomputer Systems and Microcontroller	3	3	3	3	3	1	1	-	-	2	1	2	2	2

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Chairman

Dean Academics

Dean (Academics)
HiCET

		Thermodynamics and Fluid Engineering	3	3	3	2	2	2	2	0.8	-	-	-	2	1	2
		Theory of Machines	2.2	1.4	1.8	-	-	-	-	-	0.2	0.4	-	0.8	1.4	-
		Sensors and Signal Conditioning	3	2	2.8	2.8	2.8	2.2	1	-	-	1	1	1	2.6	2.6
		Assembly Programming and Interfacing Laboratory	3	3	3	3	3	1	1	-	-	2	1	2	2	2
		Solid and Fluid Mechanics & Machinery Laboratory	3	2	2	2.8	1	1	-	-	1	-	-	2	1.2	1.4
III	V	Machine Design	3	3	3	3	3	2	1	2	-	-	-	2	2	2
		Industrial Automation and Control	0.6	-	2.2	-	0.2	-	-	-	0.2	0.2	0.2	0.6	1.8	-
		Control of Mechatronics Systems	0.6	-	2.2	-	0.2	-	-	-	0.2	0.2	0.2	0.6	-	1.8
		Fluid Power Systems	3	2	2.2	2.8	2.8	1	-	-	-	-	-	2	2	3
		Object Oriented Programming	3	2	3	2	3	-	-	-	-	-	-	2	2	1
		Computer Aided Machine Drawing Laboratory	2.3	1.8	2	1.75	2	2	2	2	1.5	2	2	1.5	1.8	1.8
		Industrial Automation and Control Laboratory - I	0.8	-	2	-	1.2	-	-	-	1.2	-	1.6	-	1.8	-
		Engineering Metrology and Measurements	2	1.2	2.2	1	-	0.4	-	-	-	-	-	0.8	1.2	2.6
		Non Traditional Machining Techniques	3	2	3	2	3	-	1	-	-	-	-	2	2	2.4
		Automobile Systems	0.6	-	2.2	-	0.2	-	-	-	0.2	0.2	0.2	0.6	1.8	-
		Operations Research	3	3	2.2	1.2	1	1	-	-	-	-	1	1	1.8	1
		Materials Science and Applications	3	3	2	2	2	-	-	-	1	-	-	2	2	1
	VI	Total Quality Management	-	-	-	-	0.8	2	0.6	0.8	0.6	-	1.4	1.2	-	-
		Design of Mechatronics Systems	2.4	2	2.2	1.8	1	-	-	-	0.6	0.6	0.6	2	2.6	2.2
		CNC Technology	3	2	2	2	1	1	-	-	-	-	-	2	2	2
		Vetronics	2.4	1.4	2.2	2.2	1.2	2	2.4	-	-	-	-	3	2.4	-
		CNC Laboratory	2.3	1.8	2	1.75	2	2	2	2	1.5	2	2	1.5	1.8	1.8
		Industrial Automation and Control Laboratory - II	1.8	1.2	0.6	-	2	-	-	-	1	1.5	-	-	1.4	2
		Embedded System	3	2.2	3	2.2	3	-	-	-	1	-	-	3	3	2
		Discrete Event System Simulation	-	3	-	-	0.8	2	0.6	0.8	0.6	-	1.4	1.2	-	-
		Product Design and Development	3	3	2.2	1.2	1	1	-	1	2	-	1.4	1	1.8	1
		Non-Destructive Testing Techniques	3	2	3	2	3	-	1	-	-	-	-	2	2	2.4
		Distinctive Electrical Machines	3	2	3	2	2	1	-	-	-	-	1	2	2	2
IV	VII	Virtual Instrumentation and Human Machine Interface	3	1.8	1.8	1.2	1.6	-	-	1.2	1.8	-	0.8	1.8	2	2

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Chairman

Dean Academics

Dean (Academics)
HiCET

		Machine Vision Systems	1.4	-	2.2	-	1.2	-	-	-	1	1	1	1.2	1.8	1.6
		Industrial Robotics	0.6	-	2.2	-	0.2	-	-	-	0.2	0.2	0.2	0.6	-	1.8
		CAE Laboratory	2.3	1.8	2	1.75	2	2	2	2	1.5	2	2	1.5	1.8	1.8
		Project Phase – I	3	3	3	3	3	3	3	3	3	3	3	3	3	3
		Mobile Robotics	0.6	-	2.2	-	0.2	-	-	-	0.2	0.2	0.2	0.6	-	1.8
		Textile Automation	0.6	-	2.2	-	0.2	-	-	-	0.2	0.2	0.2	0.6	1.8	-
		Medical Mechatronics	2.4	2	2.2	1.8	1	-	-	-	0.6	0.6	0.6	2	2.6	2.2
		Disaster Management	3	3	2.2	1.2	1	1	-	-	-	-	1	1	1.8	1
		Factory Automation	3	3	2	2	3	-	-	-	-	2	1	3	2	2
	VIII	Project Phase – II	3	3	3	3	3	3	3	3	3	3	3	3	3	3
		Rapid Prototyping and Reverse Engineering	3	2.2	3	2.2	3	-	-	-	1	-	-	3	3	2
		Industrial IoT	3	2	3	2	3	-	-	-	-	-	-	2	2	1
		Artificial Intelligence for Mechatronics Engineering	3	2	3	2	3	-	-	-	-	-	-	2	2	1
		MEMS and Nano Technology	3	3	2	3	3	1	1	-	1	-	-	2	2	2
		Information System for Engineers	3	3	3	2	2	-	-	-	-	-	-	2	2	3
		Machineries in Agriculture	2.2	1.4	1.8	-	-	-	-	-	0.2	0.4	-	0.8	1.4	-
		Industrial Diagnostics and Maintenance Techniques	1.2	0.2	0.6	-	-	0.6	-	-	0.2	0.4	0.8	0.4	1.2	0.4
		Engineering Economics and Cost Analysis	2	1.2	2	1.2	1	1	1	1.2	1.2	1	1	1.2	1.4	1.6
		Principles of Management	-	-	-	-	0.8	2	0.6	0.8	0.6	-	1.4	1.2	-	-
		Professional Ethics in Engineering	2	1.8	0.8	1.8	1.8	2	2.2	2	2.8	2.8	3	2	-	1

Chairman

G. Naamadu

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Dean Academics

Dean (Academics)
HiCET

DETAILS OF CHANGES CARRIED OUT IN CURRICULUM & SYLLABUS

CBCS PATTERN

UNDERGRADUATE PROGRAMMES

B.E MECHATRONICS ENGINEERING

REGULATION-2019

(For the students admitted during the academic year 2019-2023 and onwards)

SEMESTER - I										
S.NO	**COURSE CODE**	**COURSE TITLE**	**COURSE CATEGORY**	**L**	**T**	**P**	**C**	**CIA**	**ESE**	**TOTAL**
THEORY										
1	**19HE1101**	Technical English	HS	2	1	0	3	25	75	100
2	**19MA1102**	Calculus and Linear Algebra .	BS	3	1	0	4	25	75	100
THEORY WITH LAB COMPONENT										
3	**19PH1151**	Applied Physics	BS	2	0	2	3	50	50	100
4	**19CY1151**	Chemistry for Engineers	BS	2	0	2	3	50	50	100
5	**19CS1151**	Python Programming and Practices	ES	2	0	2	3	50	50	100
6	**19ME1152**	Engineering Drawing	ES	1	0	4	3	50	50	100
PRACTICAL										
7	**19HE1701**	Language Competency Enhancement Course - I	HS	0	0	1	1	100	0	100
			TOTAL	**12**	**2**	**11**	**20**	**350**	**350**	**700**

ACADEMIC COUNCIL • HICET • Chairman

G. Naamadh
Chairman, Board of Studies
Chairman - BoS
MCT - HiCET

Dean Academics
Dean (Academics)
HiCET

SEMESTER – II										
S.NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	**19HE2101**	Business English for Engineers	HS	2	1	0	3	25	75	100
2	**19MA2101**	Differential Equations and Complex Variables	BS	3	1	0	4	25	75	100
3	**19ME2101**	Engineering Mechanics	ES	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENT										
4	**19PH2151**	Material Science	BS	2	0	2	3	50	50	100
5	**19CY2151**	Environmental Studies	BS	2	0	2	3	50	50	100
6	**19MT2153**	Basics of Mechatronics Engineering	ES	2	0	2	3	50	50	100
PRACTICAL										
7	**19GE2001**	Engineering Practices Lab	ES	0	0	4	2	50	50	100
8	**19HE2701**	Language Competency Enhancement Course - II	HS	0	0	1	1	100	0	100
			TOTAL	**14**	**2**	**11**	**22**	**375**	**425**	**800**

Chairman

G. Nagnadh

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Dean Academics

Dean (Academics)
HiCET

SEMESTER - III										
S.NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	19MA3101	Fourier Series and Statistics	BS	3	1	0	4	25	75	100
2	19MT3201	Mechanics of solids	PC	3	1	0	4	25	75	100
3	19MT3202	Industrial Motor Control	PC	3	0	0	3	25	75	100
4	19MT3203	Digital Applications in Mechatronics Systems	PC	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENT										
5	19MT3251	Production Technology	PC	2	0	2	3	50	50	100
PRACTICAL										
6	19MT3001	Computer Aided Drafting Laboratory	PC	0	0	3	1.5	50	50	100
7	19MT3002	Industrial Motor Control Laboratory	PC	0	0	3	1.5	50	50	100
NON CREDIT MANDATORY COURSES										
8	19MC3191	Indian Constitution	ACM	2	0	0	0	100	0	100
			TOTAL	16	2	8	20	350	450	800

Chairman

Chairman, Board of Studies
Chairman - BoS
MCT - HiCET

Dean Academics
Dean (Academics)
HiCET

SEMESTER - IV										
S.NO	**COURSE CODE**	**COURSE TITLE**	**COURSE CATEGORY**	**L**	**T**	**P**	**C**	**CIA**	**ESE**	**TOTAL**
THEORY										
1	**19MA4101**	Numerical Methods	BS	3	1	0	4	25	75	100
2	**19MT4201**	Microcomputer Systems and Microcontroller	PC	3	0	0	3	25	75	100
3	**19MT4202**	Thermodynamics and Fluid Engineering	PC	3	1	0	4	25	75	100
4	**19MT4203**	Theory of Machines	PC	3	1	0	4	25	75	100
THEORY WITH LAB COMPONENT										
5	**19MT4251**	Sensors and Signal Conditioning	PC	2	0	2	3	50	50	100
PRACTICAL										
6	**19MT4001**	Assembly Programming and Interfacing Laboratory	PC	0	0	3	1.5	50	50	100
7	**19MT4002**	Solid and Fluid Mechanics & Machinery Laboratory	PC	0	0	3	1.5	50	50	100
NON CREDIT MANDATORY COURSES										
8	**19MC4191**	Essence of Indian Traditional Knowledge	ACM	2	0	0	0	100	0	100
			TOTAL	**16**	**3**	**8**	**21**	**350**	**450**	**800**

Chairman

Chairman, Board of Studies
Chairman - BoS
MCT - HiCET

Dean Academics
Dean (Academics)
HiCET

SEMESTER - V										
S.NO	**COURSE CODE**	**COURSE TITLE**	**COURSE CATEGORY**	**L**	**T**	**P**	**C**	**CIA**	**ESE**	**TOTA**
THEORY										
1	**19MT5201**	Machine Design	PC	3	1	0	4	25	75	100
2	**19MT5202**	Industrial Automation and Control	PC	3	0	0	3	25	75	100
3	**19MT5203**	Control of Mechatronics Systems	PC	3	0	0	3	25	75	100
4	**19MT53XX**	**Professional Elective - I**	PE	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENT										
5	**19MT5251**	Fluid Power Systems	PC	2	0	2	3	50	50	100
6	**19MT5252**	Object Oriented Programming	PC	2	0	2	3	50	50	100
PRACTICAL										
7	**19MT5001**	Computer Aided Machine Drawing Laboratory	PC	0	0	3	1.5	50	50	100
8	**19MT5002**	Industrial Automation and Control Laboratory - I	PC	0	0	3	1.5	50	50	100
ONE CREDIT MANDATORY COURSES										
9	**19HE5071**	Soft Skill I	EEC	1	0	0	1	100	0	100
10	**19HE5072**	Design Thinking	EEC	1	0	0	1	100	0	100
			TOTAL	**18**	**1**	**10**	**24**	**500**	**500**	**1000**

PROFESSIONAL ELECTIVE - I										
S.NO	**COURSE CODE**	**COURSE TITLE**	**COURSE CATEGORY**	**L**	**T**	**P**	**C**	**CIA**	**ESE**	**TOTAL**
1	**19MT5301**	Engineering Metrology and Measurements	PE	3	0	0	3	25	75	100
2	**19MT5302**	Non Traditional Machining Techniques	PE	3	0	0	3	25	75	100
3	**19MT5303**	Automobile Systems	PE	3	0	0	3	25	75	100
4	**19MT5304**	Operations Research	PE	3	0	0	3	25	75	100
5	**19MT5305**	Materials Science and Applications	PE	3	0	0	3	25	75	100

Chairman

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Dean Academics

Dean (Academics)
HiCET

SEMESTER - VI										
S.NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	CIA	ESE	TOTA
THEORY										
1	19MT6181	Total Quality Management	HS	3	0	0	3	25	75	100
2	19MT6201	Design of Mechatronics Systems	PC	3	0	0	3	25	75	100
3	19MT6202R	CNC Technology	PC	3	0	0	3	25	75	100
4	19MT63XX	**Professional Elective - II**	PE	3	0	0	3	25	75	100
5	19XX6401	**Open Elective – I**	OE	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENT										
6	19MT6251	Vetronics	PC	2	0	2	3	50	50	100
PRACTICAL										
7	19MT6001	CNC Laboratory	PC	0	0	3	1.5	50	50	100
8	19MT6002	Industrial Automation and Control Laboratory - II	PC	0	0	3	1.5	50	50	100
9	19MT6701	Inplant Training / Internship *	EEC	0	0	0	1	100	0	100
ONE CREDIT MANDATORY COURSES										
10	19HE6071	Soft Skill II	EEC	1	0	0	1	100	0	100
11	19HE6072	Intellectual Property Rights (IPR)	EEC	1	0	0	1	100	0	100
			TOTAL	**19**	**0**	**8**	**24**	**575**	**525**	**1100**

PROFESSIONAL ELECTIVE - II										
S.NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	CIA	ESE	TOTAL
1	19MT6301	Embedded System	PE	3	0	0	3	25	75	100
2	19MT6302	Discrete Event System Simulation	PE	3	0	0	3	25	75	100
3	19MT6303	Product Design and Development	PE	3	0	0	3	25	75	100
4	19MT6304	Non Destructive Testing Techniques	PE	3	0	0	3	25	75	100
5	19MT6305	Distinctive Electrical Machines	PE	3	0	0	3	25	75	100

Chairman

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Dean (Academics)

Dean (Academics)
HiCET

SEMESTER - VII										
S.NO	**COURSE CODE**	**COURSE TITLE**	**COURSE CATEGORY**	**L**	**T**	**P**	**C**	**CIA**	**ESE**	**TOTAL**
THEORY										
1	**19MT7201**	Virtual Instrumentation and Human Machine Interface	PC	3	1	0	4	25	75	100
2	**19MT7202**	Machine Vision Systems	PC	3	0	0	3	25	75	100
3	**19MT73XX**	**Professional Elective - III**	PE	3	0	0	3	25	75	100
4	**19XX7401**	**Open Elective – II**	OE	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENT										
5	**19MT7251**	Industrial Robotics	PC	2	0	3	3.5	50	50	100
PRACTICAL										
6	**19MT7001**	CAE Laboratory	PC	0	0	3	1.5	50	50	100
7	**19MT7901**	Project Phase – I	EEC	0	0	4	2	100	0	100
			TOTAL	**14**	**1**	**10**	**20**	**300**	**400**	**700**

PROFESSIONAL ELECTIVE - III										
S.NO	**COURSE CODE**	**COURSE TITLE**	**COURSE CATEGORY**	**L**	**T**	**P**	**C**	**CIA**	**ESE**	**TOTAL**
1	**19MT7301**	Mobile Robotics	PE	3	0	0	3	25	75	100
2	**19MT7302**	Textile Automation	PE	3	0	0	3	25	75	100
3	**19MT7303**	Medical Mechatronics	PE	3	0	0	3	25	75	100
4	**19MT7304**	Disaster Management	PE	3	0	0	3	25	75	100
5	**19MT7305**	Factory Automation	PE	3	0	0	3	25	75	100

Chairman

Chairman, Board of Studies
Chairman - BoS
MCT - HiCET

Dean (Academics)
HiCET

SEMESTER - VIII										
S.NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	CIA	ESE	TOTA
THEORY										
1	19MT83XX	Professional Elective - IV	PE	3	0	0	3	25	75	100
2	19MT83XX	Professional Elective - V	PE	3	0	0	3	25	75	100
PRACTICAL										
3	19MT8901	Project Phase – II	EEC	0	0	16	8	100	0	100
			TOTAL	6	0	16	14	150	150	300

PROFESSIONAL ELECTIVE - IV										
S.NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	CIA	ESE	TOTA
1	19MT8301	Rapid Prototyping and Reverse Engineering	PE	3	0	0	3	25	75	100
2	19MT8302	Industrial IoT	PE	3	0	0	3	25	75	100
3	19MT8303	Artificial Intelligence for Mechatronics Engineering	PE	3	0	0	3	25	75	100
4	19MT8304	MEMS and Nano Technology	PE	3	0	0	3	25	75	100
5	19MT8305	Information System for Engineers	PE	3	0	0	3	25	75	100

PROFESSIONAL ELECTIVE - V										
S.NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	CIA	ESE	TOT
1	19MT8306	Machineries in Agriculture	PE	3	0	0	3	25	75	100
2	19MT8307	Industrial Diagnostics and Maintenance Techniques	PE	3	0	0	3	25	75	100
3	19MT8308	Engineering Economics and Cost Analysis	PE	3	0	0	3	25	75	100
4	19MT8181	Principles of Management	PE	3	0	0	3	25	75	100
5	19MT8182	Professional Ethics in Engineering	PE	3	0	0	3	25	75	100

ACADEMIC COUNCIL Chairman HICET

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Dean Academics

Dean (Academics)
HiCET

OPEN ELECTIVES										
S.NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	CIA	ESE	TOTA
OPEN ELECTIVE - I										
1	19MT6401	Industrial Safety and Environment	OE	3	0	0	3	25	75	100
OPEN ELECTIVE - II										
2	19MT7401	Project Management	OE	3	0	0	3	25	75	100
LIFE SKILL OPEN ELECTIVES COURSES										
3	19LSX401	General Studies for Competitive Examinations	OE	3	0	0	3	25	75	100
4	19LSX402	Human Rights, Women's Rights and Gender Equality	OE	3	0	0	3	25	75	100
5	19LSX403	Indian Ethos and Human Values	OE	3	0	0	3	25	75	100
6	19LSX404	Indian Constitution and Political System	OE	3	0	0	3	25	75	100
7	19LSX405	Yoga for Human Excellence	OE	3	0	0	3	25	75	100

VALUE ADDED COURSES										
S.NO	COURSE CODE	COURSE TITLE	SEMESTER	L	T	P	C	CIA	ESE	TOTA
ADDITIONAL CREDIT COURSES - CAREER GUIDANCE										
1	19HE1072	Career Guidance – Level I Personality, Aptitude and Career Development	I	2	0	0	0	100	0	100
2	19HE1073	Entrepreneurship & Innovation	I	1	0	0	0	100	0	100
3	19HE2072	Career Guidance – Level II Personality, Aptitude and Career Development	II	2	0	0	0	100	0	100
4	19HE3071	Career Guidance – Level III Personality, Aptitude and Career Development	III	2	0	0	0	100	0	100
5	19HE4071	Career Guidance – Level IV Personality, Aptitude and Career Development	IV	2	0	0	0	100	0	100

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Chairman

Dean Academics

Dean (Academics)
HiCET

CREDIT DISTRIBUTION								
SEM I	SEM II	SEM III	SEM IV	SEM V	SEM VI	SEM VII	SEM VIII	TOTAL
20	22	20	19	24	24	20	14	165

Chairman

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Dean Academics

Dean (Academics)
HiCET

Programme	Course Code	Name of the Course	L	T	P	C
BE	19MT5201	Machine Design (Approved Design Data Book is Permitted)	3	1	0	4

Course Objective

1. To familiarize the fundamentals involved in design process
2. To learn fundamental approaches to failure prevention for static and repeated loading
3. To interpret the types of gears and principles of gear tooth action
4. To learn the fundamentals of brakes and chain drives
5. To impart the knowledge in selection of bearings and springs for different applications

Unit	Description	Instructional Hours
	INTRODUCTION TO BEHAVIOR OF MATERIALS	
I	Behavior of Materials - Optimum Design - Mechanical Properties of Materials - Types of Loads - Stresses - Static, Varying, Thermal, Impact and Residual - Factors of Safety - Theories of Failure - Stress Concentration Factors.	9+3
	DESIGN OF SHAFTS AND WELDED JOINTS	
II	Design of Solid and Hollow Shafts - Based on Strength, Rigidity and Deflection- Torsional Rigidity - Design of welding joints.	9+3
	GEARS	
III	Principles of Gear Tooth Action - Gear Correction - Gear Tooth Failure Modes - Stresses and Loads - Component Design of Spur, Helical and Bevel gears.	9+3
	BRAKES AND CHAIN DRIVES	
IV	Design of Brakes -Types - Band - Block - Chain Drives - Selection of Transmission Chains and Sprockets - Failure of Chain Drives-Design of Bolt - Design of Nuts.	9+3
	BEARINGS AND SPRINGS	
V	Design of Bearings - Sliding Contact - Rolling Contact - Design of Journal Bearings - Design of Springs - Types - Helical and Leaf.	9+3
	Total Instructional Hours	45+15=60

Course Outcome

On completion of the course the students will be able to

- CO1: Analyse the stress, strain and deflection in simple machine elements
- CO2: Calculate safety factors of simple structures exposed to static and repeatedloads
- CO3: Determine the performance requirements in the selection of commercially available machine elements such as shaft, coupling, gears, bearings and springs etc.
- CO4: Design and optimize the selection of brakes and clutches for automotive components and machine elements
- CO5: Decide an appropriate failure model

TEXT BOOKS:

T1- R.B.Patil, *"Design of Machine Elements"*, 1st Edition, McMillan Publications, India, 2017.

T2- S. Md. Jalaludeen, *"Machine Design (Vol. I & II)"*, 4th Edition, Anuradha Publications, Chennai, 2014.

REFERENCE BOOKS:

R1- V.B.Bhandari, *"Design of Machine Elements"*, 3rd Edition, Tata McGraw Hill Publishing CompanyLimited, New Delhi, 2010.

R2- PSG College of Technology, *"Design Data Book of Engineers"*, KalaikathirAchchagam, Coimbatore, 2018.

R3- Maitra.G.M., and Prasad.L.N., *"Hand Book of Mechanical Design"*, 2nd Edition, Tata McGraw Hill Publishing CompanyLimited,New Delhi, 2005.

R4- Sundararajamoorthy T. V, Shanmugam .N, "Machine Design", Anuradha Publications, Chennai, 2015.

S. Nanadh

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL * HINDUSTHAN COLLEGE OF ENGG & TECH * Chairman

Dean Academics

Dean (Academics)
HiCET

Mapping of COs with POs and PSOs														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSC
CO1	3	3	3	3	3	2	1	2				2	2	2
CO2	3	3	3	3	3	2	1	2				2	2	2
CO3	3	3	3	3	3	2	1	2				2	2	2
CO4	3	3	3	3	3	2	1	2				2	2	2
CO5	3	3	3	3	3	2	1	2				2	2	2
AVG	3	3	3	3	3	2	1	2	-	-	-	2	2	2

- 1-low, 2-medium, 3-high, '-'- no correlation
- Note: The average value of this course to be used for program articulation matrix.

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

HINDUSTHAN ACADEMIC COUNCIL Chairman HINDUSTHAN COLLEGE OF ENGG & TECH

Dean Academics

Dean (Academics)
HiCET

THEORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	19MT5202	Industrial Automation and Control	3	0	0	3

Course Objective

1. To study the architecture, Hardware and Software wiring of programmable logiccontroller
2. To read the fundamentals of PLC programming instructions
3. To explain the PLC programs to perform specified discrete sequential control operations
4. To develop the knowledge in real time application using PLC
5. To learn basic knowledge on architecture of SCADA and HMI

Unit	Description	Instructional Hours
I	**PROGRAMMABLE LOGIC CONTROLLERS** Architecture of PLC -Principles of Operations - PLC size and Application - PLC Discrete Modules - PLC Analog Modules– I/O Specifications-Memory Types - Scan Cycle - PLC Programming Language - Fundamentals of Logics.	9
II	**PROGRAMMING INSTRUCTIONS** Programming EXAMINE ON and EXAMINE OFF instructions -Logical Instructions - Control Instructions - Data Manipulating Instructions - Math Instructions –Immediate I/O Instructions - PLC Ladder Diagram.	9
III	**TIMERS AND COUNTERS** ON DELAY Timer - OFF DELAY Timer - Retentive Timer - Timer Applications - UP Counter - DOWN Counter- UP/DOWN Counter - Counter Applications - Combining Timer and Counter Functions.	9
IV	**APPLICATIONS OF PLC** Water Level Control - Material Handling Application - StampingSystem - Spray Painting System - Bottle Filling System - Lift Elevator Control - Traffic Light Control - - Automatic car washing machine - Automatic lubrication of supplier Conveyor belt .	9
V	**SCADA SYSTEMS** Introduction and Definition of SCADA - Basic Architecture of SCADA - Human Machine Interface - Master Terminal Unit - Remote Terminal Unit - SCADA Data Transfer through PLC - Communication Technologies - Communication System Components.	9
	Total Instructional Hours	45

Course Outcome

On completion of the course the students will be able to

CO1: Demonstrate knowledge and understanding of PLC interfacing and programming techniques
CO2: Design and describe the operation of a PLC program
CO3: Choose various Timers and Counters based on real time applications
CO4: Create PLC program to control typical industrial related processes
CO5: Infer and control the Industrial Process using SCADA systems

TEXT BOOKS:

T1- Frank D. Petruzella, *"Programmable Logic Controllers"*, 3rd Edition, Tata McGraw Hill Publishing CompanyLimited,NewDelhi, 2010.

T2- Ronald L.Kurtz, *"Securing SCADA System"*, 1st Edition, John Wiley & Sons, 2015.

REFERENCE BOOKS:

R1- John W.Webb and Ronald A.Reis, *"Programmable Logic Controllers-Principles and Applications"*, 4th Edition,PHI Learning Private Limited, NewJersey, 2003.

R2- Stenerson, *"Fundamentals of Programmable Logic Controllers, Sensors and Communication"*, 3rd Edition, PearsonEducation, Asia, 2005.

R3- William T. Shaw, *"Cybersecurity for SCADA systems"*, Penn Well Books, 2006

R4- Gary Dunning, *"Introduction to Programmable Logic Controllers"*,3rd India edition, Cengage Learning, 2007

Chairman, Board of Studies

Chairman - BOS
MCT - HiCET

ACADEMIC COUNCIL • Chairman • MINDUSTHAN COLLEGE OF ENGG & TECH

Dean Academics

Dean (Academics)
HiCET

Mapping of COs with POs and PSOs														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO
CO1	1		2						1	1	1	1	1	
CO2	1		3									1	2	
CO3			2		1								2	
CO4			3										3	
CO5	1		1									1	1	
AVG	0.6	-	2.2	-	0.2	-	-	-	0.2	0.2	0.2	0.6	1.8	-

- 1-low, 2-medium, 3-high, '-"- no correlation
- Note: The average value of this course to be used for program articulation matrix.

S. Nbamadh
Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

HINDUSTHAN COLLEGE OF ENGG & TECH • ACADEMIC COUNCIL • Chairman

Dean Academics

Dean (Academics)
HiCET

THEORY COURSES

Programme	Course Code	Name of the Course	L	T	P
BE	19MT5203	Control of Mechatronics Systems	3	0	0

Course Objective

1. To solve the fundamental concepts of control systems and mathematical modeling of the system
2. To discuss the concept of time response of the system and error
3. To sketch the plot for frequency response of system and stability analysis
4. To develop and analysis state variable model
5. To select the controller for mechatronics applications

Unit	Description	Instructional H...
I	**SYSTEM REPRESENTATION AND MODELLING** Introduction and Need for Control Systems with Examples - Open Loop and Closed Loop Systems - Transfer Function Model - Mathematical Modeling of Mechanical, Electrical Systems - Block Diagram Reduction - Signal Flow Graph.	9+3
II	**TIME RESPONSE ANALYSIS** Standard Test Signals - Time Response – First order and Second order systems- Time Domain Specifications- Error Coefficients – Generalized Error series – Steady State Error.	9+3
III	**STABILITY ANALYSIS** Frequency Domain: Bode Plot - Polar Plot –Effects of Lag, Lead and Lag Lead compensation. Time Domain: Routh Hurwitz Criterion - Root Locus construction- Nyquist Stability Criterion	9+3
IV	**STATE SPACE ANALYSIS** Concepts of State - State Variables and State Models - State Space Equations - Transfer Function - Transfer Model, State Space Representation of Dynamic Systems, State Transition Matrix - Decomposition of Transfer Function - Controllability and Observability.	9+3
V	**BASIC CONTROLLERS** P, PI, PD and PID Controller –Feed Forward Control - Tuning of Controller - Ziegler Nicol Tuning - Distributed Control System - Case study:Controller design for flow control process.	9+3
	Total Instructional Hours	45+15=60

Course Outcome

On completion of the course the students will be able to

CO1: Interpret different physical, mechanical, electrical system to Construct equivalent models and it Transfer functions.
CO2: Describe the response of different order systems for and error series
CO3: Analyze the stability of the system using different plots
CO4: Solve system equations in state-variable form
CO5: Identify controller concepts used in industry

TEXT BOOKS:

T1- A. Nagoorkani, *"Control systems Engineering"*, 3rd Edition, RBA Publications, Chennai, 2017.
T2- Curtis D. Johnson, *"Process Control Instrumentation Technology"*, 8th Edition, PHI Learning Private Limited, New Del 2005.

REFERENCE BOOKS:

R1- Katsuhiko Ogata, "Modern Control Engineering", 5th Edition, PHI Learning Private Limited, New Delhi, 2010.
R2- M Gopal, "Control Systems-Principles and Design", 4th Edition, McGraw Hill Education, New Delhi, 2012.
R3- Norman S. Nise, "Control Systems Engineering", 6th Edition, John Wiley& Sons Inc., New York, 2010.
R4- S.K.Bhattacharya, *"Control System Engineering"*, 3rd Edition, Pearson, 2013.

WEB REFERENCES:

1. http://instrumentationtools.com/difference-between-dcs-plc-systems

g. Nasmadh

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Chairman

Dean Academics

Dean (Academics)
HiCET

Mapping of COs with POs and PSOs														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO
CO1	1		2						1	1	1	1		
CO2	1		3									1		2
CO3			2		1									2
CO4			3											3
CO5	1		1									1		
AVG	0.6	-	2.2	-	0.2	-	-	-	0.2	0.2	0.2	0.6	-	1.

- 1-low, 2-medium, 3-high, '-'- no correlation
- Note: The average value of this course to be used for program articulation matrix.

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Dean Academics

Dean (Academics)

THEORY CUM PRACTICALCOURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	19MT5251	**Fluid Power Systems**	2	0	2	3

Course Objective

1. To familiarize the fundamentals of fluid power Principles, characteristics of the fluid power system components
2. To learn the hydraulic system components for various applications
3. To develop fluid power circuits for various Mechatronics systems
4. To impart knowledge about pneumatic system components for various application circuits
5. To learn to develop applications based on fluid power system

Unit	Description	Instructional Hours
	FLUID POWERSYSTEMS AND FUNDAMENTALS	
I	Introduction to Fluid Power - Advantages of Fluid Power, Application of Fluid Power System. Types of Fluid Power Systems, Properties of Hydraulic Fluids - Types of Fluids - Fluid Power Symbols - Basics of Hydraulics-ANSII symbols	6
	HYDRAULIC COMPONENTS AND ACTUATORS	
II	Introduction to Pumps, Fluid Power Actuators: Linear Hydraulic Actuators - Types of Hydraulic Cylinders - Single Acting - Double Acting - Special Cylinders like Tandem – Rodless – Telescopic - Cushioning Mechanism.	6
	DESIGN OF HYDRAULIC CIRCUITS	
III	Construction of Control Components: Direction Control Valve - 3/2 Way Valve - 4/2 Way Valve - Shuttle Valve - Check Valve - Pressure Control Valve - Pressure Reducing Valve, Sequence Valve, Flow Control Valve - Accumulators and Intensifiers: Types of Accumulators - Accumulators Circuits, Intensifier Circuit.	6
	PNEUMATIC SYSTEMS AND COMPONENTS	
IV	Pneumatic Components: Properties of Air - Compressors - Filter, Regulator and Lubricator Unit - Fluid Power Circuit Design - Speed Control Circuits, Synchronizing Circuit, Sequential Circuit Design for Simple Applications using Cascade Method.	6
	APPLICATION, MAINTENANCE AND TROUBLE SHOOTING	
V	Development of Hydraulic / Pneumatic Circuits Applied to Machine Tools - Presses - Material Handling Systems - Automotive Systems - Maintenance and Trouble Shooting of Fluid Power Circuits - Safety Aspects.	6
	Total Instructional Hours	30

LABORATORY COURSES

HYDRAULICS

1.	Design and Testing of the Following Hydraulic Circuits: a. Pressure Control b. Flow Control	2
2.	Design and Testing of Hydraulic Bi-Directional and Semi-Rotary Motor System.	2
3.	Design and Testing of Hydraulic Cylinder Sequencing System using fluid power simulation software and PLC.	2
4.	Design and Testing of a Double Acting Cylinder using Sensor Based Electro Hydraulic Control and PLC.	3
	PNEUMATICS	
5.	Design and Testing of Single Acting Cylinder using of 3/2 Way Direction Control Valves.	2
6.	Design and Testing of Single Acting Cylinder and also Speed Control using Flow Control Valves.	2
7.	Design and Testing Circuit of a Double Acting Cylinder using 3/2 and 5/2 Way Valves, AND, OR logic Elements.	2
	Total Instructional Hours	15+30=45

On completion of the course the students will be able to

G.Naamadh

Chairman, Board of Studies

Chairman - BoS
MCT - HICET

ACADEMIC COUNCIL MINUTES COLLEGE OF ENGG & TECH Chairman

Dean Academics

Dean (Academics)
HICET

Course Outcome

CO1: Explain the fundamental concepts of fluid power system
CO2: Apply the hydraulic concepts into pumps and valves
CO3: Design hydraulic circuits for different applications
CO4: Apply the knowledge of pneumatic systems and its components
CO5: Manipulate the knowledge in fluid power system maintenance and troubleshooting techniques

TEXT BOOKS:

T1- Anthony "*Esposito, Fluid Power with Applications*", 6th Edition, PHI Learning Private Limited, New Delhi, 2009

T2- R.Srinivasaan, "*Hydraulics and Pneumatics Control*", 2nd Edition, Mcgraw Hill India Pvt. Ltd, 2008

REFERENCE BOOKS:

R1- Andrew *Parr*, "*Hydraulics and Pneumatics*", 7th Edition, Jaico Publishing House, 2008

R2- FESTO, "*Fundamentals of Pneumatics*", Vol. I, II, III

R3- S.R.Majundar , "*Oil Hydraulic Systems- Principles and Maintenance*", 2nd Edition, Mcgraw Hill India Pvt. Ltd, 2008.

R4- S.R.Majundar , "*Pneumatic Systems- Principles and Maintenance*", 2nd Edition, Mcgraw Hill India Pvt. Ltd, 2007.

Mapping of COs with POs and PSOs

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3	2	2	2	2	1						2	2	3
CO2	3	2	2	3	3	1						2	2	3
CO3	3	2	3	3	3	1						2	2	3
CO4	3	2	2	3	3	1						2	2	3
CO5	3	2	2	3	3	1						2	2	3
AVG	3	2	2.2	2.8	2.8	1	-	-	-	-	-	2	2	3

- 1-low, 2-medium, 3-high, '-'- no correlation
- Note: The average value of this course to be used for program articulation matrix.

Chairman, Board of Studies

Dean Academics

Chairman - BoS
MCT - HiCET

Dean (Academics)
HiCET

THEORY CUM PRACTICAL COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	19MT5252	Object Oriented Programming	2	0	2	3

Course Objective

1. To learn the concepts of object oriented programming
2. To impart the fundamental concepts of core JAVA
3. To classify various types of inheritance
4. To develop the application programming based on exception handling
5. To develop the program using multithread

THEORY

Unit	Description	Instructional Hours
	BASIC CONCEPTS OF OBJECT ORIENTED PROGRAMMING	
I	Object Oriented Programming Concepts - Objects - Classes - Methods and Messages - Abstraction and Encapsulation - Inheritance - Polymorphism	6
	OVERVIEW OF JAVA	
II	Basics of Java Programming, Data Types, Variables and Arrays, Operators, Control Structures - Classes, Objects and Methods - Constructors - Thiskeyword - Finalize Method.	6
	PACKAGES AND INTERFACES	
III	Inheritance - Method Overriding - Abstract Class - Final keyword - Java API Packages - Naming Conventions - Creating, Accessing, Using Packages - Interfaces: Defining, Extending, Implementing Interfaces.	6
	EXCEPTION HANDLING	
IV	Exception Types - Uncaught Exceptions - Using Try and Catch -Multiple Catch - Nested Try - Throws - Finally - Built in Exceptions - Throwing own exceptions - Chained Exceptions.	6
	MULTITHREAD PROGRAMMING	
V	Creating and Extending Thread - Stopping and Blocking Thread - Life Cycle -Using Thread - Thread priority - Synchronization - Runnable Interface - Inter Thread Communications.	6
	Instructional Hours	30

PRACTICAL

1	Create class and object using Java programto display first 100 prime numbers	
2	Java program to implement Method overloading and random number generation.	
3	Java program using to implement Inheritance i) single inheritance ii) multilevelinheritance iii) hierarchal inheritance using super keyword	
4	Java program using to implement method overriding and dynamic dispatch	
5	Java program to print Odd and Even Numbers from an Array	
6	Java program to create a thread, multi thread program	
7	Java program for implement a Stack concept using Classes and Object	
8	Java program for producer consumer application	
	Instructional Hours	15
	Total Hours	45

Course Outcome

On completion of the course the students will be able to

CO1: Describe the concepts of objects, classes and inheritanceCO2: Apply the concepts of data, array and structures

CO3: Develop the program using function overloading, operator overloading, virtual functions

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Dean Academics

Dean (Academics)
HiCET

ACADEMIC COUNCIL Chairman

and polymorphism.

CO4: Create an exception handling application using programsCO5:

Develop the program using the concepts of multithread

TEXT BOOKS:

T1: Herbert Schild, *"Java the Complete Reference"*, 8th Edition, McGraw Hill Education, New Delhi, 2011.

T2: Ali Bahrami, *"Object Oriented Systems Development"*, 1st Edition, Pearson Education, New Delhi, 2008.

REFERENCE BOOKS:

R1: E Balagurusamy, *"Programming with JAVA"*, 5th Edition, McGraw Hill Education, New Delhi, 2015.

R2: Michael Blaha, James Rumbaugh, *"Object Oriented Modeling and Design With UML"*, 2nd Edition, PearsonEducation, New jersey, 2008.

R3: Paul Deitel, Harvey Deitel, "*Java, How to Program"*, 8th Edition, PHI Publications , 2010.

R4: Ken Arnold, James Gosling, David Holms, "*The java Programming Language*", Pearson Education, 2003.

Mapping of COs with POs and PSOs

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

- 1-low, 2-medium, 3-high, '-'- no correlation
- Note: The average value of this course to be used for program articulation matrix.

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Dean Academics

Dean (Academics)
HiCET

LABORATORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	19MT5001	Computer Aided Machine Drawing Laboratory	0	0	3	1.5

Course Objective

1. To develop skills on 2D drafting and 3D modeling using CAD software systems
2. To apply constructional drawing techniques in Engineering field
3. To provide the importance of computer aided machine drawing in various applications
4. To assemble various components to achieve the desire mechanisms.
5. To expose students to gain knowledge in machine design elements.

Unit	Description of the Experiments	Practical Hours
1	Study of Welding Symbols and Riveted Joints	
2	Study of Limits, Fits and Tolerances	
3	Study of Screw Threads and Threaded Fasteners	
4	Assembly Drawing of sleeve coupling	
5	Assembly Drawing of Protected Flange Coupling	
6	Assembly Drawing of Universal Coupling	
7	Assembly Drawing of Knuckle Joint	
8	Assembly Drawing of Screw Jack	
9	Assembly Drawing of Stuffing Box	
10	Assembly Drawing of Plummer Block	
11	Assembly Drawing of Connecting Rod	
12	Assembly Drawing Of Machine Vice	
	Total Practical Hours	45

Course Outcome

On completion of the course the students will be able to

CO1: Develop 2D, 3D models using modeling software
CO2: Design and model the constructional features in Engineering field
CO3: Apply the design skills in computer aided machine drawing
CO4: Demonstrate the machine drawings in assembly operations
CO5: Design and model the given machine elements

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Chairman

Dean Academics

Dean (Academics)
HiCET

Mapping of COs with POs and PSOs														
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO-1**	**PSO-2**
CO1	2	2	2	2	2	2	2	2	2	2	2	2	1	1
CO2	3	1	2	1	-	-	-	-	-	-	-	-	2	2
CO3	-	3	3	2	-	-	-	-	1	-	-	-	3	3
CO4	-	1	1	-	-	-	-	-	-	-	-	-	1	1
CO5	2	2	2	2	-	-	-	-	-	-	-	1	2	2
AVG	2.3	1.8	2	1.75	2	2	2	2	1.5	2	2	1.5	1.8	1.8

- 1-low, 2-medium, 3-high, '-'- no correlation
- Note: The average value of this course to be used for program articulation matrix.

ACADEMIC COUNCIL • HINDUSTHAN COLLEGE OF ENGG & TECH • Chairman

G. Naarnadh

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Dean Academics

Dean (Academics)
HiCET

LABORATORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	19MT5002	Industrial Automation and Control Laboratory-I	0	0	3	1.5

Course Objective

1. To acquire knowledge onPLC hardware and software
2. To impart the knowledge about the basic instruction set of PLC
3. To explain the PLC wiring with field devices
4. To create ladder logic diagrams for digital I/O's and interface with PLC for industrial applications
5. To read the basics of SCADA

Unit	Description of the Experiments
1	Implementation of Logic Instruction using PLC Basic Operations.
2	Implementation of Math Instruction using PLC Basic Operations
3	Programming with PLCfor the Lamp Circuit.
4	Programming with PLC for Actuating Single Acting Cylinder.
5	Programming with PLC for Water Level Control of Two Different Water Tanks.
6	Programming with PLC for Material Handling System.
7	Programming with PLC for StampingSystem.
8	Programming with PLC for Spray Painting System.
9	Programming with PLC for Bottle Filling System.
10	Programming with PLC for Lift Elevator Control.
11	Programming with PLC for Traffic Light Control.
12	Study of SCADA System.

Total Practical Hours 45

Course Outcome

On completion of the course the students will be able to

CO1: Demonstrate the working knowledge of PLC for a real time process

CO2: Develop the program in PLC Software and interface with different controlled applications

CO3: Develop hard wiring with PLC and field digital I/Os

CO4: Create the ladder logic for industrial applications

CO5: Explain the uses of SCADA

Chairman, Board of Studies

Chairman - BoS MCT - HiCET

ACADEMIC COUNCIL · HINDUSTHAN COLLEGE OF ENGG & TECH · Chairman

Dean Academics

Dean (Academics) HiCET

Mapping of COs with POs and PSOs														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1			2										1	
CO2	1		1		2				1		3		2	
CO3	2		3		1				2		3		2	
CO4	1		3		3				3		2		3	
CO5			1										1	
AVG	0.8	-	2	-	1.2	-	-	-	1.2	-	1.6	-	1.8	-

- 1-low, 2-medium, 3-high, '-'- no correlation
- Note: The average value of this course to be used for program articulation matrix.

Chairman

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Dean Academics

Dean (Academics)
HiCET

Programme	Course Code	Course Title	L	T	P	C
BE/BTECH	19HE5071	Soft Skills - I	1	0	0	1

Course Objectives:

1.To employ soft skills to enhance employability and ensure workplace and career success.
2.To enrich students' numerical ability of an individual and is available in technical flavor.
3.To interpret things objectively, to be able to perceive and interpret trends to make generalizations and be able to analyze assumptions behind an argument/statement.

Unit	Description	Instructional Hours
I	**Introduction to Soft Skills:** Introduction- Objective -Hard vs Soft Skills - Measuring Soft Skills- Structure of the Soft Skills -Self Management-Critical Thinking-Reflective thinking and writing- p2p Interaction	3
II	**Art of Communication:** Verbal Communication - Effective Communication - Active listening –Paraphrasing - Feedback - Non-Verbal Communication – Roles-Types- How nonverbal communication can go wrong- How to Improve nonverbal Communication - Importance of feelings in communication - dealing with feelings in communication.	4
III	**World of Teams:** Self Enhancement - importance of developing assertive skills- developing self-confidence – developing emotional intelligence - Importance of Team work – Team vs. Group - Attributes of a successful team – Barriers involved - Working with Groups – Dealing with People- Group Decision Making.	3
IV	**Quantitative Aptitude:** Averages - Profit and loss - Partnerships - Time and work - Time, Speed and Distance - Problems based on trains - Problems based on boats and streams	3
V	**Logical Reasoning:** Clocks - Calendars - Direction Sense - Data Interpretation: Tables, Pie Chart, Bar Graph - Data Sufficiency	2

Course Outcome:

CO1: Students will have clarity on their career exploration process and to match their skills and interests with a chosen career path.

CO2: Students will develop knowledge, skills, and judgment around human communication that facilitate their ability to work collaboratively with others

CO3: Students will understand how teamwork can support leadership skills

CO4: Students will be able to make sense of problems, develop strategies to find solutions, and persevere in solving them.

CO5: Students will demonstrate an enhanced ability to draw logical conclusions and implications to solve logical problems.

REFERENCE BOOKS:

R1: Soft Skills Training: A Workbook to Develop Skills for Employment - Frederick H. Wentz
R2: How to prepare for data interpretation for CAT by Arun Sharma.
R3: How to Crack TEST OF REASONING in all competitive examinations by Jaikishan and Premkishan.
R4: A New Approach To Reasoning Verbal & Non-Verbal By B.S. Sijwali
R5: Quantitative Aptitude for Competitive Examinations - Dr. R.S. Aggarwal, S. Chand

ACADEMIC COUNCIL • MINDSHAN COLLEGE OF ENGG & TECH • Chairman

Chairman, Board of Studies

Dean Academics

Chairman - BoS
MCT - HiCET

Dean (Academics)
HiCET

Programme	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech.	19HE5072	**DESIGN THINKING**	1	0	0	1

Course Objective

OBJECTIVES:

- To expose students to the design process
- To develop and test innovative ideas through a rapid iteration cycle.
- To provide an authentic opportunity for students to develop teamwork and leadershipskills

Unit	Description	Instructional Hours
I	**DESIGN ABILITY** Asking Designers about what they Do – Deconstructing what Designers Do – Watching what Designers Do – Thinking about what Designers Do – The Natural Intelligence of Design Sources	4
II	**DESIGNING TO WIN** Formula One Designing – Radical Innovations – City Car Design – Learning FromFailures – Design Process and Working Methods	4
III	**DESIGN TO PLEASE AND DESIGNING TOGETHER** Background – Product Innovations – Teamwork versus Individual work – Roles and Responsibilities – Avoiding and Resolving Conflicts.	4
IV	**DESIGN EXPERTISE** Design Process – Creative Design - Design Intelligence – Development of Expertise – Novice to Expert. Critical Thinking – Case studies: Brief history of Albert Einstein, Isaac Newton and Nikola Tesla	3
	Total Instructional Hours	**15**

Course Outcome

Upon completion of the course, students will be able to CO1:
Develop a strong understanding of the Design Process
CO2: Learn to develop and test innovative ideas through a rapid iteration cycle.CO3:
Develop teamwork and leadership skills

TEXT BOOKS:

T1 - 1. Nigel Cross, "Design Thinking", Kindle Edition.

REFERENCE BOOKS:

R1 - Tom Kelley, "Creative Confidence", 2013. R2 - 3.
Tim Brown, "Change by Design", 2009.

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Chairman

Dean Academics

Dean (Academics)
HiCET

THEORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	19MT5301	Engineering Metrology and Measurements	3	0	0	3

Course Objective

1. To describe the principle of dimensional metrology
2. To discuss various linear and angular measurements
3. To identify the various types of errors using different instruments
4. To familiarize the principles, techniques and devices used for quality control in modern Industrial environment
5. To acquire knowledge on various metrological equipments

Unit	Description	Instructional Hours
I	**BASICS OF MEASUREMENTS** General Concept of Measurement - Need for Measurement - Methods of Measurement - Units and Standards – Sensitivity - Stability - Range - Accuracy - Precision - Tolerance - Fits - Errors - Types of Errors - Interchangeability.	9
II	**LINEAR AND ANGULAR METROLOGY** Linear Metrology: Vernier Caliper - Micrometer - Dial Indicator - Slip Gauges and Classification - Optical Flats - Limit Gauges - Comparators - Mechanical, Pneumatic and Electric Types. Angular Metrology: Sine Bar - Optical Bevel Protractor - Auto Collimator - Angle Decker - Taper Measurements.	9
III	**FORM AND SURFACE MEASUREMENTS** Screw Thread Terminologies - Errors in Thread - Drunkenness - Measurement of Various Elements of Thread - Two and Three Wire Method. Gears Measurement: Gear Errors - Constant Chord and Base Tangent Method - Parkinson Gear Tester – Gleason Gear Testing Machine.Surface Finish Measurement: Elements of Surface Texture - Analysis of Surface Finish - Stylus Probe Instrument – Talysurf Method.	9
IV	**ADVANCED TECHNIQUES IN METROLOGY** Coordinate Measuring Machine - Constructional Features - Types and Application, Machine Vision Systems, Profile Projector, Universal Measuring Machine, Laser principles - Laser Interferometer - Types - DC and AC Laser Interferometer.	9
V	**APPLICATIONS OF MEASUREMENTS** Applications - Flow Measurements in Chemical Pipelines -Vehicle Tyre Pressure Measurement, Temperature Measurement in Furnace - Force Measurements in Brake Pedal and Torque Measurements in Motors.	9
	Total Instructional Hours	45

Course Outcome

On completion of the course the students will be able to

CO1: Analyze the uncertainties in dimensional metrology and use the measurement standards
CO2: Apply geometric tolerances in design of engineering components
CO3: Choose the proper method to find the errors in surface and screw threads
CO4: Measure the complex profile using advanced measurement techniques
CO5: Select the right measuring tool with decided accuracy for a given application

TEXT BOOKS:

T1- Ernest O Doebelin, *"Measurement Systems - Applications and Design"*, 4th Edition,Tata McGraw Hill Publishing CompanyLimited,New Delhi, 2008.

T2- R. K. Jain, *"Engineering Metrology"*, 20th Edition, Khanna Publishers, New Delhi, 2013.

Sr. Noormadh

Chairman, Board of Studies

ACADEMIC COUNCIL * HINDUSTHAN COLLEGE OF ENGG & TECH * Chairman

Dean Academics

Chairman - BoS
MCT - HiCET

Dean (Academics)
HiCET

REFERENCE BOOKS:

R1- Thomas G Beckwith, Lienhard, Roy D. Marangoni, John H. Lienhard V *"Mechanical Measurements"*, 6th Edition Addison Wesley, 2009.

R2- Anand K Bewoor, Vinay A Kulkarni, *"Metrology and Measurement"*, 1st Edition,Tata McGraw Hill Publishing CompanyLimited, New Delhi, 2009.

R3- Connie Dotson et.al, " *Fundamentals of Dimensional Metrology*", Thomas Asia, Singapore, 2003.

R4- Groover.M.P, "*Automation, Production system and computer integrated manufacturing*", Prentice Hall Publishing, New Delhi, 2003.

Mapping of COs with POs and PSOs

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3	2	2										3	2
CO2	3		2			2							3	2
CO3		1	2	2										3
CO4	3		2									2		3
CO5	1	3	3	3								2		3
AVG	2	1.2	2.2	1	-	0.4	-	-	-	-	-	0.8	1.2	2.6

- 1-low, 2-medium, 3-high, '-'- no correlation
- Note: The average value of this course to be used for program articulation matrix.

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Dean Academics

Dean (Academics)
HiCET

THEORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	19MT5302	Non Traditional Machining Techniques	3	0	0	3

Course Objective

1. To select the process parameters of different advanced manufacturing processes
2. To express their knowledge of electrical based manufacturing processes over conventional techniques
3. To list the chemicals used in the manufacturing process
4. To choose the suitable thermal techniques to achieve the high precision on the machining component
5. To examine the surface coating processes

Unit	Description	Instructional Hours
I	**MECHANICAL ENERGY BASED PROCESSES** Introduction - Modern Machining Process - Need - Advantages & Applications - Abrasive Jet Machining (AJM) - Working Principles - Process Parameters - Applications - Water Jet Machining (WJT) - Working Principles - Process Parameters -Applications - Ultrasonic Machining (USM) - Working Principles - Process Parameters - Applications.	9
II	**ELECTRICAL ENERGY BASED PROCESSES** Electric Discharge Machining (EDM) - Working Principles - Equipments - Process Parameters - Material Removal Rate - Tool - Dielectric - Flushing - Wire Cut EDM and its Applications - Electric Discharge Grinding - Working Principle - Equipment - Process Parameters - Applications.	9
III	**CHEMICAL AND ELECTRO CHEMICAL ENERGY BASED PROCESSES** Chemical Machining (CHM) - Etchants - Maskant - Techniques of Applying Maskant - Process Parameters - Material Removal Rate - Applications - Electro Chemical Machining (ECM) - Principles of ECM - Equipments - Material Removal Rate - Process Parameters - Electro Chemical Grinding (ECG) and Electro Chemical Honing (ECH) - Applications.	9
IV	**THERMAL ENERGY BASED PROCESSES** Laser Beam Machining (LBM) - Principles - Equipment - Applications - Plasma Arc Machining (PAM) - Principles - Equipment - Types - Beam Control Techniques - Applications - Electron Beam Machining (EBM) - Principles - Equipment - Types - Beam Control Techniques - Applications.	9
V	**SURFACE COATING AND HARDENING PROCESS** Classification - Removal Processes - Conversion Coatings - Thermal Treatments - Metal Coatings - Physical Vapour Deposition (PVD) - Chemical Vapour Deposition (CVD) - Ion Plating - Galvanizing - Electroplating - Organic Coatings - Surface hardening - Laser hardening.	9
	Total Instructional Hours	45

Course Outcome

On completion of the course the students will be able to

CO1: List the process parameters of different manufacturing process
CO2: Operate the advanced electrical machining operation on the given component
CO3: Select the appropriate chemical process based on the product material
CO4: Interpret how a thermal techniques to be carried out
CO5: Analyse and improve manufacturing processes through surface coating

TEXT BOOKS:

T1- Benedict. G.F, *"Non Traditional Manufacturing Processes"*, 2nd Edition, Taylor, CRC Press, NewYork, 2019.

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL • HINDUSTHAN COLLEGE OF ENGG & TECH • Chairman

Dean Academics

Dean (Academics)
HiCET

T2- Kaushik kumar, J.Paulo Darim Divya Zindani, *"Advanced Machining and Manufacturing Processes"*, 1st Edition, Springler Nature, 2018.

REFERENCE BOOKS:

R1- V. K. Jain, *"Advanced Machining Processes"*,4th Edition, Allied Publishers, 2009.
R2- E Weller, "*Non Traditional Machining Process*", 2nd Edition,2006.
R3- P.C.Pandey, "*Modern Machining Process*", Mcgraw Hill Education, 2017.
R4- *"Advance Analysis of Non Traditional Machining*", Springer, DRC 2012.

WEB REFERENCES:

1. http://www.sciencedirect.com/science/article/pii/S1877705815004798
2. http://www.slac.stanford.edu/cgi-wrap/getdoc/slac-r-621.pdf

Mapping of COs with POs and PSOs

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3	2	3	2	3		1					2	2	2
CO2	3	2	3	2	3		1					2	2	3
CO3	3	2	3	2	3		1					2	2	2
CO4	3	2	3	2	3		1					2	2	2
CO5	3	2	3	2	3		1					2	2	3
AVG	3	2	3	2	3	-	1	-	-	-	-	2	2	2.4

- 1-low, 2-medium, 3-high, '-'- no correlation
- Note: The average value of this course to be used for program articulation matrix.

S. Nagarajan
Chairman, Board of Studies
Chairman - BoS
MCT - HiCET

Chairman

Dean Academics
Dean (Academics)
HiCET

THEORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	19MT5303	Automobile Systems	3	0	0	3

Course Objective

1. To impart knowledge about various automobile components and subsystems
2. To define various transmission systems of automobiles and to have the practice for assembling and dismantling of engine parts
3. To describe the mechanisms involved in the steering systems and braking systems
4. To classify different suspension systems used in automobile
5. To learn about Electrical system and accessories used in automobiles

Unit	Description	Instructional Hours
I	**ENGINE COMPONENTS** Principles of IC Engines - Engine Terminology - Types of Engines: Petrol & Diesel - Two Stroke and Four Stroke - Engine Components: Cylinder Block - Cylinder Head - Sump - Manifolds - Gaskets - Cylinder - Piston - Rings - Connecting Rod - Piston Pins - Crank Shaft - Bearings - Valves - Mufflers. Engine Cooling and Lubrication systems.	9
II	**TRANSMISSION SYSTEMS** Clutch - Construction of Electromagnetic - Mechanical - Hydraulic – Vacuum clutches. Gear Boxes: Manual and Automatic - Over Drives - Transfer Box - Fluid Flywheel - Torque Converter - Propeller Shaft - Slip Joint - Universal Joints - Differential and Rear Axle - Case Study on Lightweight Chassis.	9
III	**STEERING AND BRAKES** Constructional details of steering linkages. Different types of steering gear boxes. Steering linkages and layouts. Power and Power assisted steering, Wheels and Tyres - Wheel Alignment Parameters - Steering Geometry. Braking System: Classification of brakes, drum brake & disc brakes. Constructional details-Theory of braking. Mechanical hydraulic and Pneumatic brakes .	9
IV	**SUSPENSION SYSTEMS** Basic Requirements - Functions - Types of Suspension Springs - Plastic, Air and Independent Suspension System - Shock Absorbers - Air suspension - Hydrolastic suspension - Trouble Shooting.	9
V	**ELECTRICAL SYSTEM AND ACCESSORIES** Types of Batteries - Construction, Operation and Maintenance - Lighting - Wiring Circuit - Head Lights - Switches - Indicating Lights - Trouble Shooting - Direction Indicators - Windscreen Wiper - Horn - Speedometer - Heaters - Air conditioner.	9
	Total Instructional Hours	45

Course Outcome

On completion of the course the students will be able to

- CO1: Explain various components in automobiles and also compare petrol and diesel engine
- CO2: Describe the working of manual and automatic transmission
- CO3: Apply the steering mechanism in developing a new vehicle
- CO4: Design and develop a suspension vehicle system
- CO5: Integrate various electrical systems and accessories with vehicle battery

TEXT BOOKS:

T1- Kirpal Singh, "*Automobile Engineering Vol. 1 and 2*", 7th Edition, Standard Publishers, New Delhi, 2011.

T2- H. M. Sethi, "*Automobile Technology*", 1st Edition, Tata McGraw Hill Publishing Company Limited,NewDelhi, 2007.

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

HINDUSTHAN ACADEMIC COUNCIL Chairman HINDUSTHAN COLLEGE OF ENGG & TECH

Dean Academics

Dean (Academics)
HiCET

REFERENCE BOOKS:

R1- Jain K.K. and Asthana .R.B, "*Automobile Engineering*", 2nd Edition, Tata McGraw Hill Publishing Company Limited,NewDelhi, 2002.

R2- William H crouse, Donald T Anglin, "*Automotive Mechanics*", 10th Edition, Butterworth Publishers, 2017.

R3- Joseph Heitner, "*Automotive Mechanics*," 2nd Edition, East-West Press, 1999.

R4- Ganesan V, "*Internal Combustion Engine*", 3rd Edition, Tata McGraw Hill Publishing, NewDelhi, 2012.

Mapping of COs with POs and PSOs

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	1		2						1	1	1	1	1	
CO2	1		3									1	2	
CO3			2		1								2	
CO4			3										3	
CO5	1		1									1	1	
AVG	0.6	-	2.2	-	0.2	-	-	-	0.2	0.2	0.2	0.6	1.8	-

- 1-low, 2-medium, 3-high, '-'- no correlation
- Note: The average value of this course to be used for program articulation matrix.

Chairman

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Dean Academics

Dean (Academics)

THEORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	19MT5304	Operations Research	3	0	0	3

Course Objective

1. To experience in modeling, solving and analyzing problems using linear programming
2. To expose variety of problems such as transportation and trans-shipment
3. To familiarize the students with assignment models
4. To learn basic inventory control techniques.
5. To introduce about maintenance and replacement schedule against failure

Unit	Description	Instructional Hours
I	**LINEAR PROGRAMMING** Introduction - Origin of Operations Research(OR) - Characteristics of Operations Research - Models in Operations Research - Role of Operations Research in Decision Making. Methods of Solving OR Problems - Scope of OR. Steps of Formulating Linear Programming Problem (LPP) - Graphical Method - Special Cases in LP - Simplex Method - Minimization Case - Degeneracy in LP.	9+3
II	**TRANSPORTATION PROBLEM** Formulation of General Transportation Problems - Types of Transportation Problems - Solving Transportation Problem - Loops in Transportation Method - Transportation Algorithm - Modified Distribution Method - Stepping Stone Method.	9+3
III	**ASSIGNMENT PROBLEM** Mathematical Formulation of Assignment Problem (AP) - Solution Methods of AP - Enumeration Method - The Hungarian Method - Variations of the Assignment Problem - Multiple Optimal Solutions.	9+3
IV	**INVENTORY CONTROL** Models of inventory-Operation of inventory-Quality discount-Implementation of purchase inventory model-Multiple item model with storage limitation-Determination of stock level- Empirical queuing model.	9+3
V	**REPLACEMENT AND MAINTENANCE ANALYSIS** Types of Maintenance - Types of Replacement Problem - Determination of Economic Life of an Asset - Basics of Interest Formulae - Examples - Simple Probabilistic Model for Items which Completely Fail.	9+3
	Total Instructional Hours	45+15=60

Course Outcome

On completion of the course the students will be able to

CO1: Formulate and solve linear programming problem for a physical situations like production, distribution of goods and economics.
CO2: Build and solve Transportation Models.
CO3: Perform model formulation for assignment problems.
CO4: Understand the inventory control plan and workout stock level.
CO5: Analyze the various replacement models and apply them for arriving at optimal decisions

TEXT BOOKS:

T1- Nita H Shah, Ravi M.Gor and HardikSoni, *"Operations Research"*, 1st Edition, PHI Learning Private Limited, New Delhi, 2007.

T2- R.Panneerselvam, *"Operations Research"*, 2nd Edition, PHI Learning Private Limited, New Delhi, 2010.

REFERENCE BOOKS:

R1- Hamdy A Taha, *"Operations Research"*, 8th Edition, Pearson Education, New Delhi, 2008.

R2- S.Jaishankar, *"Operations Research: Decision Models Approach"*, 1st Edition, Excel Books, New Delhi, 2010.

R3- Taha.H A, *"Operations Research"*, 6th Edition, PHI Learning Private Limited, New Delhi, 2003.

R4- Bazara M J and Sherail H, "Linear programming and Network Flows", John Wiley, 2009.

g. Nasrradh
Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL • HINDUSTHAN COLLEGE OF ENGG & TECH • Chairman

Dean Academics
Dean (Academics)
HiCET

Mapping of COs with POs and PSOs														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3	3	3	2	1	1					1	1	3	1
CO2	3	3	2	1	1	1					1	1	2	1
CO3	3	3	2	1	1	1					1	1	2	1
CO4	3	3	2	1	1	1					1	1	1	1
CO5	3	3	2	1	1	1					1	1	1	1
AVG	3	3	2.2	1.2	1	1	-	-	-	-	1	1	1.8	1

- 1-low, 2-medium, 3-high, '-'- no correlation
- Note: The average value of this course to be used for program articulation matrix.

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL • HINDUSTHAN COLLEGE OF ENGG & TECH • Chairman

Dean Academics

Dean (Academics)
HiCET

THEORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	19MT5305	Materials Science and Applications	3	0	0	3

Course Objective

1. To impart knowledge in mechanical properties of metals and non metals
2. To provide knowledge on effect of alloys in engineering materials
3. To identify the different types of heat treatment processes
4. To impart knowledge in production of composites materials
5. To learn the different field of applications of materials and composites

Unit	Description	Instructional Hours
I	**MATERIALS AND ITS PROPERTIES** Introduction - Types of Materials - Metallic - Composite - Polymeric - Ceramic - Materials - Recent Advances in Materials. Mechanical Properties - Thermal Properties. Chemical Properties - Factors Affecting Mechanical Properties. Factors in Selection ofMaterials - Applications in Field of Automotive - Medical and Aero Space.	9
II	**METALS AND NON METALS** Metallic Materials - Effect of Alloying Additions on Steel - Stainless and Tool Steels HSLA - Maraging Steels - Cast Iron - Grey and white - Copper and Copper Alloys - Aluminium and Aluminium Alloys - Brass - Bronze - Ni-based Super Alloys and Titanium Alloys. Non Metallic Materials - Polymers - Types of Polymer - Commodity and Engineering Polymers -Properties and Applications - Engineering Ceramics - Types of Ceramics - Properties and Applications.	9
III	**PROCESSING AND HEAT TREATMENT OF MATERIALS** Processing of Ferrous and Non Ferrous Metals-Processing of Ceramics - Metals - Processing of Polymers - Introduction-Annealing, Stress Relief - Recrystallization and Spheroidising-Normalizing - Hardening, Case Hardening and Tempering of Steel -Chemical Vapor Deposition(*CVD*) - Physical Vapor Deposition(PVD).	9
IV	**COMPOSITE MATERIALS** Introduction - Classification of Composite Materials - Particle Reinforced Composites - Fibre Reinforced Composites - Fibre Glass Reinforced Composites - Hydrid Composites - Structural Composites - Protective Coatings - Adhesives - Concrete Polymer Composities.	9
V	**PROCESSING AND APPLICATIONS OF COMPOSITES** Manufacturing of Polymer Matrix Composites (PMCs) - Pultrusion, Resin Transfer Moulding (RTM) - Manufacturing of Metal Matrix Composites (MMCs) - Solid State - Liquid State - Vapour State Processing - Manufacturing of Ceramic Matrix Composites (CMCs) - Hot Pressing - Applications and Case Studies - Automotive - Aerospace - Commercial Applications.	9
	Total Instructional Hours	45

Course Outcome

On completion of the course the students will be able to

CO1: Identify the properties of different ferrous and nonferrous metals
CO2: Select appropriate materials based on the application
CO3: Choose the suitable heat treatment process for changing the properties of materials
CO4: Explain the properties composite materials
CO5: Identify the production process in different fields of application

TEXT BOOKS:

T1- George P. Carney and *Dieter* Tillman, *"Mechanical Metallurgy"*, 3rd Edition, McGraw Hill Education, New York, 2016.

T2- Sidney H. Avner, *"Physical Metallurgy"*, 2nd Edition, Tata McGraw Hill Education, New York, 2012.

REFERENCE BOOKS:

R1- Robert M. Jones, *"Mechanics of Composite Materials"*, 1st Edition, 2nd Edition Taylor and Francis Group, 2006.

R2- Lawrence H.VanVlack, *"Elements of Material Science and Engineering"* 6th Edition, Pearson Publication, Australia, 2013.

R3- Williams D Callister, *"Material Science and Engineering"* Revised Indian Edition,Wiley India Pvt. Ltd., New Delhi,2007.

R4- O P kanna, *"A Text Book ofMaterial Science and Metallurgy"*, 5th Edition, Dhanpat Rai Publications, 2001.

Chairman, Board of Studies

Chairman

Dean Academics

Dean (Academics)
MCT - HICET

Mapping of COs with POs and PSOs														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3	3	2	2	2	-			1			2	2	1
CO2	3	3	2	2	2	-			1			2	2	1
CO3	3	3	2	2	2				1			2	2	1
CO4	3	3	2	2	2				1			2	2	1
CO5	3	3	2	2	2				1			2	2	1
AVG	3	3	2	2	2	-	-	-	1	-	-	2	2	1

- 1-low, 2-medium, 3-high, '-"- no correlation
- Note: The average value of this course to be used for program articulation matrix.

ACADEMIC COUNCIL • HINDUSTHAN COLLEGE OF ENGG & TECH • Chairman

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Dean Academics

Dean (Academics)

THEORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	19MT6181	Total Quality Management	3	0	0	3

Course Objective

1. Acquire knowledge on TQM concepts
2. To Acquire knowledge on customer Satisfaction, Motivation etc
3. Develop skills to use TQM tools for domain specific applications
4. To explore industrial applications of Quality Function Deployment and Taguchi Qualityconcepts
5. To impart detail exposure to students on various Quality systems like ISO and its standards

Unit	Description	Instructional Hours
I	**INTRODUCTION** Introduction - Definition of quality - Dimensions of quality - Basic concepts of TQM - TQM Framework - Gurus of TQM - Contributions of Deming, Juran and Crosby - Barriers to TQM Implementation - Principles of TQM- Quality statements - Quality Council - Quality circle- Costs of Quality- Leadership.	9
II	**TQM PRINCIPLES** Customer satisfaction - Strategic Quality Planning - Customer complaints, Customer Retention - Employee involvement - Motivation, Empowerment - Teams - Recognition and Reward, Performance Appraisal - PDSA Cycle, 5S, Kaizen - Supplier Partnership - Partnering, Supplier selection, Supplier Rating - Supplier Certification.	9
III	**STATISTICAL PROCESS CONTROL** The Seven Traditional Tools of Quality - New Seven Management tools - Statistical Fundamentals - Measures of central Tendency and Dispersion, Population and Sample - Control Charts - Concept of Six sigma- Process capability - Bench marking - Reason to Bench mark, Bench marking process.	9
IV	**TQM TOOLS** Quality Function Deployment (QFD) - Taguchi Quality loss function - Total Productive Maintenance (TPM) - Concepts, Improvement Needs - Performance Measures - FMEA - Stages, Types.	9
V	**QUALITY SYSTEMS** Need for ISO 9000 and other Quality System - ISO 9001-2008 Quality System - Elements - Implementation of Quality System - Documentation, Quality Auditing - QS 9000 - ISO 14000 - Concepts, Requirements and Benefits.	9
	Total Instructional Hours	45

Course Outcome

On completion of the course the students will be able to

CO1: Understand quality concepts and philosophies of TQM
CO2: Apply TQM principles and concepts of continuous improvement
CO3: Apply and analyze the quality tools, management tools and statistical fundamentals to improve quality
CO4: Understand the TQM tools as a means to improve quality
CO5: Remember and understand the ISO quality systems and procedures adopted

TEXT BOOKS:

T1- Dr.V.Jayakumar, et. al., *"Total Quality Management"*, 4th Edition, Lakshmi Publications, Chennai, 2016.
T2- Suganthi.L and Anand Samuel, *"Total Quality Management"*, PHI Learning Private Limited, New Delhi, 2006.

REFERENCE BOOKS:

R1- James R. Evans and William M. Lindsay, *"The Management and Control of Quality"*, 8th Edition, 1st Indian Edition, Cengage Learning, 2012.
R2- Janakiraman. B and Gopal .R.K., *"Total Quality Management - Text and Cases"*,PHI Learning Private Limited, New Delhi, 2006.
R3- Dale H.Besterfiled, Carol B.Michna,Glen H. Besterfield,Mary B.Sacre,Hemant Urdhwareshe, "Total Quality Management", Pearson Education Asia, Revised Third Edition, Indian Reprint, Sixth Impression, 2013.
R4- ISO 9001-2015 standards

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

HINDUSTHAN COLLEGE OF ENGG & TECH ACADEMIC COUNCIL Chairman

Dean Academics

Dean (Academics)
HiCET

Mapping of COs with POs and PSOs														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1						2	3	3	1		2	2		
CO2						2		1	2		1	3		
CO3					2	1					1			
CO4					2	2					2			
CO5						3					1	1		
AVG	-	-	-	-	0.8	2	0.6	0.8	0.6	-	1.4	1.2	-	-

- 1-low, 2-medium, 3-high, '-'- no correlation
- Note: The average value of this course to be used for program articulation matrix.

g. Nasmadh

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Chairman

Dean Academics

Dean (Academics)
HiCET

THEORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	19MT6201	Design of Mechatronics Systems	3	0	0	3

Course Objective

1. To impart knowledge about Mechatronics Design Process
2. To impart knowledge about System Modeling
3. To familiarize the design of Mechatronics system with Real Time Interfacing
4. To provide knowledge in Data Acquisition and Control
5. To know about the case studies and the application of Mechatronics systems

Unit	Description	Instructional Hours
	MECHATRONICS SYSTEM DESIGN	
I	Introduction - Integrated design Issues - Key Elements - Mechatronics Design Process - Traditional and Mechatronics Designs, Advanced Approaches in Mechatronics, Industrial Design and Ergonomics, Safety.	9
	SYSTEM MODELLING	
II	Introduction - Model Categories - Fields of Application - Model Development - Model Verification - Model Validation - Model Simulation - Design of Mixed Systems - Electro Mechanics Design - Model Transformation Domain - Independent Description Forms - Simulator Coupling.	9
	REAL TIME INTERFACING	
III	Introduction - Elements of Data Acquisition & Control Systems - Overview of I/O Process - Installation of the I/O Card and Software, Data Conversion Process.	9
	CASE STUDIES	
IV	Introduction - Thermal Cycle Fatigue Test of an Aluminum Plate - PH Control System - Windscreen Wiper Motion - Pick and Place Robot - Car Park Barrier - Car Engine Management - Bar Code Reader - Skip Control of a CD Player - Strain Gauge Weighing System - Rotary Optical Encoder - De Icing Temperature Control System.	9
	APPLICATIONS IN MECHATRONICS	
V	Sensors for Condition Monitoring - Mechatronics Control in Automated Manufacturing - Fuzzy Logics in Automaticwashing machine- Micro Sensor - Principle - Fabrication Techniques - Applications of Micro Mechatronics Components.	9
	Total Instructional Hours	45

Course Outcome

On completion of the course the students will be able to:

CO1: Design a system, formulate, analyze and solve Mechatronics engineering problems
CO2: Classify various models of System Modeling
CO3: Describe various elements used in Real Time Interfacing
CO4: Explain the Data Acquisition and Control system through case studies
CO5: Understand the fuzzy logic techniques in the applications of Mechatronics system design

TEXT BOOKS:

T1- DevdasShetty and Richard A. Kolk, *"Mechatronics System Design"*, 9th Edition, Thomson Asia Pvt. Ltd., Singapore, 2011.

T2- Georg Pelz, *"Mechatronics Systems: Modeling and simulation with HDLs"*, 1st Edition, John Wiley and Sons Ltd., NewDelhi, 2003.

REFERENCE BOOKS:

R1- W. Bolton, Mechatronics, *"Electronic Control systems in Mechanical and Electrical Engineering"*, 4th Edition, Pearson Education, New Delhi, 2011.

R2- Brian Morriss Automated Manufacturing Systems - Actuators, Controls, Sensors and Robotics, 13th Edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 1995.

R3- Bradley, D.Dawson, N.C. Burd and A.J. Loader, "*Mechatronics: Electronics in Products and Processes*", CRC Press 1991 , First Indian print 2010.

R4- De Silva, "*Mechatronics: A Foundation Course*", Taylor & Francis, Indian Reprint, 2013.

S. Naamadh

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL • MNJ COLLEGE OF ENGG & TECH • Chairman

Dean Academics

Dean (Academics)
HiCET

WEB REFERENCES:

1. http://een.iust.ac.ir/profs/Shamaghdari/Mechatronics/Resources/3Shetly_Mechatronics%20System%20Design.
2. http://mte401.weebly.com/uploads/1/4/0/7/14075053/2hr15sep14.pdf
3. https://www.researchgate.net/publication/326348482_Design_and_Simulation_of_Washing_Machine_using_Fuzzy_Logic_Controller_FLC/link/5b474aaaa6fdccadaec1e057/download

Mapping of COs with POs and PSOs

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3	1	2	2					1			2	2	2
CO2	2	3	2	2	2							1	2	1
CO3	3	2	2	2	1							3	3	3
CO4	2	2	2	1	1				1	1		2	3	2
CO5	2	2	3	2	1				1	2	3	2	3	3
AVG	2.4	2	2.2	1.8	1	-	-	-	0.6	0.6	0.6	2	2.6	2.2

- 1-low, 2-medium, 3-high, '-'- no correlation
- Note: The average value of this course to be used for program articulation matrix.

S. Nanadh
Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL • Chairman • HICET COLLEGE OF ENGG & TECH

Dean Academics

Dean (Academics)
HiCET

THEORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	19MT6202R	CNC TECHNOLOGY	3	0	0	3

Course Objective

1. To understand evolution and principle of CNC machine tools
2. To understand the structure and parts of CNC machine tools
3. To describe constructional features of CNC machine tools, drives and positional transducers
4. To generate CNC programs for popular CNC controllers
5. To describe tooling and work holding devices for CNC machine tools

Unit	Description	Instructional Hours
I	**INTRODUCTION TO CNC MACHINE TOOLS** Evolution of CNC Technology, Principles, Features, Advantages, Applications - CNC and DNC Concept -Types of Control Systems - CNC Controllers, Characteristics, Interpolators - Types of CNC Machines - Turning Centre, Machining Centre, Grinding Machine - EDM - Computer Aided Inspection	9
II	**STRUCTURE OF CNC MACHINE TOOL** CNC Machine Building, Structural Details, Configuration and Design - Guide ways, Friction, Anti friction and other types of Guide ways - Elements used to convert the Rotary motion to a Linear motion - Screw and Nut, Recirculating Ball Screw, Planetary Roller Screw, Recirculating Roller Screw - Rack and Pinion - Spindle Assembly - Torque Transmission Elements - Gears, Timing Belts, Flexible Couplings, Bearings.	9
III	**DRIVES AND CONTROLS** Spindle Drives - DC Motors - Feed Drives -Stepper Motor - Servo Principle, DC and AC Servomotors - Linear Motors Open Loop and Closed Loop Control - Axis Measuring System - Synchro, Synchro-resolver - Gratings, Moiré Fringe Gratings - Encoders - Inductosysn - Laser Interferometer.	9
IV	**CNC PROGRAMMING** Coordinate System - Structure of a Part Program - G & M Codes - Tool Length Compensation, Cutter Radius and Tool Nose Radius Compensation - Do Loops, Subroutines, Canned Cycles - Mirror Image - Parametric Programming - Machining Cycles - Programming for Machining Centre and Turning Centre for well known Controllers such as Fanuc, Heidenhain, Sinumerik etc.	9
V	**TOOLING AND WORK HOLDING DEVICES** Introduction to Cutting Tool Materials - Carbides, Ceramics, CBN, PCD- Inserts Classification - Qualified, Semi Qualified and Preset Tooling - Tooling System for Machining Centre and Turning Centre - Tool for Complete Machining System - Work Holding Devices for Rotating and Fixed Work Parts - Economics of CNC - Maintenance of CNC Machines	9
	Total Instructional Hours	45

Course Outcome

On completion of the course the students will be able to

CO1:Gain knowledge on CNC components and their working

CO2:Interpret the CNC machine structures and tools

CO3:Describe the drives and controls of CNC machines

CO4:Program for various CNC operations using part programming techniques

CO5:Illustrate the control systems of CNC drives and devices

TEXT BOOKS:

T1- Graham T Smith, "*CNC Machining Technology*" Springler Verlag, 2016.

T2- Rao P.N., "*CAD/CAM Principles and Applications*", Tata McGraw-Hill Publishing Company Limited, New Delhi, 2010.

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL * INDUSTHAN COLLEGE OF ENGG & TECH * Chairman

Dean Academics

Dean (Academics)
HiCET

REFERENCE BOOKS:

R1-Evans K., "*Programming of CNC Machines*", 4th Edition – Industrial Press Inc, New York, 2016

R2-Mike Mattson, "*CNC Programming Principles and Applications*", Delmar Cengage learning, 2010.

R3- Michael Fitzpatric, "Machining & CNC technology", 3rd Edition, 2013.

R4- Suk.Hwan Suh, "Theory and Design of CNC Systems", Springer, 2008.

Mapping of COs with POs and PSOs

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

- 1-low, 2-medium, 3-high, '-'- no correlation
- Note: The average value of this course to be used for program articulation matrix.

Chairman, Board of Studies

ACADEMIC COUNCIL Chairman HINDUSTHAN COLLEGE OF ENGG & TECH

Dean Academics

Chairman - BoS
MCT - HiCET

Dean (Academics)
HiCET

THEORY CUM PRACTICAL COURSES

Programme	Course Code	Name of the Course	L	T	P
BE	19MT6251	VETRONICS	2	0	2

Course Objective

1. To impart knowledge about the evolution of electronics in Automobile and its Emission Standard
2. To classify various ignition and Injection system
3. To identify various sensors and Actuators used in Automobiles
4. To familiarize with different Engine Control Management
5. To expose the safety systems used in Automobiles

Unit	Description	Instruction Hours
I	**ELECTRONICS IN AUTOMOBILES** Evolution of Electronics in Automobiles - Emission Laws - Introduction to Euro I, Euro II, Euro III, Euro IV, Euro V standards and Euro VI standards - Emission Control Management. Charging Systems: Working and Design of Charging Circuit Diagram - Requirements of Starting System.	6
II	**IGNITION AND INJECTION SYSTEMS** Ignition Fundamentals - Electronic Ignition Systems - Distribution Less Ignition - Direct Ignition - Spark Plugs - Carburetion - Study of Fuel Injector - Petrol Fuel Injection - Diesel Fuel Injection.	6
III	**SENSOR AND ACTUATORS** Working Principle and Characteristics of Airflow Rate, Engine Crankshaft Angular Position, Hall Effect, Exhaust Gas Oxygen Sensors - Exhaust Gas Recirculation Actuators, Stepper Motor Actuator, and Vacuum Operated Actuator.	6
IV	**ENGINE CONTROL SYSTEMS** Control Modes for Fuel Control - Engine Control Subsystems - Ignition Control Methodologies - Different ECU's used in the Engine Management - Vehicle Networks: CAN Standard, Format of CAN Standard - Diagnostics Systems in Modern Automobiles..	6
V	**INFOTAINMENT AND SAFETY SYSTEMS** Traction Control System - Cruise Control System - Electronic Control of Automatic Transmission - Antilock Braking System - Electronic Suspension System - Working of Airbag and Role of MEMS in Airbag Systems -Climate Control of Cars.	6
	Instructional Hours	30
1	Testing of Batteries and Battery Maintenance	2
2	Testing of Staring motors and Generators	2
3	Diagnosis of Ignition System	2
4	Study of Automobile Electrical Wiring	2
5	Interfacing of Actuators like Stepper motor in Automobile	2
6	Study and onboard Diagnosis of Engine Management System	2
7	Study of Three Wheeler Chassis frame and Power Transmission System	3
	Instructional Hours	15
	Total Instructional Hours (Theory + Practical)	45

Course Outcome

On completion of the course the students will be able to

CO1: Apply the basics of electronics and Emission controls Techniques in Automobiles
CO2: Select proper Ignition and Injection system for an Automobile
CO3: Compile different sensors and actuators used in automobile industries
CO4: Conclude a electronic control unit to be used in an Automobile
CO5: Design and develop the safety system in Automobiles

TEXT BOOKS:

T1- Ribbens, "*Understanding Automotive Electronics*", 7th Edition (Indian Reprint), Elsevier, 2013.
T2- Tom Denton," *Automobile Electrical and Electronics Systems*", 4th Edition, Edward Arnold Publishers, 2012.

g. Naamadh
Chairman, Board of Studies

ACADEMIC COUNCIL * MUTHAYAMMAL COLLEGE OF ENGG & TECH * Chairman

Dean Academics

Chairman - BoS
MCT - HiCET

Dean (Academics)
HiCET

REFERENCE BOOKS:

R1- Tim, Gilles, "*Automotive Engines: Diagnosis, Repair, Rebuilding*", 7th Edition, Delmar Publishers, New York, 2015.

R2- Barry Hollembeak, "*Automotive Electricity, Electronics & Computer Controls*", 1st Edition, Delmar Publishers, 2001.

R3- Ronald. K. Jurgon, "*Automotive Electronics Handbook*", 2nd Edition, Tata McGraw Hill Publishing CompanyLimited,NewDelhi, 1999.

R4- Robert Bosch GmbH, "*Automotive Hand Book*", 9th Edition, Wiley& Sons Inc., New York, 2014.

R5- Powertrain,"Worldwide emission standards and related regulations", siemens, 2020

Mapping of COs with POs and PSOs

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3	3	2	3	1	3	3					3	3	
CO2	3		3	2		2	2					3	2	
CO3	2	2	2	2	2	2	2					3	2	
CO4	2	2	3	2	3	1	2					3	3	
CO5	2		1	2		2	3					3	2	
AVG	2.4	1.4	2.2	2.2	1.2	2	2.4	-	-	-	-	3	2.4	-

- 1-low, 2-medium, 3-high, '-"- no correlation
- Note: The average value of this course to be used for program articulation matrix.

ACADEMIC COUNCIL * Chairman * KONGUNADU COLLEGE OF ENGG & TECH

S. Nanmadh

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Dean Academics

Dean (Academics)
HiCET

LABORATORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	19MT6001	**CNC LABORATORY**	0	0	3	1.5

Course Objective

1. To study the features and applications of CNC machine tools
2. To impart knowledge in developing program for CNC operations
3. To train the students in manual and computer assisted part programming
4. To impart knowledge in tool path generation and control operation
5. To describe operationof CNC controlled machines tools

Unit	Description of the Experiments	Practical Hours
1	Manual part programming using G and M codes for Turning Operation	3
2	Manual part programming using G and M codes for Step Turning Operation	3
3	Manual part programming using G and M codes for Taper Turning Operation	3
4	Manual part programming using G and M codes for Thread Cutting Operation	3
5	Manual part programming using G and M codes for Radius Turning on Cylindrical Components	3
6	Programming and Simulation of machining using Linear Interpolation	6
7	Programming and Simulation of machining using Circular Interpolation	6
8	Programming and Simulation of machining using Pocket Milling	3
9	Programming and Simulation of machining using Slotting	3
10	Programming and Simulation of machining using Peck Drilling	3
11	Programming and Simulation of machining using Canned Cycles	3
12	Given a component drawing to write the manual part programming and execute on CNC Lathe and Milling Machine	6
	Total Practical Hours	45

Course Outcome

On completion of the course the students will be able to

CO1: Ability to write manual part programming using G and M code for simple component
CO2: Develop knowledge on machining operation using CNC machines
CO3:Enrich the knowledge and manual and computer assisted part programming
CO4: Generate CNC codes for the given model and simulate it
CO5: Demonstrate CNC part programming and perform machining operations

S. Navnath
Chairman, Board of Studies
Chairman - BoS
MCT - HiCET

HINDUSTHAN COLLEGE OF ENGG. & TECH. ACADEMIC COUNCIL Chairman

Dean Academics
Dean (Academics)
HiCET

Mapping of COs with POs and PSOs														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	2	2	2	2	2	2	2	2	2	2	2	2	1	1
CO2	3	1	2	1	-	-	-	-	-	-	-	-	2	2
CO3	-	3	3	2	-	-	-	-	1	-	-	-	3	3
CO4	-	1	1	-	-	-	-	-	-	-	-	-	1	1
CO5	2	2	2	2	-	-	-	-	-	-	-	1	2	2
AVG	2.3	1.8	2	1.75	2	2	2	2	1.5	2	2	1.5	1.8	1.8

- 1-low, 2-medium, 3-high, '-'- no correlation
- Note: The average value of this course to be used for program articulation matrix.

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Chairman

Dean Academics

Dean (Academics)

LABORATORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	19MT6002	Industrial Automation and Control Laboratory -II	0	0	3	1.5

Course Objective

1. To impart the knowledge about the data manipulation instruction set of PLC
2. To create ladder logic diagrams for analog I/O's and interface with PLC for industrial applications
3. To describe the PID controller in closed loop system
4. To interpret the working knowledge of SCADA
5. To read the basics of Discrete Control System

Unit	Description of the Experiments	Practical Hours
1	Implementation of Data Manipulation Instruction using PLC Basic Operations	6
2	Programming with PLC for Speed Control of DC Motors.	6
3	Programming with PLC for Temperature Control of Water Heater.	3
4	Programming with PLC for Flow Control in Pump for Water Circulation.	3
5	Programming with PLC for Pressure Control in Closed Air pressure Tank.	3
6	Development of SCADA systems for the Lamp Circuit.	3
7	Development of SCADA systems for Water Level Control of Two Different Water tanks	6
8	Development of SCADA systems for Material Handling System.	3
9	Development of SCADA systems for StampingSystem.	3
10	Development of SCADA systems for Automatic Bottle Filling Systems.	3
11	Development of SCADA systems for Spray Painting System	3
12	Study of Distributed Control System.	3
	Total Practical Hours	45

Course Outcome

On completion of the course the students will be able to

CO1: Develop hard wiring with PLC and field analog I/Os
CO2: Explain the concept ofSCADAand their applications
CO3: Apply various controllers in Real Time Applications
CO4: Construct a SCADA monitoring system for industrial automation process
CO5: Explain the concepts ofSCADA

ACADEMIC COUNCIL • HINDUSTHAN COLLEGE OF ENGG & TECH • Chairman

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Dean Academics

Dean (Academics)
HiCET

Mapping of COs with POs and PSOs														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3								2	1			2	
CO2	3	3			3				1	2	-	-	3	3
CO3	1	1	3		3					-	-	-		2
CO4	1	1			3				-	-	-	-	2	3
CO5	1	1			1				-	-	-			2
AVG	1.8	1.2	0.6	-	2	-	-	-	1	1.5	-	-	1.4	2

- 1-low, 2-medium, 3-high, '-'- no correlation
- Note: The average value of this course to be used for program articulation matrix.

Chairman

S. Naamadh

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Dean Academics

Dean (Academics)
HiCET

Programme	Course Code	Course Title	L	T	P	C
BE/BTECH	19HE6071	Soft Skill-II	1	0	0	1

Course Objectives:

1. To make the students aware of the importance, the role and the content of softskills through instruction, knowledge acquisition, demonstration and practice.
2. To learn everything from equations to probability with a completely different approach.
3. To make the students learn on an increased ability to explain the problem comprehensively.

Unit	Description	Instructional Hours
I	**Group Discussion & Presentation Skills:** GD skills – Understanding the objective and skills tested in a GD – General types of GDs – Roles in a GD – Do's & Don'ts – Mock GD & Feedback. - Presentation Skills – Stages involved in an effective presentation – selection of topic, content, aids – Engaging the audience – Timemanagement – Mock Presentations & Feedback	4
II	**Interview Skills and Personality Skills:** Interview handling Skills – Self preparation checklist – Grooming tips: do's & don'ts – mock interview & feedback - Interpersonal skills-creative thinking-problem solving-analytical skills	3
III	**Business Etiquette & Ethics:** Etiquette – Telephone & E-mail etiquette – Dining etiquette – do's & Don'ts in a formal setting – how to impress. Ethics – Importance ofEthics and Values – Choices and Dilemmas faced – Discussions from news headlines.	3
IV	**Quantitative Aptitude:** Permutation, Combination - Probability - Logarithm - Quadratic Equations - Algebra - Progression - Geometry - Mensuration.	3
V	**Logical Reasoning:** Logical Connectives - Syllogisms - Venn Diagrams – Cubes - Coded inequalities - Conditions and Grouping	2

Course Outcome:

CO1:	Students will have learnt to keep going according to plan, coping with the unfamiliar, managing disappointment and dealing with conflict.
CO2:	Students will Actively participate meetings, Group Discussions / interviews and prepare & deliver presentations
CO3:	Students will define professional behavior and suggest standards for appearance, actions and attitude in a Business environment
CO4:	Students will be able to apply quantitative reasoning and mathematical analysis methodologies to understand and solve problems.
CO5:	Students will excel in complex reasoning.

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL * Chairman * HICET

Dean Academics

Dean (Academics)
HiCET

Programme	Course Code	Course Title	L	T	P	C
BE/BTECH	19HE6072	Intellectual Property Rights (IPR)	1	0	0	1

Course Objectives:

1. To introduce fundamental aspects of Intellectual property Rights to students who are going to play a major role in development and management of innovative projects in industries.
2. To disseminate knowledge on patents, patent regime in India and abroad and registration aspects.
3. To disseminate knowledge on copyrights and its related rights and registration aspects.
4. To disseminate knowledge on trademarks and registration aspects.
5. To disseminate knowledge on Design, Geographical Indication (GI) and their registration aspects.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO INTELLECTUAL PROPERTY** Introduction, Types of Intellectual Property, International Organizations, Agencies and Treaties, Importance of Intellectual Property Rights.	3
II	**PATENTS** Patents -Elements of Patentability: Novelty, Non-Obviousness (Inventive Steps), Industrial Application -Non -Patentable Subject Matter -Registration Procedure, Rights and Duties of Patentee, Assignment and license.	3
III	**COPYRIGHTS** Purpose And Function Of Trade Marks, Acquisition Of Trade Mark Rights, Protectable Matter, Selecting And Evaluating Trade Mark, Trade Mark Registration Processes.	3
IV	**TRADEMARKS** Concept of Trademarks -Different kinds of marks (brand names, logos, signatures, symbols, well known marks, certification marks and service marks) -Non-Registrable Trademarks - Registration of Trademarks.	3
V	**DESIGN AND GEOGRAPHICAL INDICATION** Design: meaning and concept of novel and original -Procedure for registration. Geographical indication: meaning, and difference between GI and trademarks -Procedure for registration.	3

Course Outcome:

CO1: Identify different types of Intellectual Properties (IPs), the right of ownership, scope of protection as well as the ways to create and to extract value from IP.

CO2: Recognize the crucial role of IP in organizations of different industrial sectors for the purposes of product and technology development.

CO3: Identify, apply and assess ownership rights and marketing protection under intellectual property law as applicable to information, ideas, new products and product marketing.

CO4: Identify different types of trademarks and procedure for registration

CO5: Recognize the concept of design, geographical indication and procedure for registration

Chairman

g. Nasmadh

Chairman, Board of Studies

Chairman - BoS
MCT - HICET

Dean Academics

Dean (Academics)
HICET

THEORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	19MT6301	Embedded System	3	0	0	3

Course Objective

1. To impart a detailed knowledge of Embedded system
2. To visualize the Architecture of ARM processor
3. To familiarize with the communication networks and devices
4. To illustrate knowledge in Real time operating systems
5. To familiarize with the applications of Embedded systems

Unit	Description	Instructional Hours
I	**FUNCTIONAL BLOCK OF EMBEDDED SYSTEMS** Introduction to Functional Building Blocks of Embedded Systems (ES) - Processor Embedded into a System - Single Processor - Embedded Hardware Units and Devices in a System - Software Tools for Designing Embedded System - Embedded System on Chip - Challenges in Designing Embedded Systems.	9
II	**ARM PROCESSOR AND MEMORY ORGANIZATION** ARM Processor Architecture - Instruction Set - SHARC - Processor - Memory Organization - Instruction Level Parallelism: Pipelined and Superscalar Units - Performance Metrics - Processor Selection - DMA - Memory Management - Cache Mapping Techniques, Dynamic Allocation - Fragmentation.	9
III	**DEVICES AND COMMUNICATION BUSES FOR DEVICES NETWORK** IO Types - Synchronous and Asynchronous - Timer and Counting Devices - Wireless Devices - Watch Dog Timer - Serial Communication Network Using I^2C, CAN, USB and Advanced High Speed Buses - Parallel Communication Network using ISA, PCI, PCI-X, ARM and Advanced High Speed Buses.	9
IV	**REAL TIME OPERATING SYSTEMS** Architecture of Kernel - Tasks, Task state and Task Scheduler - Context Switching - Scheduling Algorithms - Types - Semaphores - Mutex - Mail boxes - Message Queues - Event Registers - Pipes - Signals.	9
V	**CASE STUDIES** *Case Studies*: Embedded System in Washing Machine, Automatic Chocolate Vending machine, Adaptive Cruise Control in Car, Smart Card. Design and Implement Wireless Network to Drive a Motor Car Toy.	9
	Total Instructional Hours	45

Course Outcome

On completion of the course the students will be able to

CO1: Design the Embedded system using software tools
CO2: Apply ARM processor in various industries
CO3: Discriminate between various Protocols like serial and Parallel networks
CO4: Design an Embedded system using real time operating system
CO5: Implement an interface between Hardware Peripherals, Sensors and Systems

TEXT BOOKS:

T1- P.Rajkamal, *"Embedded System-Architecture, Programming and Design"*, 2nd Edition, Tata McGraw Hill Publishing CompanyLimited,New Delhi, 2011.

T2- Daniel W.Lewis, *"Fundamentals of Embedded Software: with ARM Cortex-M3"*, 2nd Edition, PHI Learning Private Limited, New Delhi, 2012.

REFERENCE BOOKS:

R1- Frank Vayid, Tony Givargis, *"Embedded System Design- A Unified Hardware & Software Introduction"*, 2nd Edition, Wiley India PvtLtd., 2011.

R2- Heath Steve *"Embedded Systems Designs"*, 2nd Edition, Newnes, 2003.

R3- David E. Simon, *"An embedded software primer"*, Addison – Wesley, Indian Edition Reprint, 2009.

R4- Santanu Chattopadhyay, " Embedded System Design", 2nd Edition, PHI Learning Private Limited, New Delhi, 2013.

S. Vasanth

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL • Chairman • HINDUSTHAN COLLEGE OF ENGG & TECH

Dean Academics

Dean (Academics)
HiCET

Mapping of COs with POs and PSOs														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3	3	3	3	3				1			3	3	2
CO2	3	2	3	2	3				1			3	3	2
CO3	3	2	3	2	3				1			3	3	2
CO4	3	2	3	2	3				1			3	3	2
CO5	3	2	3	2	3				1			3	3	2
AVG	3	2.2	3	2.2	3	-	-	-	1	-	-	3	3	2

- 1-low, 2-medium, 3-high, '-'- no correlation
- Note: The average value of this course to be used for program articulation matrix.

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Dean Academics

Dean (Academics)

THEORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	19MT6302	Discrete Event System Simulation	3	0	0	3

Course Objective

1. To familiarize the comports of the system and different types of models
2. To provide an exposure on how to simulate a system or a process
3. To generate the Random number using various techniques
4. To solve the models through Mathematical distributions and Generate Random variables
5. To model the different field of Applications

Unit	Description	Instructional Hours
I	**OVERVIEW OF SYSTEM** Systems and System Environment - Components of a System: Discrete and ContinuousSystems - Model of a System - Types of Models - Discrete Event System Simulation - Steps in a Simulation Study - When Simulation is the Appropriate Tool and When it is Not Appropriate - Advantages and Disadvantages of Simulation.	9
II	**SYSTEM SIMULATION** Simulation of Single Server Queuing Systems - Simulation of Two Server QueuingSystems - Simulation of Inventory Systems - Simulation of Reliability Systems - Simulation of Lead Time Demand.	9
III	**RANDOM NUMBER GENERATION** Properties of Random Numbers - Generation of Pseudo Random Numbers - Techniques for Generating Random Numbers - Tests for Random Numbers - Kolmogorov Smirnov Test - Chi Square Test -Runs Test - Autocorrelation Test	9
IV	**RANDOM VARIATE GENERATION** Review of Terminology and Concepts - Inverse Transform Technique for Exponential,Uniform, Triangular, Weibull, Empirical, Uniform and Discrete Distribution, Acceptance Rejection Method for Poisson and Gamma Distribution	9
V	**SIMULATION OF MANUFACTURING AND MATERIAL HANDLINGSYSTEM** Models of Manufacturing System - Models of Material Handling Systems - Goals and Performance Measures - Issues in Manufacturing and Material Handling Simulation -Manufacturing Example- An Assembly Line Simulation.	9
	Total Instructional Hours	45

Course Outcome

On completion of the course the students will be able to

CO1: Define the Simulation and its importance in creation of models for Real Time systemsCO2: Develop a Simulation for Queuing system
CO3: Produce the Random numbers through various techniques
CO4: Analyze the Random variates using Mathematical and Statistical SimulationCO5: Develop the applications of Manufacturing and Material Handling system

TEXT BOOKS:

T1- Jerry Banks, John S. Carson II, Barry L. Nelson, David M. Nicol, *"Discrete-Event System Simulation"*, 5th Edition,Pearson Education, New Jersey, 2013.

T2- Lawrence M. Leemis, Stephen K.Park, *"Discrete-Event Simulation: A First Course"*, 4th Edition, PHI Learning PrivateLimited, New Delhi, 2006.

REFERENCE BOOKS:

R1- Averill M. Law, *"Simulation Modeling and Analysis"*, 4th Edition, Tata McGraw Hill Publishing CompanyLimited,NewDelhi, 2007.

R2- Sheldon M. Ross, *"Simulation"*, 4th Edition, Elsevier, 2006.

R3- Jerry Banks, John S. Carson II, Barry L. Nelson, David M. Nicol, *"Discrete-Event System Simulation"*, 2nd Edition,Pearson Education, New Jersey, 2008 (For Unit 2&3).

R4- Geoffrey Gordon, *"System Simulation"*,PHI Learning Private Limited, New Delhi, 2003.

Chairman, Board of Studies — **Dean Academics**

Chairman - BoS
MCT - HICET

Chairman
ACADEMIC COUNCIL • HINDUSTHAN COLLEGE OF ENGG & TECH

Dean (Academics)
HICET

Mapping of COs with POs and PSOs														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1		3				2	3	3	1		2	2		
CO2		3				2		1	2		1	3		
CO3		3			2	1					1			
CO4		3			2	2					2			
CO5		3				3					1	1		
AVG	-	3	-	-	0.8	2	0.6	0.8	0.6	-	1.4	1.2	-	-

- 1-low, 2-medium, 3-high, '-'- no correlation
- Note: The average value of this course to be used for program articulation matrix.

S. Nasnadh
Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Dean Academics

Dean (Academics)
HiCET

THEORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	19MT6303	Product Design and Development	3	0	0	3

Course Objective

1. To learn several aspects of the Product Design Process
2. To select suitable methodology for Product Development
3. To familiarize about the concept of Product Architecture
4. To provide knowledge about the concept of manufacturing in Product Design
5. To impart knowledge about Design of Manufacturing

Unit	Description	Instructional Hours
I	**PRODUCT DESIGN** Introduction - Product Life Cycles - Characteristics of Successful Product Development - Design and Development of Product s -Types of Design and ReDesigns - Engineering Designs - Duration and Cost of Product Development - Challenges of Product development.	9
II	**CONCEPT GENERATION AND SELECTION** Task - Structured Approaches - Clarification - Search - Externally and Internally - Explore Systematically - Reflect on the Solutions and Processes - Concept Selection - Methodology - Benefits.	9
III	**PRODUCT ARCHITECTURE** Implications - Product Change - Variety - Component Standardization - Product Performance -Manufacturability - Product Development Management - Establishing the Architecture - Creation - Clustering - Geometric Layout Development - Fundamental and Incidental Interactions - Related System Level Design Issues - Secondary Systems - Architecture of the Chunks - Creating Detailed Interface Specifications.	9
IV	**INDUSTRIAL DESIGN** Integrate Process Design - Managing Costs - Robust Design - Integrating CAE - CAD - CAM Tools - Simulating Product Performance and Manufacturing Processes Electronically - Need for Industrial Design - Impact Design Process - Investigation of Industrial Design - Impact - Design Process - Investigation of Customer Needs - Conceptualization - Refinement - Management of the Industrial Design Process - Technology Driven Product s - User - Driven Product s - Assessing the Quality of Industrial Design.	9
V	**DESIGN FOR MANUFACTURING** Definition - Overview of DFM Process Estimation of Manufacturing Cost - Reducing the Component Costs and Assembly Costs - Estimating the Manufacturing Cost - Reduce the Costs of Component and Assembly- Impact of DFM Decision on Other Factors.	9
	Total Instructional Hours	45

Course Outcome

On completion of the course the students will be able to

CO1: Design the Product s for the given set of applications
CO2: Generate and select suitable Design methods to Design the Product
CO3: Design a Product , component or process to meet desired needs
CO4: Use CAE, CAD and CAM in industrial Product Design
CO5: Design the Product s for manufacturing and Assembly

TEXT BOOKS:

T1- Karl T. Ulrich and Stephen D. Eppinger, *"Product Design and Development"*, 7th Edition, Tata McGraw Hill Publishing CompanyLimited,NewDelhi, 2020.

T2- S. Dalela and Mansoor Ali, *Industrial Engineering and Management Systems*, Standard Publishers Distributors Pvt. Ltd., New Delhi, 2006.

REFERENCE BOOKS:

R1- Kevin Otto, Kristin wood, *"Product Design"*, 4th Edition, Pearson Education, Australia, 2012.

R2- Harry Nystrom, *Creativity and Innovation*, John Wiley and Sons Pvt. Ltd., 1st Edition Singapore, 1988.

R3- Benjamin W. Niebel and Alanb.Draper, *"Product Design and Process Engineering"*, 1st Edition, Tata McGraw Hill Publishing CompanyLimited,New Delhi, 1976.

R4- Stephen Rosenthal, "Effective Product Design and Development", Business One Orwin, 1992, ISBN 1-55623-603-4

Chairman, Board of Studies

Chairman - BoS
MCT - RICET

Chairman
RICET

Dean Academics

Dean (Academics)
RICET

Mapping of COs with POs and PSOs														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3	3	3	2	1	1		1	2		2	1	3	1
CO2	3	3	2	1	1	1		1	2		2	1	2	1
CO3	3	3	2	1	1	1		1	2		1	1	2	1
CO4	3	3	2	1	1	1		1	2		1	1	1	1
CO5	3	3	2	1	1	1		1	2		1	1	1	1
AVG	3	3	2.2	1.2	1	1	-	1	2	-	1.4	1	1.8	1

- 1-low, 2-medium, 3-high, '-'- no correlation
- Note: The average value of this course to be used for program articulation matrix.

Chairman, Board of Studies
MCT - HiCET

HINDUSTHAN COLLEGE OF ENGG & TECH ACADEMIC COUNCIL Chairman

Dean Academics
Dean (Academics)
HiCET

THEORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	19MT6304	Non Destructive Testing	3	0	0	3

Course Objective

1. To list all types of NDT Techniques in Engineering
2. To select the appropriate Ultrasonic scanning Techniques
3. To examine the defects through Radiography Method
4. To state the principles of advanced techniques of NDT
5. To compare and select the suitable NDT techniques

Unit	Description	Instructional Hours
I	**VISUAL INSPECTION & LIQUID PENETRANT TESTING** Introduction to Various Non - Destructive Methods, Comparison of Destructive and Non Destructive Tests, Visual Inspection, Optical Aids used for Visual Inspection, Applications, Physical Principles, Procedure for Penetrate Testing, Penetrant Testing Materials, Penetrant Testing Methods - Water Washable, Post - Emulsification Methods, Applications.	9
II	**ULTRASONIC TESTING** Principle, Ultrasonic Transducers, Ultrasonic Flaw Detection Equipment, Modes of Display A-Scan, B-Scan, C-Scan, Applications, Inspection Methods - Normal Incident Pulse - Echo Inspection, Normal Incident ThroughTransmission Testing - Applications of Normal Beam Inspection in Detecting Fatigue Cracks.	9
III	**RADIOGRAPHY** Principle of Radiography, X-Ray and Gamma Ray Sources - Safety Procedures and Standards, Effect of Radiation on Film, Radiographic Imaging, Inspection Techniques - Single Wall Single Image, Double Wall Penetration, Multiwall Penetration Technique.	9
IV	**MAGNETIC PARTICLE TESTING & THERMOGRAPHY** Principle of Magnetic Particle Testing(MPT) - Procedure used for Testing a Component, Equipment used for MPT, Magnetizing Techniques, Applications. Principle of Thermography, Infrared Radiometry. Measurements, Applications - Imaging Entrapped Water Under an Epoxy Coating.	9
V	**ACOUSTIC EMISSION & EDDY CURRENT TESTING** Principle of AET, Instrumentation, Applications - Testing of Metal Pressure Vessels, Fatigue Crack Detection in Aerospace Structures - Principles, Instrumentation for ECT, Technique - High Sensitivity Techniques, Multi Frequency, Phased Array ECT, Applications - Case Studies on Defects in Cast, Rolled, Extruded, Welded and Heat Treated Components.	9
	Total Instructional Hours	45

Course Outcome

On completion of the course the students will be able to

- CO1: Describe about the various NDT techniques
- CO2: Interpret the various internal defects of the manufacturing product through UltrasonicMethod
- CO3: Analysis the different defects propagation through radiographymethod
- CO4: Examine the defects through Thermography and Magnetic Particle Method
- CO5: Analyze the crack propagation through Acoustic Emission and Eddy current Testing

TEXT BOOKS:

T1- Baldev Raj, Jeyakumar.T, Thavasimuthu.M., *"Practical Non Destructive Testing"*, 2nd Edition, Narosa Publishing House, New Delhi, 2002.

T2- Peter J. Shull, *"Non Destructive Evaluation: Theory, Techniques and Application"*, 6th Edition,Marcel Dekker, Inc., New York, 2016.

Chairman, Board of Studies

ACADEMIC COUNCIL • Chairman • HINDUSTHAN COLLEGE OF ENGINEERING

Dean Academics

Chairman - BoS
MCT - HiCET

Dean (Academics)
HiCE

REFERENCE BOOKS:

R1- Krautkramer. J., *"Ultra Sonic Testing of Materials"*,4th Edition, Springer, Verlag Publication, New York. 2002.

R2- KarlJorg Langenberg, René Marklein, Klaus Mayer, *"Ultrasonic Nondestructive Testing of Materials: Theoretical Foundations"*, 1st Edition, CRC Press, New York, 2012.

R3- V.Jayakumar, K.Elagovan, *"Non Destructive Testing and Materilas"*, Lakshmi Publications, Chennai, 2008.

R4- Ravi prakash, *"Non Destructive Testing Techniques"*, 1st Revised Edition, New Age Publications, New Delhi, 2010.

Mapping of COs with POs and PSOs														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3	2	3	2	3		1					2	2	2
CO2	3	2	3	2	3		1					2	2	3
CO3	3	2	3	2	3		1					2	2	2
CO4	3	2	3	2	3		1					2	2	2
CO5	3	2	3	2	3		1					2	2	3
AVG	3	2	3	2	3	-	1	-	-	-	-	2	2	2.4

- 1-low, 2-medium, 3-high, '-'- no correlation
- Note: The average value of this course to be used for program articulation matrix.

S. Nbenadh

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL • HiCET • Chairman

Dean Academics

Dean (Academics)
HiCET

THEORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	19MT6305	Distinctive Electrical Machines	3	0	0	3

Course Objective

1. To learn different types of Stepper Motors
2. To explain the control techniques in switched Reluctance Motor
3. To discuss the performance characteristics of PMBLDC
4. To describe the various characteristics of PMSM
5. To infer the construction and working of LIM and servo motor

Unit	Description	Instructional Hours
I	**STEPPER MOTORS AND SWITCHED RELUCTANCE MOTORS** Constructional Features - Principle of Operation - Variable Reluctance Motor - Permanent Magnet Stepper Motor - Hybrid Stepper Motor. Different Modes of Excitation – SRM Motors-Constructional Features - Principle of Operation -Torque Equation	9
II	**SPECIAL TRANSFORMERS** Different types of connections of power and distribution transformers - Welding transformers- Isolation transformer- Pulse transformer- Audio transformers and microphone transformers- Instrument transformers : current transformers and potential transformers- Constant Voltage Transformer (CVT) and.Constant Current Transformer (CCT)	9
III	**PERMANENT MAGNET BRUSHLESS DC MOTORS** Principle of Operation - Types - Magnetic Circuit Analysis - EMF and Torque Equations - Power Controllers - Motor Characteristics and Control - Applications.	9
IV	**PERMANENT MAGNET SYNCHRONOUS MOTORS** Principle of Operation - EMF - Power Input and Torque Expressions - Power Controllers - Torque speed characteristics - Self control - Vector control - Applications.	9
V	**LINEAR INDUCTION MOTORS AND SERVO MOTORS** Linear Induction Motor (LIM) - Construction - Principle of Operation -Control ofLIM - Applications Servomotor - Types - Constructional Features. Principle of Operation - Control Applications.	9
	Total Instructional Hours	45

Course Outcome

On completion of the course the students will be able to

CO1: Choose the suitable stepper motor for specific industrial ApplicationsCO2: Apply the different control techniques for Switched Reluctance Motor CO3: Analyze the speed and torque characteristics of PMBLDC

CO4: Derive the power and torque equations of PMSM

CO5: Use LIM and servo motor for industrial Applications

TEXT BOOKS:

T1- K.Venkataratnam, "*Special Electrical Machines*", 2nd Edition, Universities Press, India, 2009.

T2- E.G. Janardhanam, "*Special Electrical Machines*", 4th Edition,PHI Learning Private Limited, New Delhi, 2014.

T3- Ghosh, Smarajit, "Electrical Machines" 2nd Edition,PHI Learning Private Limited, New Delhi, 2012

REFERENCE BOOKS:

R1- Naser A and BoldeaL,"Linear Electric Motors: Theory Design and Practical Applications PHI Learning PrivateLimited, New Delhi, 2008.

R2- Kenjo, T and Naganori, S "Permanent Magnet and brushless DC motors", Clarendon Press, Oxford, New Delhi, 2014.

R3- R. Krishnan, "Switched Reluctance Motors Drives", CRC Press, New York, 2012.

R4- T.Kenjo, "Stepping Motors & their Microprocessor Controls", Clarendon Press, London, 2002.

ACADEMIC COUNCIL • HINDUSTHAN COLLEGE OF ENGG & TECH • Chairman

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Dean Academics

Dean (Academics)

Mapping of COs with POs and PSOs														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3	2	3	2	2	1					1	2	2	2
CO2	3	2	3	2	2	1					1	2	2	2
CO3	3	2	3	2	2	1					1	2	2	2
CO4	3	2	3	2	2	1					1	2	2	2
CO5	3	2	3	2	2	1					1	2	2	2
AVG	3	2	3	2	2	1	-	-	-	-	1	2	2	2

- 1-low, 2-medium, 3-high, '-"- no correlation
- Note: The average value of this course to be used for program articulation matrix.

Chairman

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Dean Academics

Dean (Academics)
HiCET

THEORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	19MT7201	Virtual Instrumentation and Human Machine Interface	3	1	0	4

Course Objective

1. Understand the basic components of virtual instrumentation system
2. To develop a VI program using various techniques
3. Identify elements of data acquisition for software and hardware installation
4. To gain the knowledge about different types of common instrument interfaces
5. To learn to develop applications based on virtual instrumentation system

Unit	Description	Instructional Hours
I	**VIRTUAL INSTRUMENTATION** Conventional and Distributional Virtual Instrumentation(VI) - VI Vs Traditional Instruments - Block Diagram and Architecture of a Virtual Instrument - Hardware and Software in VI - Virtual instrumentation for Test, Control and Design - Virtual instrument in Engineering Process - Graphical Programming in Data Flow - HMI / SCADA Software.	9+3
II	**VI PROGRAMMING TECHNIQUES** Controlling Programs through Structures: For loops and While loops - Case and Sequence Structures: Flat sequence and Stacked sequence - Shift Register - Feedback Nodes - Formula Nodes - Arrays - Clusters - Error Handling - Waveform Charts and Waveform Graphs - XY Graphs - Strings - File I/O.	9+3
III	**DATA ACQUISITION BASICS** Concepts of Data Acquisition - Data Acquisition in LabVIEW - Hardware Installation and Configuration - Components of DAQ - DAQ Signal Accessory - DAQ Assistant - DAQ Hardware - DAQ Software.	9+3
IV	**INTERFACING** Common Instrument Interfaces: RS 232 / RS485 - GPIB - VISA standard - Bus Interfaces: USB-PCI - PCI - X - PXI - PCMCIA - SCXI-VXI - LXI.	9+3
V	**APPLICATIONS** Application of Virtual Instrumentation: Digital Stop Watch using Lab VIEW - BCD to Seven Segment Decoder - Cruise Control - PID Controller - Client Server Application in LABVIEW - Notifiers, Simple Read Only Server, Two Way Communication, Read Write Server. The students can design anyone of the following 1. Design a Simulator Barometer using LabVIEW. 2. Design a LabVIEW Program to Simulate Virtual Joystick.	9+3
	Total Instructional Hours	45+15=60

Course Outcome

On completion of the course the students will be able to

- CO1: Demonstrate the basic concepts about virtual instrumentation
- CO2: Develop programming through LabVIEW graphical programming environment
- CO3: Experiment with data acquisition hardware and LabVIEW software
- CO4: Apply the knowledge of common instrument interfaces and bus interfaces
- CO5: Design and develop the industrial applications using LabVIEW

TEXT BOOKS:

T1- Jovitha Jerome, *"Virtual Instrumentation using LabVIEW"*, PHI Learning Private Limited, 2012.

T2- S.Sumathi&P.Surekha, *"Virtual Instrumentation with LabVIEW"*, ACME Learning Private Limited, 2011.

REFERENCE BOOKS:

R1- Sanjay Gupta & Joseph John, *"Virtual Instrumentation using LabVIEW"*,McGraw Hill Education, NewYork, 2010.

R2- Gary Johnson & Richard Jennings, *"LabVIEW Graphical Programming"*, 4th Edition, McGraw Hill Education, NewYork, 2006.

R3- Jeffrey Travis & Jim Kring, *"Labview for Everyone"*, PHI Learning Private Limited, 3rd Edition, 2007.

R4- Jeffrey Beyon, "Labview : Programming, Data Acquisition and Analysis", PHI Learning Private Limited.

Chairman, Board of Studies

Chairman - BoS
MCT - HICET

ACADEMIC COUNCIL • HINDUSTHAN COLLEGE OF ENGG & TECH • Chairman

Dean Academics

Dean (Academics)
HICET

Mapping of COs with POs and PSOs														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3				1							1	3	2
CO2	3	3	3	2	1			3	2		2	2	2	2
CO3	3	3	3	2	2			2	3			2	2	2
CO4	3				2				2			2	1	2
CO5	3	3	3	2	2			1	2		2	2	2	2
AVG	3	1.8	1.8	1.2	1.6	-	-	1.2	1.8	-	0.8	1.8	2	2

- 1-low, 2-medium, 3-high, '-'- no correlation
- Note: The average value of this course to be used for program articulation matrix.

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

HINDUSTHAN ACADEMIC COUNCIL
Chairman
HINDUSTHAN COLLEGE OF ENGG & TECH

Dean Academics

Dean (Academics)
HiCET

THEORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	19MT7202	Machine Vision System	3	0	0	3

Course Objective

1. To describe known basic principles of Machine Vision System
2. To study the Image Acquisition and Lighting techniques
3. To review Image processing techniques for Computer Vision
4. To study Mathematical Transforms necessary for Image Processing.
5. To study some applications of Machine Vision Algorithms

Unit	Description	Instructional Hours
I	**INTRODUCTION** Human vision – Machine vision and Computer vision – Benefits of Machine vision – Block diagram and Function of Machine Vision System Implementation of Industrial Machine Vision System.	9
II	**IMAGE ACQUISITION** Lighting Techniques – Types and Selection – Machine Vision Lenses and Optical Filters. Specifications and Selection– Imaging Sensors – CCD and CMOS. Specifications – Interface Architectures – Analog and Digital Cameras – Digital Camera Interfaces – Camera Computer Interfaces.	9
III	**IMAGE PROCESSING** Fundamentals of Digital Image – Spatial and Frequency Domain – image segmentation- Thresholding- Grayscale Stretching –Image Smoothing and Sharpening – Edge Detection – Binary Morphology.	9
IV	**IMAGE ANALYSIS** Feature Extraction – Region Features, Shape and Size Features – Texture Analysis – Template Matching and Classification – 3D Machine Vision Techniques – Decision Making.	9
V	**MACHINE VISION APPLICATIONS** Machine vision Applications in Manufacturing, Electronics, Printing, Pharmaceutical, Textile, Applications in Metrology and Gauging–Bio medical Field, Surveillance, Bio-metrics.	9
	Total Instructional Hours	45

Course Outcome

On completion of the course the students will be able to

CO1: Implement fundamental required for Machine Vision
CO2: Evaluate the techniques for Camera Lighting Interface.
CO3: Develop Image Processing techniques for Machine Vision System
CO4: Interpret Image Segmentation and Representation Techniques
CO5: Develop an applications using Machine Vision Techniques

TEXT BOOKS:

T1- A. Alexander Hornberg, "*Handbook of Machine Vision*", First Edition, 2006.
T2- Milan Sonaka, Vaclav hlavac, Roger Boyle, *Image processing, analysis and machine vision* " First edition 2007.

REFERENCE BOOKS:

R1- E.R.Davies, "Machine Vision", Third edition, 2006.
R2- Rafael C.Gonzales, Richard.E.Woods, *"Digital Image Processing Publishers"*, Fourth Edition 2007.
R3- Emanuel Trucco, Alessandro Verri, "Introductory Techniques for 3D computer vision", 1st Edition, PHI Learning Private Limited, 2006.
R4- Herbert Freeman, "Machine Vision Algorithms, Architecture and Systems", Academic Press, Inc. 2012.

Chairman

S. Nagarath

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Dean Academics

Dean (Academics)
HiCET

Mapping of COs with POs and PSOs														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3		2		3				3	3	3	3	1	1
CO2	1		3						1	1	1	1	2	1
CO3	1		2		3				1	1	1	1	2	2
CO4	1		3										3	2
CO5	1		1									1	1	2
AVG	1.4	-	2.2	-	1.2	-	-	-	1	1	1	1.2	1.8	1.6

- 1-low, 2-medium, 3-high, '-'- no correlation
- Note: The average value of this course to be used for program articulation matrix.

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL • HINDUSTHAN COLLEGE OF ENGG & TECH • Chairman

Dean Academics

Dean (Academics)
HiCET

THEORY CUM PRACTICAL COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	19MT7251	Industrial Robotics	2	0	3	3.5

Course Objective

1. To outline the evolution of robots and its anatomy
2. To describe the various kinematics and inverse kinematics of robot motions
3. To illustrate the principle of robot end effectors
4. To acquire knowledge about basics of robot programming
5. To discuss the applications of robots in industries

Unit	Description	Instructional Hours
	FUNDAMENTALS OF ROBOTICS	
I	Definition and History of Robotics - Classification of Robots - Robot Anatomy - Robot Coordinates - Workspace - Degrees of Freedom - Asimov's Laws of Robotics. Robot Actuators and Drives.	6
II	**ROBOT KINEMATICS** Introduction to Robot kinematics - Homogeneous Transformations - Forward Kinematics - Denavit - Hartenberg (D-H) Representation - Inverse kinematics. Basics of Trajectory Planning.	6
III[III]	**ROBOT END EFFECTORS** Robot End effectors: Introduction - Types of End Effectors - Mechanical Gripper - Types of Gripper Mechanism - Other Types of Gripper - Special Purpose Grippers - Design Considerations - Tools as End Effector - Robot End Effector Interface.	6
IV	**ROBOT PROGRAMMING** Robot Programming: Types – Lead through and Textual Programming - Robot Languages - Classification of Robot Language - Computer Control and Robot Software. Val system and languages.	6
V	**APPLICATIONS OF ROBOT** Machine Interface - Robots in Manufacturing and Non - Manufacturing Applications - Medical Applications - Automation and Mechatronics Applications	6
	Total Instructional Hours	30

LABORATORY COURSES

1	Programming for Point-to-Point Operation and Continuous Path Operation.
2	Programming for Pick and Place Operation with and without delay.
3	Programming for Estimation of Accuracy of a Robot.
4	Programming for Estimation of Repeatability and Resolution of a Robot.
5	Programming for Estimation of work volume for different configuration of Robot.
6	Programming for Loading and Unloading Operations with Different Cycles.
7	Create a Model to Find the Force in Spring Damper at Static Equilibrium and Simulate using ADAMS Software.
8	Create Geometry of the Lift Mechanism and then Set the Constraints of the Model and Simulate using ADAMS Software.
	Total practical Hours 20
	Total Hours 50

S. Namadh
Chairman, Board of Studies

Chairman - BoS
MCT - HICET

Chairman

Dean Academics

Dean (Academics)
HICET

On completion of the course the students will be able to

Course Outcome

CO1: Explain the basic concepts and working of robot.
CO2: Analyze the kinematics of robot motions for a given problem
CO3: Evaluate and construct a robot end effector for specific applications
CO4: Write programs for the given applications
CO5: Design a robot for real world problems and applications

TEXT BOOKS:

T1- Mikell P. Groover, Mitchell Weiss, Roger N.Nagel Nicholas G.Odrey, *"Industrial Robotics Technology, Programmingand Applications "*, 2nd Edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 2012.

T2- Saeed B.Niku *"Introduction to Robotics: Analysis, Systems, Applications"*, 2nd Edition, John Wiley & Sons Ltd., NewDelhi, 2012.

REFERENCE BOOKS:

R1- Deb. S.R., *"Robotics Technology and Flexible Automation"*, 2nd Edition, Tata McGraw Hill Publishing Compan Limited,New Delhi, 2010.

R2- Klafter R.D., Chimielewski T.A., Negin M., *"Robotic Engineering - An integrated approach"*, PHI Learning PrivateLimited, New Delhi, 2003.

R3- Fu K.S. Gonzaleaz R.C. and Lee C.S.G., "*Robotics Control Sensing, Vision and Intelligence*", Tata McGraw HillPublishing Company Limited, New Delhi, 2008.

R4- John.J.Craig, " *Introduction to Robotics: Mechanics & control*", Pearson Publication, Fourth edition, 2018.

Mapping of COs with POs and PSOs

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	1		2						1	1	1	1		1
CO2	1		3									1		2
CO3			2		1									2
CO4			3											3
CO5	1		1									1		1
AVG	0.6	-	2.2	-	0.2	-	-	-	0.2	0.2	0.2	0.6	-	1.8

- 1-low, 2-medium, 3-high, '-'- no correlation
- Note: The average value of this course to be used for program articulation matrix.

S. Nagarajan
Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL Chairman

Dean Academics

Dean (Academics)
HiCET

LABORATORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	19MT7001	Computer Aided Engineering Lab	0	0	3	1.5

Course Objective

1. To introduce fundamentals of the analysis software, its features and applications
2. To learn the basics of Finite Element analysis.
3. To study the various failure modes of engineering components
4. To acquire knowledge on various loads and stresses acting on structures and components
5. To expose the students to different applications of simulation and analysis tools.

Unit	Description of the Experiments	Practical Hours
1	Stress analysis of a plate with a circular hole.	
2	Stress analysis of rectangular L bracket	
3	Stress analysis of an axi-symmetric component	
4	Stress analysis of Cantilever beam	
5	Stress analysis of Simply supported beam	
6	Stress analysis of Fixed beam	
7	Mode frequency analysis of a 2D component	
8	Mode frequency analysis of Cantilever beam	
9	Mode frequency analysis of Aircraft wing	
10	Thermal stress analysis of a 2D component	
11	Conductive heat transfer analysis of a 2D component	
12	Convective heat transfer analysis of a 2D component	**Total Practical Hours** 45

Course Outcome

On completion of the course the students will be able to

CO1: Execute stress calculations for various load conditions
CO2: Perform the stress and deformation analysis of different components
CO3: Analyze and simulate deformation plot for structural and thermal loads
CO4: Model and analyze the real world system
CO5: Evaluate the performance of real world system

S. Nanadh

Chairman, Board of Studies

Chairman

Dean Academics

Chairman - BoS
MCT - HiCET

Dean (Academics)
HiCET

Mapping of COs with POs and PSOs														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	2	2	2	2	2	2	2	2	2	2	2	2	1	1
CO2	3	1	2	1	-	-	-	-	-	-	-	-	2	2
CO3	-	3	3	2	-	-	-	-	1	-	-	-	3	3
CO4	-	1	1	-	-	-	-	-	-	-	-	-	1	1
CO5	2	2	2	2	-	-	-	-	-	-	-	1	2	2
AVG	2.3	1.8	2	1.75	2	2	2	2	1.5	2	2	1.5	1.8	1.8

- 1-low, 2-medium, 3-high, '-'- no correlation
- Note: The average value of this course to be used for program articulation matrix.

S. Narnadh
Chairman, Board of Studies

Dean Academics

Chairman - BoS
MCT - HiCET

Dean (Academics)
HiCET

THEORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	19MT7301	Mobile Robotics	3	0	0	3

Course Objective

1. Design and Kinematic modeling of Mobile robots
2. Develop the Path and Trajectory for the Robot
3. Identify the Robot performance characteristics through Sensors
4. Locate the Robot and Mapping
5. Write algorithms in Path Planning and Navigation

Unit	Description	Instructional Hours
I	**MOBILE ROBOT** Introduction - Locomotion, Classification - Legged, Wheeled, Aerial. Key Issues in Locomotion. Mobile Robot Kinematics - Kinematic Model - Forward Kinematic Model, Representing Position, Wheel Kinematic Constraints and Robot Kinematic Constraints.	9
II	**ROBOT MANEUVERABILITY AND WORKSPACE** Degree of Mobility - Degree of Steerability - Robot Maneuverability - Degrees of Freedom - Holonomic Robots - Path and Trajectory Considerations - Motion Control - Open Loop Control and Feedback Control.	9
III	**PERCEPTION** Sensors for Mobile Robots - Classification, Performance, Uncertainty in Sensors, Wheel Sensor - Heading Sensor- Accelerometers - Inertial Measurement - Motion Sensor - Range Sensors - Vision Sensor - Basics of Computer Vision, Image Processing Techniques, Feature Extraction - Image, Range Data Location Recognition.	9
IV	**LOCALIZATION** Major Challenges, Localization Based Navigation. Belief Representation, Map Representation, Probabilistic Map - Examples of Localization Systems - Autonomous Map Building.	9
V	**PLANNING AND NAVIGATION** Planning and Reaction - Path Planning - Graph search, Potential field - Obstacle Avoidance - Bug Algorithm, Histogram, Curvature Velocity Techniques - Navigation Architecture - Case Studies on Rock Climbing.	9
	Total Instructional Hours	45

Course Outcome

On completion of the course the students will be able to

CO1: Design and Modeling of Mobile Robots
CO2: Model the Trajectory Path of the Robot
CO3: Interpret various Sensors used for Perception
CO4: Prepare Localizing and Mapping the Robot
CO5: Develop the Navigation Path of the Robot

TEXT BOOKS:

T1- Siegwart, Nourbakhsh, *"Introduction to Autonomous Mobile Robots"*, 2nd Edition, MIT Press, 2011.
T2- Siciliano, et.al, *"Robotics: Modelling, Planning and Control"*, 4th Edition, Springer, 2013.

REFERENCE BOOKS:

R1- Choset Et. al, *"Principles of Robot Motion: Theory, Algorithm & Implementations"*, 3rd Edition, MIT Press, 2011.
R2- Siciliano, Khatib, Eds., *"Handbook of Robotics"*, 4th Edition, Springer, 2008.
R3- Thrun, Burgard, Fox, *"Probabilistic Robotics"*, 1st Edition, MIT Press, 2010.
R4- Roland Siewart et al, "Introducton to Autonomous Mobile Robotics", 2nd Edition, PHI Learning Pvt Ltd, 2011.

WEB REFERENCES:

1. http://www.intechopen.com/books/mobile - robots - current - trends
2. http://www.telegraph.co.uk/lifestyle/pets/10200202/Official - studies - strengthen - case - for electric - collar - ban - says - dog - group.html
3. http://cw.routledge.com/textbooks/eresources/9780750651868/casestudies - 12.doc

Chairman, Board of Studies

ACADEMIC COUNCIL • HINDUSTHAN COLLEGE OF ENGG & TECH • Chairman

Dean Academics

Chairman - BoS
MCT - HICET

Dean (Academics)
HICET

Mapping of COs with POs and PSOs														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	1		2						1	1	1	1		1
CO2	1		3									1		2
CO3			2		1									2
CO4			3											3
CO5	1		1									1		1
AVG	0.6	-	2.2	-	0.2	-	-	-	0.2	0.2	0.2	0.6	-	1.8

- 1-low, 2-medium, 3-high, '-'- no correlation
- Note: The average value of this course to be used for program articulation matrix.

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL • HiCET • Chairman

Dean Academics

Dean (Academics)
HiCET

THEORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	19MT7302	Textile Automation	3	0	0	3

Course Objective

1. To summarize the Basic concepts and list the Basic processing of the Textile Technology
2. To familiarize with the Basics of Spinning
3. To interpret the Basics of Weaving Process and its Variables
4. To operate the Automated Spinning Machines
5. To impart the knowledge about the Basics of Waving Machines

Unit	Description	Instructional Hours
I	**BASICS OF PROCESSING** History of Textile Technology and its Advancements - Introduction to Textile Fibers - Overview of Textile Manufacturing - Introduction to Automation in Textile Industries - Objectives and Process Variables in Processing Machines - Singeing - Desizing - Scouring - Bleaching - Mercerizing - Dyeing - Printing - Finishing - Robotics in Textile Industries.	9
II	**BASICS OF SPINNING** Spinning Process Flow Chart - Objectives and Process Variables of Textile Spinning Machineries - Mixing - Blow Room - Carding - Draw Frame - Combing - Speed Frame - Ring Frame - Rotor Spinning.	9
III	**BASICS OF WEAVING** Weaving Process Flowchart - Objectives and Process Variables in Weaving - Preparatory Winding, Warping, Sizing and Beaming - Objectives and Process Variables in Weaving - Drawing In, Knotting, Denting and Weaving.	9
IV	**AUTOMATION IN SPINNING MACHINERY** Machinery Material Flow and its Variation Controls - Feeders & Stop Motions - Auto Levelers - Safety Switches - Production and Quality Monitors - Full Doff and Preset Length Monitors - Data Acquisition System for Spinning Preparatory - Ring Spinning - Rotor Spinning - CAD / CAM / CIM in Spinning.	9
V	**AUTOMATION IN WEAVING MACHINERY** Yarn Cleaner Controls - Knotter / Splicer Carriage Controls - Warping Machine Monitors and Controls - Sizing Machine Monitors and Controls - Auto Reaching / Drawing In and Knotting Machine Monitors and Controls - Data Acquisition System in Weaving Preparatory and Weaving - Humidification Systems - Weaving, Dyeing, Printing, Apparel Production.	9
	Total Instructional Hours	45

Course Outcome

On completion of the course the students will be able to

CO1: Evaluate Textile Technology and Manufacturing with Textile Fibers
CO2: Describe various process involved in Spinning
CO3: List out the various process involved in Weaving
CO4: Explain various stages of Automation scopes in Spinning Machinery
CO5: Outline the role of computers in Automated Weaving Machinery

TEXT BOOKS:

T1- Ashok Kumar.L, Senthil Kumar., "*Automation in Textile Machinery: Instrumentation and Control System Design Principles*", 1st Edition, CRC Press, USA, 2018.

T2- J Chattopadhyay R, "*Advances in Technology of Yarn Production*", 1st Edition, NCUTE, IIT Delhi, 2002..

REFERENCE BOOKS:

R1- Krishna Kant, "*Computer Based Industrial Control*", 2nd Edition, PHI Learning Private Limited, New Delhi, 2011.

R2- Oxtoby E, "*Spun Yarn Technology*", New Edition, Butter Worth"s, London, 2012.

R3- R Shishoo, "*The Global Textile and Clothing Industries*", 1st Edition, Woodhead Publications, 2012.

R4- P V Vidhyasagar, "*Encyclopedia of Textiles*", Akhil Publications, New Delhi, 2000.

Chairman, Board of Studies

Chairman

Dean Academics

Dean (Academics)
HICET

Chairman - BoS
MCT - HICET

Mapping of COs with POs and PSOs														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	1		2						1	1	1	1	1	
CO2	1		3									1	2	
CO3			2		1								2	
CO4			3										3	
CO5	1		1									1	1	
AVG	0.6	-	2.2	-	0.2	-	-	-	0.2	0.2	0.2	0.6	1.8	-

- 1-low, 2-medium, 3-high, '-'- no correlation
- Note: The average value of this course to be used for program articulation matrix.

J. Naamadh

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Chairman

Dean Academics

Dean (Academics)
HiCET

THEORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	19MT7303	Medical Mechatronics	3	0	0	3

Course Objective

1. To familiarize the Role of Instrumentation in Medical Applications
2. To introduce the various Sensing and Measurement devices
3. To learn different types of Amplifiers and Filters
4. To discuss the need and technique of Electrical Safety in Hospitals
5. To learn the advanced equipments in Medicine

Unit	Description	Instructional Hours
I	**MEDICAL EQUIPMENTS** Cell Structure - Electrode - Electrolyte Interface, Electrode Potential, Resting and Action Potential - Electrodes for their Measurement, ECG, EEG, EMG, Machine Description - Methods of Measurement.	9
II	**SENSORS AND TRANDUCERS IN BIO-MEDICAL APPLICATIONS** Basic Transducer Principles - Types - Resistive, Inductive, Capacitive, Fiber - Optic, Photoelectric, Chemical, Active and Passive Transducers and their Description and Feature Applicable for Biomedical Instrumentation - Bio, Nano Sensors and Application.	9
III	**CONDITIONING, RECORDING AND DISPLAY OF BIOSIGNALS** Input Isolation, DC Amplifier, Charge Amplifier, Power Amplifier and Differential Amplifier - Feedback, Operational Amplifier - Electrometer Amplifier, Carrier Amplifier - Instrument Power Supply, Basis of Signal Conversion and Digital Filtering.	9
IV	**MEDICAL SUPPORT** Blood Pressure Measurement: by Ultrasonic Method - Plethysmography - Blood Flow Measurement by Electromagnetic Flow Meter Cardiac Output Measurement by Dilution Method - Vector Cardiography, Heart Lung Machine - Artificial Ventilator - Anesthetic Machine - Cardiac Pacemaker - DC – Defibrillator- Patient Safety - Electrical Shock Hazards.	9
V	**MEDICAL CASE STUDIES IN MECHATRONICS** Smart Probe for Detecting Kidney Stones, Smart Probe for Breast Cancer, Ankle Sprain, Active Prosthetic Knee, Smart System for Cardiovascular Plaque Detection.	9
	Total Instructional Hours	45

Course Outcome

On completion of the course the students will be able to

CO1: Select modern engineering and Information Technology tools for Engineering Practice
CO2: Select different sensors and transducers for Biomedical Instrumentation
CO3: Describe the signal conditioning circuits used in Biomedical Engineering
CO4: Identify different measurement techniques used in physiological parameters measurement
CO5: Analyze the problems in various fields of Medical Practices.

TEXT BOOKS:

T1- Khandpur, R.S., "*Handbook of Biomedical Instrumentation*", 3rd Edition, Tata McGraw Hill Publishing CompanyLimited,NewDelhi, 2014.

T2- SiamakNajarian, JavadDarghai, GoldisDarbemamieh, Siamak H. Farkoush, "*Mechatronics in Medicine - A Biomedical Engineering Approach*" , 1st Edition, Tata McGraw Hill Publishing CompanyLimited, New Delhi, 2012.

REFERENCE BOOKS:

R1- Tompkins W.J., "*Biomedical Digital Signal Processing*", 1st Edition, PHI Learning Private Limited, New Delhi, 2000.

R2- Cromwell, Weibell and Pfeiffer, "*Biomedical Instrumentation and Measurements*", 2nd Edition, PHI Learning Private Limited, New Delhi, 2010.

R3- Arumugam, "*Bio Medical Instrumentation*", Anuradha Agencies Publications, 2002.

R4- Geddes L.A., and Baker, L.E., "*Principles of Applied Bio-medical Instrumentation*", 3rd Edition, John Wiley and Sons, 2010

Chairman, Board of Studies

Chairman - BOS
MCT - HiCET

Dean Academics

Dean (Academics)
HiCET

Mapping of COs with POs and PSOs														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3	1	2	2					1			2	2	2
CO2	2	3	2	2	2							1	2	1
CO3	3	2	2	2	1							3	3	3
CO4	2	2	2	1	1				1	1		2	3	2
CO5	2	2	3	2	1				1	2	3	2	3	3
AVG	2.4	2	2.2	1.8	1	-	-	-	0.6	0.6	0.6	2	2.6	2.2

- 1-low, 2-medium, 3-high, '-'- no correlation
- Note: The average value of this course to be used for program articulation matrix.

Chairman, Board of Studies

Chairman - BOS
MCT - HICET

Chairman

Dean Academics

Dean (Academics)
HICET

THEORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	19MT7304	Disaster Management	3	0	0	3

Course Objective

1. To provide students an exposure to disasters, their significance andtypes.
2. To understand the relationship between vulnerability, disasters, disaster prevention and risk reduction3.To explain approaches of psychological impact of disasters
4. To enhance the risk management with respect to India5.To understand the technological disaster

Unit	Description	Instructional Hours
I	**INTRODUCTION TO DISASTERS** Definition: Disaster, Hazard, Vulnerability, Resilience, Risks - Disasters: Types of disasters - Earthquake, Landslide, Flood, Drought, Fire - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disaster.	9
II	**APPROACHES TO DISASTER RISK REDUCTION (DRR)** Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- non-structural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stake – holders- Institutional Process and Framework at State and Central Level- State Disaster Management Authority(SDMA) - Early Warning System - Advisories from Appropriate Agencies.	9
III	**PSYCHOLOGICAL IMPACT OF DISASTERS** Introduction – Approaches and Diagnostic Issues –Principles of psychosocial Intervention -Special Intervention techniques – Stress Reduction Techniques.	9
IV	**DISASTER RISK MANAGEMENT IN INDIA** Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, and Waste Management, Institutional arrangements Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation - Role of GIS and Information Technology Components , Risk Assessment, Response and Recovery Phases of Disaster - Disaster Damage Assessment	9
V	**TECHNOLOGICAL DISASTER AND CASE STUDIES** Technological disaster - Industrial hazards -Fire hazards - Role of remote sensing - Application of GIS Technology- Accidental Disaster, Case Studies, Space Based Inputs for Disaster Mitigationand Management and field works related to disaster management.	9
	Total Instructional Hours	45

Course Outcome

On completion of the course the students will be able to

CO1: Differentiate the types of disasters, causes and their impact on environment and society. CO2: Assess vulnerability and various methods of risk reduction measures as well as mitigation.CO3: Interpret the psychological impact and its reduction techniques.
CO4: Express the knowledge disaster management with respect to India
CO5: Understand the industrial hazard and its management.

TEXT BOOKS:

T1- Singhal J.P. "Disaster Management", Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN- 13: 978-9380386423

T2- Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367.ISBN-13: 978-1259007361|

T3- KapurAnu Vulnerable India: A Geographical Study of Disasters. IIAS and Sage Publishers, New Delhi, 2010.

Chairman, Board of Studies

g.Narradh

Chairman - BoS
MCT - HiCET

Dean Academics

Dean (Academics)
HiCET

REFERENCE BOOKS:

R1- Gupta Anil K, Sreeja S. Nair.Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011R2- Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005

R3- Government of India, National Disaster Management Policy,2009.

R4- R Subramanian,, "*Disaster Management*", Vikas Publishers, New Delhi, 2018.

Mapping of COs with POs and PSOs

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3	3	2.2	1.2	1	1	-	-	-	-	1	1	1.8	1
CO2	3	3	2.2	1.2	1	1	-	-	-	-	1	1	1.8	1
CO3	3	3	2.2	1.2	1	1	-	-	-	-	1	1	1.8	1
CO4	3	3	2.2	1.2	1	1	-	-	-	-	1	1	1.8	1
CO5	3	3	2.2	1.2	1	1	-	-	-	-	1	1	1.8	1
AVG	3	3	2.2	1.2	1	1	-	-	-	-	1	1	1.8	1

- 1-low, 2-medium, 3-high, '-'- no correlation
- Note: The average value of this course to be used for program articulation matrix.

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Dean Academics

Dean (Academics)
HiCET

THEORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	19MT7305	Factory Automation	3	0	0	3

Course Objective

1. To impart knowledge of automation in manufacturing industries
2. To classify material handling system and AGVs
3. To study various storage methods and its equipments
4. To learn about manufacturing cells and automated assembly lines
5. To list out different assembly methods in industries

Unit	Description	Instructional Hours
I	**OVERVIEW OF AUTOMATION** Automation in Production Systems - Automation Principles and Strategies - Elements of an Automated System - Advanced Automation Function - Levels of Automation - Hardware Components for Automation and Process Control.	9
II	**MATERIAL TRANSPORT SYSTEM** Introduction - Material Handling equipment - Design considerations in Material Handling - Industrial trucks - Automated guided vehicles - Monorails and other Rail Guided Vehicles - Conveyors - Cranes and Hoists - Analysis of Vehicle Based System - Conveyor Analysis.	9
III	**STORAGE SYSTEM** Introduction - Performance - Strategies - Conventional Storage Methods and Equipment - Automated Storage System - Carousel Storage System - Engineering Analysis of Storage System.	9
IV	**MANUFACTURING SYSTEMS** Components of Manufacturing System - Single Station Manufacturing Cells, Manual Assembly Lines - Automated Production Lines - Automated Assembly Systems.	9
V	**ASSEMBLY SYSTEMS** Robotic Assembly Automation - Parts Presentation Methods - Assembly Operations - Compliance and Remote Centre Compliance (RCC) Device - Adaptable Programmable Assembly System.	9
	Total Instructional Hours	45

Course Outcome

On completion of the course the students will be able to

CO1: Apply the automation principles in manufacturing systems
CO2: Develop different material handing mechanisms for industries
CO3: Propose the benefits of automated storage systems
CO4: Compare manual assembly lines and automated assembly lines
CO5: Enumerate different assembly operations in industries

TEXT BOOKS:

T1- Groover, M.P. "*Automation, Production Systems, and Computer - Integrated Manufacturing*", 3rd Edition, Pearson Education, 2008.

T2- C.Ray Asfahl, "Robtos and Manufacturing automation", 2nd Edition, John Wiley and Sons Ltd., New Delhi, 2011.

REFERENCE BOOKS:

R1- Groover, M.P. and Simmers, E.W. "*Computer Aided Design and Manufacturing*", Pearson Education, New Delhi, 2009.

R2- Nand K. Jha. "*Handbook of Flexible Manufacturing Systems*", Academic Press, Orlando, 2006.

R3- Groover, M.P., "*Fundamentals of Modern Manufacturing*", Pearson Education, New Delhi, 2004.

R4- Daniel E Kandray P E, "Programmable Automation", Industrial Press Publications, New Delhi, 2008.

WEB REFERENCES:

1. http://een.iust.ac.ir/profs/Shamaghdari/Mechatronics/Resources/3Shetly_Mechatronics%20System%20Design.
2. http://mte401.weebly.com/uploads/1/4.0/[illegible]/5sep14.pdf

Chairman

HINDUSTHAN COLLEGE OF ENGG & TECH

g. Nasnadh

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Dean Academics

Dean (Academics)
HiCET

Mapping of COs with POs and PSOs														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3	3	2	2	3	-			-	2	1	3	2	2
CO2	3	3	2	2	3	-			-	2	1	3	2	2
CO3	3	3	2	2	3	-			-	2	1	3	2	2
CO4	3	3	2	2	3	-			-	2	1	3	2	2
CO5	3	3	2	2	3	-			-	2	1	3	2	2
AVG	3	3	2	2	3	-	-	-	-	2	1	3	2	2

- 1-low, 2-medium, 3-high, '-'- no correlation
- Note: The average value of this course to be used for program articulation matrix.

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

HINDUSTHAN ACADEMIC COUNCIL Chairman HINDUSTHAN COLLEGE OF ENGG & TECH

Dean Academics

Dean (Academics)

THEORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	19MT8301	Rapid Prototyping and Reverse Engineering	3	0	0	3

Course Objective

1. To impart the Basics and Concepts of Rapid Product Development
2. To impart knowledge about Liquid and Solid based Models
3. To provide knowledge of methods for the Manufacturing of Prototypes from Computer Based Models
4. To impart knowledge about Reverse Engineering and the Applications
5. To familiarize about Rapid tooling and Applications of RP in various fields

Unit	Description	Instructional Hours
I	**RAPID PROTOTYPING** Introduction to Prototypes - Historical Development of Rapid Prototyping (RP) Systems - Need for Time Compression in Product Development - Product Development - Conceptual Design - Development - Detail Design - Prototype.	9
II	**LIQUID BASED AND SOLID BASED RAPID PROTOTYPING SYSTEMS** Classification - Liquid Based System - Stereo Lithography Apparatus (SLA) - Details of SL Process - Products - Advantages - Limitations - Applications and Uses - Solid Based System - Fused Deposition Modeling, Principle - Process - Products - Advantages - Applications and Uses - Laminated Object Manufacturing (LOM).	9
III	**POWDER BASED RAPID PROTOTYPINGSYSTEMS** Selective Laser Sintering - Principles of SLS Process, Principle of Sinter Bonding Process - Laser Sintering Materials - Products - Advantages - Limitations - Applications and Uses. Three Dimensional Printing (3DP)- Process - Major Applications - Research and Development - Laser Engineered Net Shaping (LENS).	9
IV	**REVERSE ENGINEERING** Introduction - History of Reverse Engineering - Measuring Device - Contact Type and Non Contact Type - CAD Model Creation from Point Clouds Preprocessing - Point Clouds to Surface Model Creation.	9
V	**RAPID PROTOTYPING APPLICATIONS** Rapid Tooling - Rapid Manufacturing-Automotive Applications - Aerospace Applications - Architecture Applications - Medical Data Processing - Types of Medical Imaging - Software for Making Medical Models - Medical Materials.	9
	Total Instructional Hours	45

Course Outcome

On completion of the course the students will be able to

- CO1: Differentiate types of Rapid Prototyping Systems and its Applications in various fields.
- CO2: Identify the process of Liquid and Solid Based Models.
- CO3: Select the process of Powder Based RP system in Model Making.
- CO4: Describe the methods of Reverse Engineering.
- CO5: Choose the various RPT Tooling and various Rapid Prototyping Applications

TEXT BOOKS:

T1- Chua C.K, Leong K.F and Lim C.S, *"Rapid Prototyping: Principles and Applications"*, 3rdEdition, World Scientific, 2013.

T2- D. T. Pham and S.S. Dimov, *"Rapid Manufacturing the Technologies and Applications of Rapid Prototyping and Rapid Tooling"*, Springer, 1st Edition, Verlag London Limited, 2001.

REFERENCE BOOKS:

R1- Alexandru C. Telea, *"Reverse Engineering of Physical Objects - Teaching Manual"*, Creaform, 2014.

R2- Hopkinson N., R.J.M, Hauge, P M. Dickens, *"Rapid Manufacturing - An Industrial Revolution for the Digital Age"*, 1stEdition,John Wiley and Sons Ltd., New Delhi, 2006.

R3- Ian Gibson, *"Advanced Manufacturing Technology for Medical Applications: Reverse Engineering, Software Conversion and Rapid Prototyping"*, 1st Edition,John Wiley and Sons Ltd., New Delhi, 2006.

R4- Paul F.Jacobs, *"Rapid Prototyping and Manufacturing,Fundamentals of Stereo lithography"*, 1st Edition, Tata McGraw Hill Publishing CompanyLimited,NewDelhi, 1993.

Chairman, Board of Studies

Chairman - BoS
MCT - HICET

Dean Academics

Dean (Academics)
HiCET

Mapping of COs with POs and PSOs														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3	3	3	3	3				1			3	3	2
CO2	3	2	3	2	3				1			3	3	2
CO3	3	2	3	2	3				1			3	3	2
CO4	3	2	3	2	3				1			3	3	2
CO5	3	2	3	2	3				1			3	3	2
AVG	3	2.2	3	2.2	3	-	-	-	1	-	-	3	3	2

- 1-low, 2-medium, 3-high, '-"- no correlation
- Note: The average value of this course to be used for program articulation matrix.

S. Nanadh

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL • MNDUSTHAN COLLEGE OF ENGG & TECH • Chairman

Dean Academics

Dean (Academics)

THEORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	19MT8302	Industrial IoT	3	0	0	3

Course Objective

1. To point out the vision, strategic research and innovation directions about IoT
2. To learn the concepts of networks and communications in the internet of things
3. To familiarize security and privacy for IoT
4. To enumerate various applications of IoT in industries
5. To distinguish between the various Interaoperability used in IoT

Unit	Description	Instructional Hours
I	**INTERNET OF THINGS** Introduction: Internet of Things (IoT) Today - Time for Convergence - Towards the IoTUniverse - Internet of Things Vision - IoT Strategic Research and Innovation Directions - IoT Applications.	9
II	**INTERNET OF THINGS STRATEGIC RESEARCH AND INNOVATION** Internet of Things and Related Future Internet Technologies - Infrastructure - Networks and Communication - Processes - Data Management - Security, Privacy & Trust - Device Level Energy Issues - IoT Related Standardization.	9
III	**SECURITY, PRIVACY FOR IOT AND IOT STANDARDISATION** Security, Privacy and Trust in IoT - Data - Platforms for Smart, Cities - First Steps towards a Secure Platform - Smartie Approach - M2M Service Layer Standardization - OGC Sensor Web for IoT - IEEE and IETF.	9
IV	**IOT APPLICATIONS FOR INDUSTRY** Future Factory Concepts - Brownfield IoT - Technologies for Retrofitting - Smart Objects, Smart Applications - Four Aspects in your Business to Master IoT - Auto ID - Value Creation from Big Data and Serialization in the Pharmaceutical Industry - IoT for Retailing - Industry - IoT for Oil and Gas Industry.	9
V	**IOT IN FUTURE** Physical Vs Virtual - Solve the Basic First - Physical Word - Data Interoperability - Semantic Interoperability - Organizational Interoperability - Eternal Interoperability - Importance of Standardization - Beginning of Everything - Need of Methods and Tools and Corresponding Research - Important Economic Dimension - Research Roadmap for IoT Testing Methodologies.	9
	Total Instructional Hours	45

Course Outcome

On completion of the course the students will be able to

- CO1: Describe about IoT and its applications
- CO2: Use of networks, communication and data management in IoT
- CO3: Explain security and privacy in IoT
- CO4: Develop applications in IoT for industry
- CO5: Compare and contrast different Interoperability

TEXT BOOKS:

T1- OvidiuVermesan and Peter Friess, *"Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems"*, 1st Edition, Apress Publications, 2013.

T2- Vijay Madisetti and ArshdeepBahga, *"Internet of Things: A Hands - on - Approach"*, 1st Edition, VPT, 2014.

REFERENCE BOOKS:

R1- Francis daCosta, *"Rethinking the Internet of Things: A Scalable Approach to Connecting Everything"*, 1st Edition, Apress Publications, 2013.

R2- J. Biron and J. Follett, *"Foundational Elements of an IoT Solution"*, O'Reilly Media, 2016.

R3- Alasdair Gilchrest, " Industry 4.0: The Industrial Internet of things", Thailand , 2016.

R4- V Iasios Tsiatsis, *"Internet of Things"*, 2nd Edition, Elesvier, 2019.

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Dean Academics

Dean (Academics)
MCET

WEB REFERENCES:

1. http://www.internet - of - things - research.eu/partners.html.
2. http://www.iot - i.eu/public.

Mapping of COs with POs and PSOs														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3	2	3	2	3							2	2	1
CO2	3	2	3	2	3							2	2	1
CO3	3	2	3	2	3							2	2	1
CO4	3	2	3	2	3							2	2	1
CO5	3	2	3	2	3							2	2	1
AVG	3	2	3	2	3	-	-	-	-	-	-	2	2	1

- 1-low, 2-medium, 3-high, '-'- no correlation
- Note: The average value of this course to be used for program articulation matrix.

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Chairman

Dean Academics

Dean (Academics)

THEORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	19MT8303	Artificial Intelligence for Mechatronics Engineering	3	0	0	3

Course Objective

1. To familiarize with the concepts of artificial intelligencetechniques
2. To learn AI technology that supports in decision making
3. To learn the concepts of genetic algorithms
4. To familiarize fuzzy techniques for building well engineered and efficient artificial Intelligence Systems
5. To create AI techniques in the fields of chaos and fractals

Unit	Description	Instructional Hours
	OVERVIEW OF THE FIELD OF ARTIFICIAL INTELLIGENCE	
I	Introduction to Artificial Intelligence - Neural Network - Neuron - Basic Idea of the Back Propagation Model - Details of the Back Propagation Mode - A Cookbook Recipe to Implement the Back Propagation Model - Additional Technical Remarks on the Back Propagation Model - Simple Perceptrons - Applications of the Back Propagation Model - General Remarks on Neural Networks.	9
	NEURAL NETWORKS	
II	Prelude - Associative Memory - Hopfield Networks - The Hopfield - Tank Model for Optimization Problems - Applications of Hopfield - Tank Model - The Kohonen model - Simulated Annealing - Boltzmann Machines.	9
	GENETIC ALGORITHMS AND EVOLUTIONARY COMPUTING	
III	Fundamentals of Genetic Algorithms - A Simple Illustration of Genetic Algorithm - Input to Output Mapping - Travelling Salesman Problem - Changes of Schemata Over Generations - Example of Schema Processing - Genetic Programming.	9
	FUZZY SYSTEMS	
IV	Fundamentals of Fuzzy sets - Fuzzy Relations - Fuzzy Logic - Fuzzy Control - Hybrid Systems - Fundamental Issues - Rough Sets: Definability and Rough Sets - Knowledge Representation Systems.	9
	CHAOS	
V	Typical features of Chaos - Representing Dynamical Systems - Trajectory, Orbit and Flow - Cobwebs - Equilibrium Solutions and Stability - Attracters - Bifurcations - Fractals - Applications of Chaos.	9
	Total Instructional Hours	45

Course Outcome

On completion of the course the students will be able to

CO1: Solve the given problem using back propagation algorithm which is used as a decision support tool
CO2: Identify problems that are amenable to solution by neural networks
CO3: Apply Genetic Algorithm to various optimization problems
CO4: Summarize the concepts of fuzzy system
CO5: Develop the practical skills for understanding complexity and solving dynamic systems that exhibits chaotic behavior

TEXT BOOKS:

T1- Toshinori Munakata, *"Fundamentals of the New Artificial Intelligence,"* 2nd Edition, Springer, 2008.
T2- Uma Rao, *"Artificial Intelligence and Neural Networks"*, Pearson Education, Asia, 2011.

REFERENCE BOOKS:

R1- Sivanandam and Deepa, *"Introduction to Genetic Algorithms"*, Springer, 2008.
R2- Timothy J. Ross, *"Fuzzy Logic with Engineering Applications"*, 3rd Edition, John Wiley & Sons Ltd., New Delhi, 2011.
R3- S. Russell and P. Norvig,"Artificial Intelligence: A Modern Approach", Prentice Hall, Third Edition, 2009.
R4- I. Bratko, "Prolog: Programming for Artificial Intelligence", Fourth edition, Addison-Wesley Educational Publishers Inc., 2011.

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Dean Academics

Dean (Academics)

Mapping of COs with POs and PSOs														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3	2	3	2	3							2	2	1
CO2	3	2	3	2	3							2	2	1
CO3	3	2	3	2	3							2	2	1
CO4	3	2	3	2	3							2	2	1
CO5	3	2	3	2	3							2	2	1
AVG	3	2	3	2	3	-	-	-	-	-	-	2	2	1

- 1-low, 2-medium, 3-high, '-'- no correlation
- Note: The average value of this course to be used for program articulation matrix.

S. Nasmadh
Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Chairman

Dean Academics

Dean (Academics)
HiCET

THEORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	19MT8304	MEMS and Nano Technology	3	0	0	3

Course Objective

1. To examine the Scaling laws in Micro systems
2. To learn about Micro Sensors and Actuators
3. To interpret Micro Fabrication Techniques and Micro systems in MEMS
4. To familiarize the basic concepts of Nano technology
5. To observe a knowledge about applications in Micro and Nano technology

Unit	Description	Instructional Hours
I	**SCALING IN MICRO SYSTEMS** Overview - Microsystems and Microelectronics-Definition - MEMS Materials - Scaling Laws - Scaling in Geometry - Scaling in Rigid Body Dynamics - Scaling in Electrostatic Forces - Scaling in Electricity Scaling in Fluid Mechanics - Scaling in Heat Transfer.	9
II	**MICRO SENSORS & ACTUATORS** Working principle of Microsystems - Micro Actuation Techniques - Micro Sensors - Types –Microactuators- Types –Micropump –Micromotors- Microvalves - Microgrippers - Micro Accelerometers.	9
III	**MICRO MACHINING &PACKAGING** Substrates - Single Crystal Silicon Wafer Formation - MEMS Materials - Photolithography - Diffusion - Oxidation- CVD,PVD - Deposition by Epitaxy- Etching Process-LIGA - SLIGA-Micro System Packaging	9
IV	**BASICS OF NANO TECHNOLOGY** Atomic Structure- Properties of Nano Particles- Semiconducting Nano Particles- Carbon Nano Tubes, Properties of Nano Tubes- Nano Tribology.- Nano Biology- Nano Sensors and Optical Properties	9
V	**MICRO &NANO APPLICATIONS** Applications of Micro System: Automotive - Bio Medical - Aero Space - Telecommunications field – NEMS- Nano Technology in Diagnostic Applications - Nano Technology in Memory and Storage - Nano Technology for Flexible Electronics.	9
	Total Instructional Hours	45

Course Outcome

On completion of the course the students will be able to

CO1: Analyze scaling laws that are used extensively in the conceptual design of Microdevices and systems
CO2: Select suitable Micro Sensors and Actuators
CO3: Summarize various Micro system Fabrication and Packaging Techniques
CO4: Interpret the basic concepts of Nano technology
CO5: Design MEMS / NEMS devices for various applications

BOOKS:

T1- Tai - Ran Hsu, *"MEMS & Microsystems Design and Manufacture"*, 2nd Edition, Tata McGraw Hill Publishing CompanyLimited,NewDelhi, 2008.

T2- M Guozhong Cao, *"Nanostructures and Nanomarterials"*, Imperial college press, 2003

REFERENCE BOOKS:

R1- SergejFatikow,Ulrich Rembold, "Microsystem Technology and Microrobotics", 1stEdition, Springer Science & Business Media, 2013.

R2- Charles P. Poole, Frank J. Owens, "Introduction to Nanotechnology", John Wiley & Sons Ltd., New Delhi, 2000. R3- James J.Allen, "Micro Electro Mechanical System Design", CRC Press Publisher, 2010

R4- Julian w. Gardner, Vijay K. Varadan, Osama O. Awadelkarim, "Micro Sensors MEMS and Smart Devices", John Wiley & Son LTD,2002

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Dean Academics

Dean (Academics)
HiCET

Mapping of COs with POs and PSOs														
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO-1**	**PSO-2**
CO1	3	3	2	3	3	1	1		1			2	2	2
CO2	3	3	2	3	3	1	1		1			2	2	2
CO3	3	3	2	3	3	1	1		1			2	2	2
CO4	3	3	2	3	3	1	1		1			2	2	2
CO5	3	3	2	3	3	1	1		1			2	2	2
AVG	3	3	2	3	3	1	1	-	1	-	-	2	2	2

- 1-low, 2-medium, 3-high, '-'- no correlation
- Note: The average value of this course to be used for program articulation matrix.

g. Naamadh

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL • HINDUSTHAN COLLEGE OF ENGG & TECH • Chairman

Dean Academics

Dean (Academics)
HiCET

THEORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	19MT8305	Information System for Engineers	3	0	0	3

Course Objective

1. To interpret the basic concepts of information systems applicable to engineers
2. To learn the system design of information systems
3. To identify the role of database management system in an information systems
4. To outline the data security of information systems
5. To estimate various modules in ethical and social issues in using information systems

Unit	Description	Instructional Hours
I	**INFORMATION TECHNOLOGY** Introduction to Information Technology - Need for Information Technology - Information Technology Firms - What They Are and How They Do Things - Opportunities in the IT Industries.	9
II	**SYSTEM DESIGN** Information Systems: Concepts and Overview of Information Systems - ASystematic Framework for Information Systems - Components of InformationSystems - Information Systems Design - Analysis and Management - Types ofInformation Systems.	9
III	**DATABASE MANAGEMENT SYSTEM** Database Management Systems for Information Systems: Data Resources - Structure and Functional Aspects - Graphic Database - Data Storage and Hypermedia - Data Design Issues and Output Designs.	9
IV	**DATA SECURITY** Information Systems Security - System Vulnerability and Abuse - ImproveBusiness Value of Security & Control using Various Technologies - Framework forSecurity and Control - Recent Technologies and Tools for Protecting InformationResources.	9
V	**ETHICS IN INFORMATION SYSTEM** Ethical and Social Issues in Information Systems - Ethics in an InformationSociety - Moral Dimensions of Information Systems - Role of Government inInformation Technology.	9
	Total Instructional Hours	45

Course Outcome

On completion of the course the students will be able to

CO1: Describe the basic concepts of information systems
CO2: Create an information system with suitable components
CO3: Familiarize with the database management system of an information systems
CO4: Point out framework forsecurity and control
CO5: Evaluate various modules in ethical and social issues in using information systems

TEXT BOOKS:

T1- Kenneth C. Laudon & Jane P.Laudon, "*Management Information Systems*" 12th Edition, PearsonEducation, New Delhi, 2014.

T2- Gerald V.Post David L. Anderson, "*Management Information System-Solving Business Problems with Information Technology*",Tata McGraw Hill Publishing CompanyLimited,NewDelhi, 2012.

REFERENCE BOOKS:

R1- Alexis Leon, "*Enterprise Resource Planning*", 2nd Edition, Tata McGraw Hill Publishing CompanyLimited,NewDelhi, 2005.

R2- Raymond Meleod, JR "*Information Systems*", 14th Edition, Mac Millan Publishing Co. Ltd, 2013.

R3- Gordan B.Davis Margrette H.Olsan, "*Management Information System*",Conceptual Foundations, Structure & Development, Tata McGraw Hill Publishing CompanyLimited,NewDelhi, 2012.

R4- Indrajith Chatterjie, "*Management Information System*", PHI Learning Pvt Ltd, New Delhi, 2010.

Chairman

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Dean Academics

Dean (Academics)
HiCET

Mapping of COs with POs and PSOs														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3	3	3	2	2	-	-	-	-	-	-	2	2	3
CO2	3	3	3	2	2	-	-	-	-	-	-	2	2	3
CO3	3	3	3	2	2	-	-	-	-	-	-	2	2	3
CO4	3	3	3	2	2	-	-	-	-	-	-	2	2	3
CO5	3	3	3	2	2	-	-	-	-	-	-	2	2	3
AVG	3	3	3	2	2	-	-	-	-	-	-	2	2	3

- 1-low, 2-medium, 3-high, '-'- no correlation
- Note: The average value of this course to be used for program articulation matrix.

S. Nasmadh

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Chairman

Dean Academics

Dean (Academ
HiCET

THEORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	19MT8306	Machineries in Agriculture	2	0	2	3

Course Objective

1. Enhance the fundamental knowledge in Agriculture machineries.
2. Analysis the Tillage equipments functions
3. Extend the knowledge about Fertilizers
4. Gain knowledge about cutting mechanisms and their applications
5. Conversant with principles of harvesting tools and machines

Theory

Unit	Description	Instructional Hours
I	**INTRODUCTION TO FARM MACHINES AND SOIL** Introduction to Farm Machines: Objectives of Farm Mechanisms - Classification of Farm Machines - Materials for Construction of Farm Machines - Principles of Operation and Selection of Machines for Production of Crops - Field Capacities & Economics. Soil:Nature and Origin of Soil- Soil Forming Rocks and Minerals - Soil Classification and Composition - Soil Forming Processes.	9
II	**TILLAGE** Tillage: Primary and Secondary Tillage Equipment - Forces Acting on Tillage Tools - Field Operation Patterns - Draft Measurement of Tillage Equipment - Earth Moving Equipment - Construction & Working Principles of Bulldozer - Trencher - Excavators - Sowing -Planting and Transplanting Equipment their Calibration and Adjustments.	9
III	**FERTILIZER APPLICATION EQUIPMENT** Fertilizer Application Equipment: Selection - Calibration - Construction Features - Different Components and Adjustment of Weed Control - Plant Protection Equipment - Sprayers and Dusters - Work Physiology of Men and Women.	9
IV	**PRINCIPLES AND TYPES OF CUTTING MECHANISMS** Principles and Types of Cutting Mechanisms: Construction and Adjustments of Shear and Impact Type Cutting Mechanisms - Crop Harvesting Machinery: Mowers - Windrowers - Reapers - Reaper Binders and Forage Harvesters - Forage Chopping and Handling Equipment - Threshing Mechanics - Types of Threshers - Straw Combines - Grain Combines - Maize Harvesting - Shelling Equipment - Root Crop Harvesting Equipment - Cotton Picking and Sugarcane Harvesting Equipment..	9
V	**PRINCIPLES OF HARVESTING TOOLS AND MACHINES** Principles of Harvesting Tools and Machines: Horticultural Tools and Gadgets - Testing of Farm Machine - Test Codes and Procedure - Interpretation of Test Results - Selection and Management of Farm Machines for Optimum Performance - Workplace Layout for Men and Women.	9
	Total Instructional Hours	**45**

Course Outcome

On completion of the course the students will be able to

CO1: Illustrate the fundamental properties of agriculture machineries
CO2: Discuss the working functions of tillage and bulldozers
CO3: Analyze the application of fertilizers
CO4: Understand the advanced technology in cutting mechanisms and harvesting
CO5: Develop the technology of harvesting tools and machines

TEXT BOOKS:

T1- Kepner R. A., Bainer Roy and Barger E. L. "Principals of Farm Machinery", 3rd Edition, CBS Publishers and Distributors, New Delhi, 2017.

REFERENCE BOOKS:

R1- Bosoi E.S., "Theory, Construction and Calculation of Agricultural Machines", 1st Edition, Oxonion Press Pvt. Ltd., New Delhi, 1990.
R2- Ghosh P.K. and Swain S., "Practical Agricultural Engineering", 1st Edition, NayaProkash, Calcutta, 1993.
R3- Donnel Hunt, "Farm Machinery and Management", 10th Edition, Iowa State University Press, Ames, USA, 2016.

Chairman, Board of Studies

Dean Academics

Mapping of COs with POs and PSOs														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3		3						1	1		1	2	
CO2	3	2	1							1			2	
CO3	1	3	2									1	1	
CO4	1	1	2									1	1	
CO5	3	1	1									1	1	
AVG	2.2	1.4	1.8	-	-	-	-	-	0.2	0.4	-	0.8	1.4	-

- 1-low, 2-medium, 3-high, '-'- no correlation
- Note: The average value of this course to be used for program articulation matrix.

Chairman, Board of Studies

ACADEMIC COUNCIL • HINDUSTHAN COLLEGE OF ENGG & TECH • Chairman

Dean Academics

Chairman - BoS
MCT - HiCET

THEORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	19MT8307	Industrial Diagnostics and Maintenance Techniques	3	0	0	3

Course Objective

1. To identify the different defects and failure analysis methods
2. To learn the different types of maintenance flowing in industries
3. To prepare catalogue, manual for aproduct
4. To apply the computer in maintenance applications
5. To expose the concept of condition monitoring techniques

Unit	Description	Instructional Hours
I	**DEFECTS AND FAILURE ANALYSIS** Defect Generation - Types of Failures - Defects Reporting and Recording - Defect Analysis -Failure Analysis - Equipment Down Time Analysis - Breakdown Analysis - FTA -FMEA - FMECA.	9
II	**MAINTENANCE SYSTEMS** Planned and Unplanned Maintenance - Breakdown Maintenance - CorrectiveMaintenance - Opportunistic Maintenance - Routine Maintenance - Preventive Maintenance - Predictive Maintenance - Condition Based Maintenance System - Selection of Maintenance System.	9
III	**SYSTEMATIC MAINTENANCE** Codification and Cataloguing - Instruction Manual and Operating Manual - Maintenance Manual and Departmental Manual - Maintenance Time Standard - Maintenance Work Order and Work Permit - Feedback and Control - Maintenance Records and Documentation.	9
IV	**COMPUTER MANAGED MAINTENANCE SYSTEM** Selection and Scope of Computerization - Equipment Classification - Codification of Breakdown, Material and Facilities - Material Management Module - Captive Engineering Module.	9
V	**CONDITION MONITORING** Condition Monitoring Techniques - Visual Monitoring - Temperature Monitoring - Vibration Monitoring - Lubricant Monitoring - Cracks Monitoring - Thickness Monitoring - Noise and Sound Monitoring - Condition Monitoring of Hydraulic System. Machine Diagnostics - Objectives - Monitoring Strategies - Examples of Monitoring and Diagnosis.	9
	Total Instructional Hours	45

Course Outcome

On completion of the course the students will be able to

CO1: Recognize the defects and failure analysis
CO2: Utilize the types of maintenance systems
CO3: Plan and create the maintenance manual, work order, related documentations
CO4: Utilize the computer for maintenance
CO5: Familiarize the condition monitoring types and methods

TEXT BOOKS:

T1- Sushil Kumar Srivastava, "*Industrial Maintenance Management*", S. Chand and Company Ltd., New Delhi, 2006.
T2- Don Nyman and Joel Levitt, "*Maintenance Planning, Scheduling and Coordination*", Industrial Press Inc., New York, 2010.

REFERENCE BOOKS:

R1- Michael E. Brumbach and Jeffrey A. Clade, "*Industrial Maintenance*", Cengage Learning India Pvt Ltd., New Delhi, 2006.
R2- R. Keith Mobley, "*Maintenance Fundamentals*", Butterworth Heinmann Publications, USA, 2004.
R3- Mishra R C, Pathak K, "*Maintenace Engineering and Management*", PHI, New Delhi, 2002
K Venkataraman, "*Maintenace Engineering and Management*", PHI, New Delhi, 2010

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Chairman
ACADEMIC COUNCIL
HINDUSTHAN COLLEGE OF ENGG & TECH

Dean Academics

Dean (Academics)
HiCET

Mapping of COs with POs and PSOs														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3					1							1	
CO2	1					1					1	2	2	
CO3		1								2			2	
CO4	1		2						1					2
CO5	1		1			1					3		1	
AVG	1.2	0.2	0.6	-	-	0.6	-	-	0.2	0.4	0.8	0.4	1.2	0.4

- 1-low, 2-medium, 3-high, '-'- no correlation
- Note: The average value of this course to be used for program articulation matrix.

Chairman, Board of Studies

Chairman
ACADEMIC COUNCIL
HINDUSTHAN COLLEGE OF ENGG & TECH

Dean Academics

THEORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	19MT8308	Engineering Economics and Cost Analysis	3	0	0	3

Course Objective

1. To learn the basic law of economics
2. To discuss the time consideration and improvement in quality
3. To acquire the knowledge of major types of costing methods and budgeting operations that support engineering cost analysis and project/operations planning and control
4. To impart knowledge in replacement and maintenance analysis
5. To explain how to replace the old one, the new asset has to be purchased with the help of depreciation charge

Unit	Description	Instructional Hours
I	**ECONOMICS** Introduction to Economics - Flow in an Economy, Law of Supply and Demand. Concept of Engineering Economics - Engineering Efficiency, Economic Efficiency. Scope of Engineering Economics - Element of Costs, Marginal Cost, Marginal Revenue, Sunk Cost, Opportunity Cost, Break - Even Analysis - V Ratio, Elementary Economic Analysis - Material Selection for Product Design Selection for a Product.	9
II	**VALUE ENGINEERING** Make or Buy Decision, Value Engineering - Function, Aims and Value Engineering Procedure. Interest Formulae and their Applications - Time Value of Money, Single Payment Compound Amount Factor, Single Payment Present Worth Factor, Equal Payment Series Sinking Fund Factor, Equal Payment Series Payment Present Worth Factor - EqualPayment Series Capital Recovery Factor - Uniform Gradient Series Annual Equivalent Factor, Effective Interest Rate, Examples in all the Methods.	9
III	**CASH FLOW** Methods of Comparison of Alternatives - Present Worth Method (Revenue Dominated Cash Flow Diagram) Future Worth Method (Revenue Dominated Cash Flow Diagram, Cost Dominated Cash Flow Diagram) Annual Equivalent Method (Revenue Dominated Cash Flow Diagram, Cost Dominated Cash Flow Diagram) Rate of Return Method.	9
IV	**REPLACEMENT AND MAINTENANCE ANALYSIS** Replacement and Maintenance analysis - Types of Maintenance, Types of Replacement Problem, Determination of Economic Life of an Asset, Replacement of an Asset with a New Asset - Capital Recovery with Return and Concept of Challenger and Defender, Simple Probabilistic Model for Items which Fail Completely.	9
V	**DEPRECIATION** Depreciation - Introduction, Straight Line Method of Depreciation, Declining Balance Method of Depreciation - Sum of the Years Digits Method of Depreciation, Sinking Fund Method of Depreciation - Annuity Method of Depreciation, Service Output Method of Depreciation - Evaluation of Public Alternatives - Introduction, Examples. Inflation Adjusted Decisions - Procedure to Adjust Inflation, Examples on Comparison of Alternatives and Determination of Economic Life of Asset.	9
	Total Instructional Hours	45

Course Outcome

On completion of the course the students will be able to

CO1: Solve engineering economic problems
CO2: Create a team with positive attitude for making a decision to build a new acceptable profit
CO3: Apply strategies in cash flows for the investments in projects
CO4: Implement the knowledge of maintenance analysis of assets
CO5: Choose the method of depreciating fund to recover money from earnings

TEXT BOOKS:

T1- R.Panneerselvam, *"Engineering Economics"*, 1st Edition, PHI Learning Private Limited, New Delhi, 2012.
T2- Chan S.Park, *"Contemporary Engineering Economics"*, 6th Edition, PHI Learning Private Limited, New Delhi, 2015.

Chairman

Chairman, Board of Studies
MCT - HiCET

Dean Academics
Dean (Academics)
HiCET

REFERENCE BOOKS:

R1- Donald.G. Newman, Jerome.P.Lavelle, *"Engineering Economics and Analysis"*, 1st Edition, Engg. Press, Texas, 2004.

R2- Kesavan.R, *"Engineering Economics and Financial Accounting"*, 1st Edition, Laxmi Publications (P) Ltd., New Delhi, 2005.

R3- Paul A Samuelson, *"Economics"* Tata Megraw Hill Pvt Ltd, 19th Edition, 2010.

R4- James L Riggs, David D bedworth, Sabah U Randhawa, "Engieering Economics", Tata Megraw Hill Pvt Ltd, 4th Edition, 2004.

Mapping of COs with POs and PSOs

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3	1	2	1	1	1	1	1	1	1	1	1	2	1
CO2	1	1	3	1	1	1	1	1	2	1	1	2	2	1
CO3	3	1	1	1	1	1	1	1	1	1	1	1	1	2
CO4	1	2	1	2	1	1	1	2	1	1	1	1	1	2
CO5	2	1	3	1	1	1	1	1	1	1	1	1	1	2
AVG	2	1.2	2	1.2	1	1	1	1.2	1.2	1	1	1.2	1.4	1.6

- 1-low, 2-medium, 3-high, '-'- no correlation
- Note: The average value of this course to be used for program articulation matrix.

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Chairman
ACADEMIC COUNCIL
SRINIVASAN COLLEGE OF ENGG & TECH

Dean Academics

Dean (Academics)
HiCET

THEORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	19MT8181	Principles of Management	3	0	0	3

Course Objective

1. To impart knowledge about functions of management and manager in an organization
2. To familiarize about planning and management objectives
3. To classify organization structure and its process
4. To recognize various motivational techniques and theories
5. To learn different approaches to management through case studies

Unit	Description	Instructional Hours
I	**MANAGEMENT** Definition - Importance - Functions - Skills Required for Managers - Roles and Functions of Managers - Science and Art of Management - Management and Administration -Types of Business Organization - Sole Proprietorship, Partnership, Company - Public and Private Sector Enterprises.	9
II	**PLANNING** Nature and Purpose - Steps Involved in Planning - Types of Plans - Plans at Individual, Department and Organization Level - Managing by Objectives - Forecasting - Purpose - Steps and Techniques - Decision Making - Steps in Decision Making.	9
III	**ORGANIZING** Nature and Purpose of Organizing - Formal and Informal Organization - Organization Chart - Structure and Process - Strategies of Departmentation - Line and Staff Authority - Benefits and Limitations - Centralization Vs De-Centralization Staffing - Manpower Planning - Recruitment - Selection - Placement.	9
IV	**DIRECTING AND CONTROLLING** Theories and Techniques of Motivation - Leadership - Types and Theories of Leadership - System and Process of Controlling - Budgetary and Non-Budgetary Control Techniques - Direct and Preventive control.	9
V	**APPROACH TO MANAGEMENT AND CASE STUDIES** American Approach to Management - Japanese Approach to Management - Indian Approach to Management - Case Studies: Curtain Dream - Compsoft - Headland - Dragon Data - Wardle Storeys.	9
	Total Instructional Hours	45

Course Outcome

On completion of the course the students will be able to

- CO1: Apply the function of management in an organization
- CO2: Develop various planning techniques to apply it in public and private sector enterprises
- CO3: Solve the problem faced by the workers due to decentralization
- CO4: Illustrate the leadership qualities and to apply motivationaltechniques
- CO5: Enumerate different approaches to management through case studies

TEXT BOOKS:

T1- Harold Koontz & Heinz Weihrich, "*Essentials of management*", 9th Edition, Tata McGraw Hill Publishing CompanyLimited,NewDelhi, 2012.

T2- P.C. Tripathy and P. N. Reddy, "*Principles of Management*", 5th Edition, Tata McGraw Hill Publishing CompanyLimited,New Delhi, 2012.

REFERENCE BOOKS:

R1- Stephen A.Robbins & David A.Decenzo & Mary Coulter, "*Fundamentals of Management*", 7th Edition, Pearson Education, New Jersey, 2011.

R2- JAF Stoner, Freeman R.E and Daniel R Gilbert "*Management*", 6th Edition, Pearson Education, New York, 2004.

R3- Stephen P. Robbins & Mary Coulter, "*Management*", 10th Edition, PHI Learning Private Limited, New Delhi, 2007.

R4- Robert Kreitner & Mamata Mohapatra, "Management", Biztantra, 2008.

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Dean Academics

Dean (Academics)
HiCET

Mapping of COs with POs and PSOs														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1						2	3	3	1		2	2		
CO2						2		1	2		1	3		
CO3					2	1					1			
CO4					2	2					2			
CO5						3					1	1		
AVG	-	-	-	-	0.8	2	0.6	0.8	0.6	-	1.4	1.2	-	-

- 1-low, 2-medium, 3-high, '-'- no correlation
- Note: The average value of this course to be used for program articulation matrix.

S. Naamadh

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL • HINDUSTHAN COLLEGE OF ENGG & TECH • Chairman

Dean Academics

Dean (Academics)
HiCET

THEORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	19MT8182	Professional Ethics in Engineering	3	0	0	3

Course Objective

1. To express moral values, social values and loyalty
2. To learn the relationship between engineering and society
3. To identify the social responsibilities through casestudies
4. To learn the different types of responsibilities andrights
5. To provide an insight of professional ethics in the global issues

Unit	Description	Instructional Hours
I	**HUMAN VALUES** Morals, Values and Ethics - Integrity - Work Ethic - Service Learning - Civic Virtue - Respect for Others - Living Peacefully - Caring - Sharing - Honesty - Courage - Valuing Time - Co- Operation - Commitment - Empathy - Self - Confidence - Character - Spirituality in Business.	9
II	**ENGINEERING ETHICS** Senses of Engineering Ethics - Variety of Moral Issues - Types of Inquiry - Moral Autonomy -Kohlberg's Theory - Gilligan's Theory - Consensus and Controversy - Models of Professional Roles - Theories about Right Action - Self Interest Uses of Ethical Theories	9
III	**ENGINEERING AS SOCIAL EXPERIMENTATION** Engineering as Experimentation - Engineers as Responsible Experimenters - Codes of Ethics - A balanced Outlook on Law - The Challenger Case Study - Bhopal Gas Tragedy - The Three MileIsland and Chernobyl Case Studies - Safety Aspects in Nuclear Power Plants.	9
IV	**RESPONSIBILITIES AND RIGHTS** Responsibilities and Duties of Indian Citizens - Collegiality and loyalty - Respect for authority - Collective bargaining - Confidentiality - Conflicts of interest - Occupational crime - Fundamental Rights - Professional rights - Employee rights - Discrimination - Right to Information Act.	9
V	**GLOBAL ISSUES** Multinational corporations - Environmental Ethics and Environmental Protection Act - Computer Ethics - Engineers as Managers - Consulting Engineers - Engineers as Expert Witnesses and Advisors - Moral Leadership - Sample Code of Ethics like IETE, ASME, ASCE, IEEE, Institution of Engineers (India), Indian Institute of Materials Management - Weapons Development.	9
	Total Instructional Hours	45

Course Outcome

On completion of the course the students will be able to

CO1: Analyze the components of ethics and values

CO2: Recognize, list and describe ethical issues and professional importance to theengineer.

CO3: Apply function effectively as an individual, as a part of team and in a multi disciplinary environment.CO4: Discuss what it means to be human and to live in a community with rights and responsibilities

CO5: Analyze international interconnections and interdependence through global issues

TEXT BOOKS:

T1- Dr.V.Jayakumar, *"Professional Ethics in Engineering"*, 4th Edition, Lakshmi Publications, Chennai, 2018.
T2- M. Govindarajan, S. Natarajan and V. S. Senthil Kumar, *"Engineering Ethics"*,PHI Learning Private Limited, New

Chairman, Board of Studies

S. Nasmadh

Chairman - BoS
MCT - HiCET

Chairman

Dean Academics

Dean (Academics)
HiCET

Delhi, 2013.

REFERENCE BOOKS:

R1- Charles D. Fleddermann, "Engineering Ethics", 4thEdition, Pearson Education, New Jersey, 2014.
R2- Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, "Engineering Ethics - Concepts and Cases", 5th Edition, Wadsworth Cengage Learning, 2014.
R3- John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003
R4- Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001.

Mapping of COs with POs and PSOs

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	2	1	2	2	3	2	3	2	2	2	3	2		1
CO2	2	2		1		2	2	2	3	3	3	2		1
CO3	2	2	2	2	2	2	2	2	3	3	3	2		1
CO4	2	2		2	2	2	2	2	3	3	3	2		1
CO5	2	2		2	2	2	2	2	3	3	3	2		1
AVG	2	1.8	0.8	1.8	1.8	2	2.2	2	2.8	2.8	3	2	-	1

- 1-low, 2-medium, 3-high, '-'- no correlation
- Note: The average value of this course to be used for program articulation matrix.

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

Chairman

Dean Academics

Dean (Academics)
HiCET

THEORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	19MT6401	Industrial Safety and Environment	3	0	0	3

Course Objective

1. To impart knowledge about the fundamentals of safety, Health and Environment
2. To provide knowledge in different safety organizations
3. To impart awareness about the work safety in industry
4. To learn the industrial safety and Ergonomics in work area
5. To impart awareness about the Environment Management

Unit	Description	Instructional Hours
I	**FUNDAMENTALS OF SAFETY** Need for Integration of Safety, Health and Environment - Fundamentals of Safety - Factory Act 1948 - Process Safety Management - Civilizations and Safety Requirements - Economic Aspects - Elements of Safety Programming -Safety Versus Health.	9
II	**SAFETY ORGANIZATION** Introduction - Purpose of a Safety Organization - Classification of Accidents - Safety and Government Role - National Safety Council - Safety Act - Provisions for Worker Welfare - Workmen Compensation Act 1943 - Safety and Security Measures - Management Safety Policy - Safety Auditing - Maintenance and Safety - Security Management of Industrial Plants.	9
III	**SAFE WORKING AND HAZARDS** Introduction - Work Place Safety - Safe Working Environment - Fire Safety Instructions - Safety Devices and Tools - Safety Instruction - Maintenance - Electricity - Welding - Hand Tools - Safety Measures for Compressed System and Cylinders - Personal Safety - Permit to Work System - Personal Protection Equipment (PPE) - Concepts of Hazard Avoidance - Hazard Classification Scale.	9
IV	**INDUSTRIAL SAFETY AND ERGONOMICS** Introduction - Safety Training - Hazard Check List - General Safety Rules - Human Factors in Machine Equipment Safety - Fire Prevention - Accident Prevention - Principles of Safe Machine Design - Safety in Materials Handling and Storage - General Safety Rules - Roles of Occupational Safety and Health Administration - Facets of Ergonomics - Ergonomics Standards - Ergonomic Risk Analysis - Sources of Ergonomic Hazards.	9
V	**ENVIRONMENTAL MANAGEMENT AND CASE STUDIES** Environment Protection Act - National Environment Policy - Environmental Standards - Degradation of Environment - Environment Management System - ISO 14000 - International Environmental Principles - Environmental Protection Agency - Environmental Impact Assessment -Case study on Machines and Equipment - Handling of Equipment.	9
	Total Instructional Hours	45

Course Outcome

On completion of the course the students will be able to

CO1: Identify the evaluation of industrial safety, Health and Environmental Standards
CO2: Describe the types of accidents and safety measures
CO3: Describe the safety working procedure of different work area
CO4: Apply ergonomics for safety working procedure for humans in industrial area
CO5: Identify the needs of environmental management for Sustainable Development

TEXT BOOKS:

T1- R.K Jain, *"Industrial Safety, Health and Environment Management System"*, 4th Edition, Khanna Publishers, New Delhi, 2015.

T2- R.K. Mishra, *"Safety Management"*, 2nd Edition, AITBS Publishers, 2012.

REFERENCE BOOKS:

R1- C. Ray Asfahl, David W. Rieske, *"Industrial Safety and Health Management"*, 6th Edition, Pearson Education, Asia, 2010.

R2- Krishnan N.V., *"Safety in Industry"*, 2nd Edition, Jaico Publisher House, 2005.

R3- L.M Deshmukh, *"Industrial Safety Management and Risk Control"*, 1st Edition, McGraw Hill Education, NewDelhi,2008.

R4- Er.Gupta, " Industrial Safety and Environment", 1st Edition,Laxmi Publications, 2008.

S. Naamadh

Chairman - BoS
MCT - HiCET

Dean (Academics)
HiCET

THEORY COURSES

Programme	Course Code	Name of the Course	L	T	P	C
BE	19MT7401	Project Management	3	0	0	3

Course Objective

1. To observe how to plan and manage the projects at each stage of the Software Development Life cycles
2. To learn the successful projects that support organization's Strategic Goals
3. To acquire the knowledge about the activities necessary to successfully complete and close the Software Projects
4. To discuss the various categories of risk involved in Project Development
5. To develop the knowledge about Organizational Behavior and Team Works

Unit	Description	Instructional Hours
I	**SOFTWARE PROJECT MANAGEMENT** Introduction - Need for Software Project Management - Activities by Software Project Management - Software Project versus Other Projects - Categories of Software Projects	9
II	**PROJECT EVALUATION AND PROGRAMME MANAGEMENT** Project Evaluation: Introduction - Project Portfolio Management -Evaluation of Individual Projects - Cost Benefit Analysis and Evaluation Techniques. Programme Management: Managing the Allocation of Resources - Strategic Programme Management - Creating a Programme - Aids to Programme Management - Benefits Management.	9
III	**ACTIVITY PLANNING** Objectives of Activity Planning - Project Schedules, Projects and Activities, Sequencing and Scheduling Activities, Network Planning Modes - Formulating Network Models, Identifying Critical Path, Identifying Critical Activities.	9
IV	**RISK MANAGEMENT** Introduction – Risk and categories of risk - Framework for Dealing with Risk - Risk Identification - Risk Assessment - Risk Planning - Evaluating Risks to the Schedule - Applying the PERT Technique - Monte Carlo Simulation.	9
V	**PEOPLE MANAGEMENT AND TEAM ORGANIZATION** Managing People: Understanding Behavior, Organizational Behavior - Selecting the Right Person for the Job - Instruction in the Best Method – Motivation based on Taylorist model - Stress - Health and Safety. Team Organization: Becoming a Team - Decision Making - Organization and Team Structures.	9
	Total Instructional Hours	45

Course Outcome

On completion of the course the students will be able to

CO1: Integrate organizational needs to the most effective Software Development Model
CO2: Plan and manage projects at each stage of the Software Development Life Cycle
CO3: Analyze between planning modules that address Real World Management Challenges
CO4: Describe various types of Risk, Risk Identifications and planning involved in Project Management
CO5: Applying skill of working as a team and as a decision maker in an Organization

TEXT BOOKS:

T1- Bob Hughes, Mike Cotterel, Rajib Mall, *"Software Project Management"*, 6th Edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 2017.

T2- Gopalaswamy Ramesh, *"Managing Global Software Projects"*, 1st Edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 2005.

Chairman, Board of Studies

Chairman - BoS
MCT - HiCET

ACADEMIC COUNCIL • HICET • Chairman • SCHOOL OF ENGG & TECH

Dean Academics

Dean (Academics)