Estd:1980

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE
(AUTONOMOUS)
(Affiliated to JNTUK, Kakinada), (Recognized by AICTE, New Delhi)
UG Programmes CE,CSE,ECE,EEE,IT & ME are Accredited by NBA
CHINNA AMIRAM (P.O):: BHIMAVARAM :: W.G.Dt., A.P., INDIA :: PIN: 534 204

Regulation: R20

MECHANICAL ENGINEERING (Honors)

SCHEME OF INSTRUCTION & EXAMINATION
(With effect from 2020-21 admitted Batch onwards)

Course Code	Course Name	Year/ Sem	Cr	L	T	P	Int. Marks	Ext. Marks	Total Marks
B20MEH101	Alternative Fuels and Energy Systems	II-II	4	3	1	0	30	70	100
B20MEH201	Micro-Electro Mechanical Systems	III-I	4	3	1	0	30	70	100
B20MEH301	Mechanical Vibrations	III-II	4	3	1	0	30	70	100
B20MEH401	Product Design and Development	IV-I	4	3	1	0	30	70	100
B20MEH501	*MOOCS-I	II-II to IV-II	2	--	--	--	--	--	100
B20MEH601	*MOOCS-II	II-II to IV-II	2	--	--	--	--	--	100
		TOTAL	**20**	**12**	**4**	**0**	**120**	**280**	**600**

*Two MOOCS courses of any MECHANICAL ENGINEERING related Program Core Courses from NPTEL/SWAYAM with a minimum duration of 8 weeks (2 Credits) courses other than the courses offered need to be taken by prior information to the concern. These courses should be completed between II Year II Semester to IV Year II Semester

Code	Category	L	T	P	C	I.M	E.M	Exam
B20MEH101	**Honors**	**3**	**1**	**--**	**4**	**30**	**70**	**3 Hrs.**

ALTERNATIVE FUELS AND ENERGY SYSTEMS

(Honors Degree Course in ME)

Course Objectives:

1.	To impart the knowledge of basics of alternative fuels for Internal combustion engine and alternative drive systems for automobiles, principle of solar energy collection
2.	To impart the knowledge of methods of production of Bio gas, methanol, ethanol, SVO, Bio diesel and various aspects of electrical and Hybrid vehicles
3.	To study the use of various gaseous fuels and hydrogen for internal combustion engine application

Course Outcomes

S.No	Outcome	Knowledge Level
1.	Describe need for alternative fuels for Internal combustion engine and alternative drive systems for automobiles, principle of solar energy collection, construction of photo voltaic cells	K2
2.	Explain various properties, methods of production of Bio gas, methanol, ethanol, SVO, Bio diesel	K2
3.	Illustrate the use of hydrogen and various gaseous fuels, reformulated conventional fuels & future alternative fuels for internal combustion engine application.	K3
4.	Explain the various aspects of electrical and Hybrid vehicles	K2

SYLLABUS

UNIT-I (10Hrs)	**Introduction:** Types of energy sources, their availability, need of alternative energy sources, Nonconventional energy sources, Classification of alternative fuels and drive trains. Scenario of conventional auto fuels, oil reserves of the world. Fuel quality aspects related to emissions. Technological up gradation required business driving factors for alternative fuels. Implementation barriers for alternative fuels. Stakeholders of alternative fuels, Road map for alternative fuels. **Solar energy**: Solar energy geometry, solar radiation measurement devices. Solar energy collectors, types of collectors. Direct application of solar energy, solar energy storage system. P. V. effect solar cells and characteristics. Application of solar energy for automobiles.
UNIT-II (10 Hrs)	**Biogas:** History, properties and production of Biogas, classification of biogas plants, biogas storage and dispensing system. Advantages of biogas, hazards and emissions of biogas. Production, properties, Engine performance, advantages and disadvantages of Methanol,

	Ethanol, Butanol, Straight vegetable oil, Biodiesel for internal combustion engine application.
UNIT-III (10 Hrs)	**Hydrogen**: Properties and production of hydrogen, Storage, Advantages and disadvantages of hydrogen, use of Hydrogen in SI and CI engines. Hazards and safety systems for hydrogen, hydrogen combustion. Emission from hydrogen. **Gaseous fuels:** Production, properties, Engine performance, advantages and disadvantages of CNG, LNG, ANG, LPG and LFG.
UNIT-IV (10 Hrs)	**Reformulated Conventional Fuels:** Introduction. Production of coal water slurry, properties, as an engine fuel, emissions of CWS. RFG, Emulsified fuels. Hydrogen-enriched gasoline. **Future Alternative Fuels:** Production, properties, Engine performance, advantages and disadvantages of PMF, Ammonia, Liquid-Nitrogen, Boron, Compressed Air, Water as fuel for Internal combustion Engine.
UNIT-V (10 Hrs)	**Alternative Power Trains:** Components of an EV, EV batteries, chargers, drives, transmission and power devices. Advantages and disadvantages of EVs. Hybrid electric vehicles, HEV drive train components, advantages of HV. History of dual fuel technology, Applications of DFT. Duel fuel engine operation. Advantages and disadvantages of duel fuel technology.

Text Books:	
1.	Alternative Fuel. S .S. Thipse JAICO. Publishing House 2015
2.	Non-Conventional Energy SourcesG. D. Rai Khanna Publishing NewDelhi.2010
Reference Books:	
1.	Alternative fuels guide. R. Bechtold SAE 2005
2.	Alternative energy sources T.N Veziroglu McGraw Hill 2001
3.	Automotive Fuels Guide Richard L.BechtoldSAE Publications 1997
4.	Alternative fuels for vehicle book by M. Poulton

				Course Code: B20MEH101	
SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)					**R20**
II B.Tech. II Semester MODEL QUESTION PAPER					
ALTERNATIVE FUELS AND ENERGY SYSTEMS					
(Honors Degree Course in Mechanical Engineering)					
Time: 3 Hrs				**Max. Marks: 70 M**	
Answer **ONE Question** from **EACH UNIT**					
All questions carry equal marks					
Assume suitable data if necessary					
			CO	**KL**	**M**
		UNIT-I			
1.	**a).**	Briefly discuss the conventional and non-conventional sources of energy?	**1**	**2**	**7**
	b).	What is the need of alternative fuels? Explain the implementation barriers of alternative fuels?	**1**	**2**	**7**
		OR			
2.	**a).**	Explain the different types of flat type solar collector with the help of neat sketch.	**1**	**2**	**7**
	b).	Explain the working of a photovoltaic cell with the help of neat sketch.	**1**	**2**	**7**
		UNIT-II			
3.	**a).**	Briefly discuss the major factors that affect power deration in diesel engine when using Bio diesel as its fuel?	**2**	**2**	**7**
	b).	Explain the performance characteristics of ethanol when used in an IC engine.	**2**	**2**	**7**
		OR			
4.	**a).**	Describe the working of a biogas plant with a neat sketch and explain its performance on IC engines.	**2**	**2**	**7**
	b).	Explain the hazards and emissions of biogas.	**2**	**2**	**7**
		UNIT-III			
5.	**a).**	Explain the chemical production of hydrogen.	**3**	**2**	**7**
	b).	Illustrate the properties of hydrogen and safety systems required for hydrogen storage.	**3**	**3**	**7**
		OR			
6.	**a).**	Explain the performance of an IC engine when using CNG as its fuel.	**3**	**2**	**7**
	b).	Illustrate the properties of gaseous fuels ANG, LPG and LFG.	**3**	**2**	**7**
		UNIT-IV			
7.	**a).**	Illustrate the Production of coal water slurry.	**3**	**3**	**7**

	b).	Briefly discuss the concept of Hydrogen-enriched gasoline.	**3**	**2**	**7**
		OR			
8.	**a).**	Explain the chemical production of Liquid-Nitrogen.	**3**	**2**	**7**
	b).	Describe the properties of Ammonia and Boron.	**3**	**2**	**7**
		UNIT-V			
9.	**a).**	Briefly discuss the future possibilities of an electric vehicle?	**4**	**2**	**7**
	b).	How hybrid electric vehicles are classified? Explain any two.	**4**	**2**	**7**
		OR			
10.	**a).**	Discuss the design considerations required for constructing an electric vehicle?	**4**	**2**	**7**
	b).	Explain any two types of motor used in electric vehicles.	**4**	**2**	**7**

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as A,B splits or as a single Question for 14 marks

Code	Category	L	T	P	C	I.M	E.M	Exam
B20MEH201	**Honors**	**3**	**1**	**--**	**4**	**30**	**70**	**3 Hrs.**

MICRO-ELECTRO MECHANICAL SYSTEMS

(Honors Degree Course in ME)

Course Objectives:

1.	To learn basics of Micro Electro Mechanical Systems (MEMS) and study the various materials used for micromachining techniques and to learn about various sensors and actuators used in MEMS
2.	To give exposure to different MEMS Thermal Sensors And Actuators.
3.	To learn the principle and various devices of MOEMS and Magnetic Sensors And Actuators devices.
4.	To impart knowledge of the basic concept of fluid actuation methods, dielectro phoresis (DEP), electro thermal flow, opto electro wetting (OEW), and thermal effects Micro fluidics and to learn Radio Frequency (RF) MEMS..

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

S.No	Outcome	Knowledge Level
1.	Gain thorough knowledge of materials used for micromachining techniques and Analyze the process of sensors and actuators.	K3
2.	Acquire the knowledge of Heat transfer processes, Thermal effects, Devices such as thermal flow sensors, thermo vessels.	K3
3.	Analyze and develop models for different types of Magnetic Sensors and magnetic sensing and detection. Develop MOEMS technology	K3
4.	Analyze the process Micro Fluidic System.	K3

SYLLABUS

UNIT-I (10 Hrs)	**Introduction:** Definition of MEMS, MEMS history and development, micro machining, lithography principles & methods, structural and sacrificial materials, thin film deposition, impurity doping, etching, surface micro machining, wafer bonding, LIGA. **Mechanical Sensors and Actuators:** Principles of sensing and actuation: beam and cantilever, capacitive, piezo electric, strain, pressure, flow, pressure measurement by micro phone, MEMS gyroscopes, shear mode piezo actuator, gripping piezo actuator, Inchworm technology.
UNIT-II (10 Hrs)	**Thermal Sensors and Actuators:** Thermal energy basics and heat transfer processes, thermisters, thermo devices, thermo couple, micro machined thermo couple probe, peltier effect heat pumps, thermal flow sensors, micro hot plate gas sensors, MEMS thermo vessels, pyro electricity, shape memory alloys (SMA), U-shaped horizontal and vertical electro thermal actuator, thermally activated MEMS relay, micro spring thermal

	actuator, data storage cantilever.
UNIT-III (10 Hrs)	**Micro-Opto-Electro Mechanical Systems:** Principle of MOEMS technology, properties of light, light modulators, beam splitter, micro lens, micro mirrors, digital micro mirror device (DMD), light detectors, grating light valve (GLV), optical switch, wave guide and tuning, shear stress measurement.
UNIT-IV (10 Hrs)	**Magnetic Sensors and Actuators:** Magnetic materials for MEMS and properties, magnetic sensing and detection, magneto resistive sensor, more on hall effect, magneto diodes, magneto transistor, MEMS magnetic sensor, pressure sensor utilizing MOKE, mag MEMS actuators, by directional micro actuator, feedback circuit integrated magnetic actuator, large force reluctance actuator, magnetic probe based storage device.
UNIT-V (10 Hrs)	**Micro Fluidic Systems:** Applications, considerations on micro scale fluid, fluid actuation methods, dielectro phoresis (DEP), electro wetting, electro thermal flow, thermo capillary effect, electro osmosis flow, opto electro wetting (OEW), tuning using micro fluidics, typical micro fluidic channel, microfluid dispenser, micro needle, molecular gate, micro pumps. **Radio Frequency (RF) MEMS:** RF – based communication systems, RF MEMS, MEMS inductors, varactors, tuner/filter, resonator, clarification of tuner, filter, resonator, MEMS switches, phase shifter.

Text Books:	
1.	MEMS, Nitaigour Premchand Mahalik, TMH Publishing co.
Reference Books:	
1.	Foundation of MEMS, Chang Liu, Prentice Hall Ltd.
2.	MEMS and NEMS, Sergey Edwrd Lyshevski, CRC Press, Indian Edition.
3.	MEMS and Micro Systems: Design and Manufacture, Tai-Ran Hsu, TMH Publishers.
4.	Introductory MEMS, Thomas M Adams, Richard A Layton, Springer International Publishers.
e-Resources:	
1.	https://nptel.ac.in/courses/117105082
2.	https://nptel.ac.in/courses/108108113

			Course Code: B20MEH201		
		SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)			**R20**
		III B.Tech. I Semester MODEL QUESTION PAPER			
		MICRO-ELECTROMECHANICAL SYSTEMS			
		(Honors Degree Course in Mechanical Engineering)			
Time: 3 Hrs.					**Max. Marks: 70 M**
		Answer **ONE Question** from **EACH UNIT**			
		All questions carry equal marks			
		Assume suitable data if necessary			
			CO	**KL**	**M**
		UNIT-I			
1.	**a).**	Explain about structural and sacrificial materials.	**1**	**3**	**7**
	b).	Describe the MEMS gyroscopes.	**1**	**3**	**7**
		OR			
2.	**a).**	Explain about surface micro machining and wafer bonding.	**1**	**3**	**7**
	b).	Describe about shear mode piezo actuator and gripping piezo actuator.	**1**	**3**	**7**
		UNIT-II			
3.	**a).**	Explain about thermal flow sensors and micro hot plate gas sensors.	**2**	**3**	**7**
	b).	Write about thermisters and thermo devices in detail.	**2**	**3**	**7**
		OR			
4.	**a).**	Describe U-shaped horizontal and vertical electro thermal actuator.	**2**	**3**	**7**
	b).	Illustrate shape memory alloys (SMA) and data storage cantilever in detail.	**2**	**3**	**7**
		UNIT-III			
5.	**a).**	Explain the principle of MOEMS technology in detail.	**3**	**3**	**7**
	b).	Explain about digital micro mirror device (DMD).	**3**	**3**	**7**
		OR			
6.	**a).**	Describe about micro lens and micro mirrors.	**3**	**3**	**7**
	b).	Explain about grating light valve (GLV).	**3**	**3**	**7**
		UNIT-IV			
7.	**a).**	Explain magnetic materials for MEMS and properties.	**3**	**3**	**7**
	b).	Describe about magnetic probe based storage device.		**3**	**7**
		OR			
8.	**a).**	Write about mag MEMS actuators and by directional micro actuator.	**3**	**3**	**7**
	b).	Describe about feedback circuit integrated magnetic actuator.	**3**	**3**	**7**
		UNIT-V			

9.	**a).**	Explain about fluid actuation methods.	**4**	**3**	**7**
	b).	Explain about tuner/filter, resonator and clarification of tuner.	**4**	**3**	**7**
		OR			
10.	**a).**	Describe micro fluid dispenser and micro pumps.	**4**	**3**	**7**
	b).	Describe about RF MEMS and MEMS inductors.	**4**	**3**	**7**

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as A,B splits or as a single Question for 14 marks

Code	Category	L	T	P	C	I.M	E.M	Exam
B20MEH301	**Honors**	**3**	**1**	**--**	**4**	**30**	**70**	**3 Hrs.**

MECHANICAL VIBRATIONS

(Honors Degree Course in ME)

Course Objectives:

1.	To gain the knowledge of mathematical modeling of a physical system and applying the principles of Newton's Second Law and conservation of energy to derive the equations of motion.
2.	To study the response of a vibrating system with periodic excitation and understand the principle of vibration isolation.
3.	To gain knowledge on vibrations measurement instruments and learn the principles involved in the critical speed of shafts.

Course Outcomes: Students will be able to

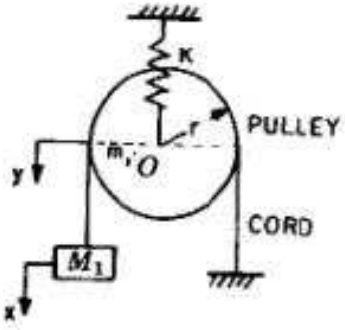
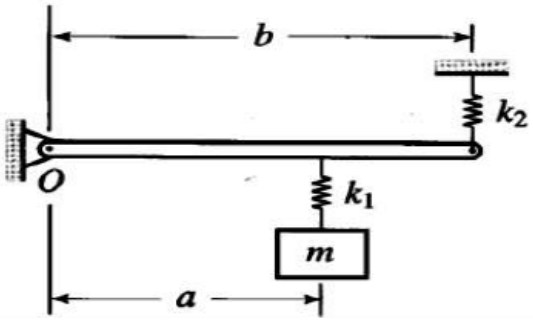
S.No	Outcome	Knowledge Level
1.	Analyze single degree freedom system for its natural frequency and vibration response.	K3
2.	Analyze single degree freedom system for its natural frequency and damped vibration response and determine response of Single degree freedom systems under harmonic excitations.	K3
3.	Apply vibration principles in measuring displacement, velocity, acceleration & Frequency and solve the problems on critical speed of shafts	K3
4.	Determine the response of Two-degree freedom systems under free and forced vibrations	K3
5.	Derive the equation of motion and find the natural frequencies mode shapes of a multi degree of freedom system using numerical methods	K3

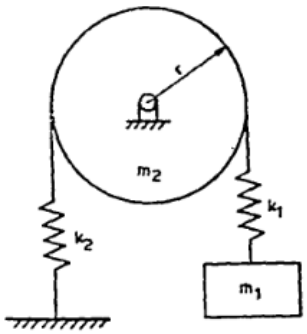
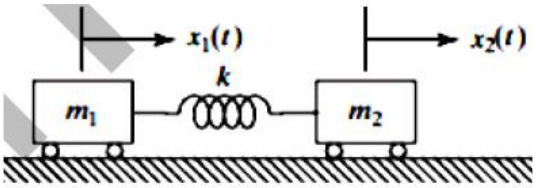
SYLLABUS

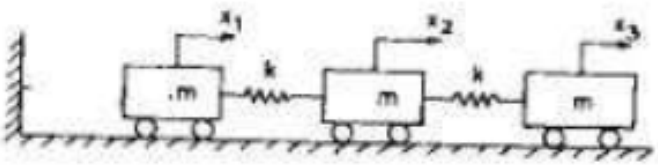
UNIT-I (10Hrs)	**Undamped free vibrations of SDOF Systems:** Introduction, basic concepts of vibration, importance of vibration study, elements of a vibrating system, types of vibration, methods of vibration analysis, harmonic motion, Equation of motion, free vibration of undamped translational system, free vibration of undamped torsional system.
UNIT-II (10Hrs)	**Damped free vibrations of SDOF Systems:** introduction, types of damping, free vibration with viscous and coulomb damping, logarithmic decrement. **Forced Vibration of SDOF Systems:** Introduction, Analysis of forced vibration with constant harmonic excitation - magnification factor, rotating and reciprocating unbalances, excitation of support (relative and absolute amplitudes), Vibration isolation and motion transmissibility, Energy dissipated due to damping and Problems.

UNIT-III (8Hrs)	**Vibration Measuring Instruments:** Displacement measuring instruments or vibrometers, Velocity measuring instruments or velocity pick-ups, Acceleration measuring instruments or accelerometers, Frequency measuring instruments. **Critical Speeds of Shafts:** Introduction, critical speed of a light shaft having single disc-without and with damping, critical speed of shaft having multiple discs and secondary critical speed.
UNIT-IV (8Hrs)	**Systems with two degrees of Freedom:** Principle modes of vibrations, Normal mode and natural frequencies of systems (without damping) – Simple spring mass systems, masses on tightly stretched strings, double pendulum, torsional systems, combined rectilinear and angular systems, Undamped dynamic vibration absorber.
UNIT-V (12Hrs)	**Numerical Methods for multi degree freedom of systems:** Introduction, Free vibrations-equations of motion for multi-degree of freedom systems, Influence coefficients, Rayleigh's method, Dunkerley's method, Stodola's method, Rayleigh-Ritz method, Holzer's method, Method of matrix iterations.

Text Books:	
1.	Elements of Vibration Analysis by Meirovitch.
2.	Mechanical Vibrations by G.K. Grover, Nem Chand & Bros., Roorkee, India.
3.	Mechanical Vibrations by V.P. Singh, Dhanpat Rai & Co. (P) Ltd., Publishers, New Delhi
Reference Books:	
1.	Vibrations by W.T. Thomson
2.	Mechanical Vibrations – Schaum series
3.	Vibration problems in Engineering by S.P. Timoshenko.
4.	Mechanical Viabrations – V.Ram Murthy.
e-Resources:	
1.	https://nptel.ac.in/courses/112103111
2.	https://nptel.ac.in/courses/112107212

		Course Code: B20MEH301			
		SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)			**R20**
		III B.Tech. II Semester MODEL QUESTION PAPER			
		MECHANICAL VIBRATIONS			
		(Honors Degree Course in Mechanical Engineering)			
Time: 3 Hrs.					**Time: 3 Hrs.**
		Answer **ONE Question** from **EACH UNIT**			
		All questions carry equal marks			
		Assume suitable data if necessary			
			CO	**KL**	**M**
		UNIT-I			
1.	**a).**	Derive the equation of motion of spring-mass system by energy method.	**1**	**3**	**7**
	b).	Find the natural frequency of system shown in figure below. The cord may be assumed inextensible. 	**1**	**3**	**7**
		OR			
2.	**a).**	Derive the expression of natural frequency for system given below. 	**1**	**3**	**7**
	b).	Enlist some advantages and disadvantages of vibrations.	**1**	**2**	**7**
		UNIT-II			
3	**a)**	Define logarithmic decrement and hence deduce the equation for logarithmic decrement for an under damped system.	**2**	**3**	**7**
	b)	A vibrating system consists of a mass of 50 kg, a spring with a stiffness of 30 kN/m and a damper. The damping provided is only	**2**	**3**	**7**

		20% of the critical value. Determine the (i) Damping factor; (ii) critical damping coefficient; (iii) natural frequency of damped vibrations (iv) logarithmic decrement			
		OR			
4.		Define transmissibility and derive an expression for the transmissibility ratio.	**2**	**3**	**14**
		UNIT-III			
5.		Explain and discuss vibrometer and accelerometer devices with the help of relative amplitude ratio versus frequency ratio plot.	**3**	**2**	**14**
		OR			
6.		A disc of mass 4 kg is mounted midway between bearings which may be assumed to be simple supports. The bearing span is 48 cm. The steel shaft which is horizontal is 9 mm in diameter. The CG of the disc is displaced 3 mm form the geometric centre. The equivalent viscous damping at the centre of the disc-shaft may be taken ad 49 N-sec/m. If the shaft rotates at 760 rpm, find the maximum stress in the shaft and compare it with dead load stress in the shaft. Also find the power required to drive the shaft at this speed.	**3**	**3**	**14**
		UNIT-IV			
7.		Determine the expression for the two natural frequencies of the system shown I figure below. The cord is inextensible and there is no slippage between the cord and the pulley. Take the mass of the pulley as m_2. 	**4**	**3**	**14**
		OR			
8.		Determine the natural frequency of the system shown in figure below, when m_1=15 kg , m_2=20 kg and k=480N/m 	**4**	**3**	**14**

		UNIT-V			
9.		Three rail bogies are connected by two springs of stiffness 40×10^5 N/m each. The mass of each bogey is 20×10^3 kg. Determine the frequencies of vibration. Neglect friction between the wheels and rails. 	**5**	**3**	**14**
		OR			
10.		Explain the procedure adopted for Rayleigh method to determine the natural frequency of multi-degree of freedom system with an suitable example.	**5**	**3**	**14**

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as A,B splits or as a single Question for 14 marks

Code	Category	L	T	P	C	I.M	E.M	Exam
B20MEH401	Honors	3	1	--	4	30	70	3 Hrs.

PRODUCT DESIGN AND DEVELOPMENT

(Honors Course)

Course Objectives:

1.	To impart the process of product design and Development
2.	To expose the various factors influencing product design.

Course Outcomes

S. No	Outcome	Knowledge Level
1.	**Identify** and analyze the product design and development processes.	K2
2.	**Explain** product design and development concepts.	K2
3.	**Interpret** product specifications related to product.	K2
4.	**Express** new and efficient way of product development.	K2
5.	**Discuss** various technical and legal issues related to product development.	K2

SYLLABUS

UNIT-I (10Hrs)	**Introduction**: Classification/Specifications of Products, Product life cycle. Product mix, Introduction to product design, Modern product development process, Innovative thinking.
UNIT-II (10 Hrs)	**Morphology of design:** Conceptual Design: Generation, selection & embodiment of concept. Product architecture, Industrial design: process, need, Robust Design development economics quantitative and qualitative analysis
UNIT-III (10 Hrs)	**Product planning:** Identify opportunities prioritise projects allocate resources project planning, Identify customer needs,: product specifications target specifications and final specifications, concept generation and selection
UNIT-IV (10 Hrs)	**Creativity Techniques:** Creative thinking,concept generation: clarify the problem search external and internal explorer systematically concept selection concurrent engineering rapid prototyping concept testing.
UNIT-V (10 Hrs)	**Design for X(DFX):** Design for Manufacturing (DFM) &Assembly (DFA), Designs for Maintainability, Designs for Environment, Product costing, Legal factors, Engineering ethics and issues of society related to design of products, Patents &IP Acts. Overview, Climes and Disclosure preparation.

Textbooks:	
1.	Karl T Ulrich, Steven D Eppinger , " Product Design & Development." Tata McGrawhill New Delhi 2003.
2.	David G Ullman, "The Mechanical Design Process." McGrawhill Inc Singapore 1992.
3.	N J M Roozenberg , J Ekels , N F M Roozenberg "Product Design Fundamentals and Methods"
Reference Books:	
1.	Hollins B & Pugh S "Successful Product Design." Butter worth London.
2.	Jones J C "Design Methods." Seeds of Human Futures. John Willey New York.
3.	Bralla J G "Handbook of Product Design for Manufacture, McGrawhill NewYork.
e-Resources:	
1.	https://nptel.ac.in/courses/112107217
2.	https://onlinecourses.nptel.ac.in/noc21_me66/preview

		Course Code: B20MEH401			
		SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)			**R20**
		IV B.Tech. I Semester MODEL QUESTION PAPER			
		PRODUCT DESIGN & DEVELOPMENT (Honors Course)			
		Mechanical Engineering			
Time: 3 Hrs.					**Max. Marks: 70 M**
		Answer **ONE Question** from **EACH UNIT**			
		All questions carry equal marks			
		Assume suitable data if necessary			
			CO	**KL**	**M**
		UNIT-I	**1**	**2**	**7**
1.	**a).**	Differentiate between product Design and Product Development.	**1**	**2**	**7**
	b).	Explain Product Life Cycle with the help of graph.			
		OR			
2.		Interpret various factors that are required in an effective and good product design.	**1**	**2**	**14**
		UNIT-II			
3.	**a).**	Explain Morphology of product design by ASIMOW.	**2**	**2**	**7**
	b).	What are guidelines for design for robustness? Discuss.	**2**	**2**	**7**
		OR			
4.		List down types of FMEA and explain any one with example.	**2**	**2**	**14**
		UNIT-III			
5.		Differentiate between target specifications and final specifications. Explain briefly about the steps involved for obtaining both target and final specifications.	**3**	**2**	**14**
		OR			
6.		Describe the input methods for obtaining information from customer, using suitable illustrations.	**3**	**2**	**14**
		UNIT-IV			
7.	**a).**	Discuss the role of aesthetics in the product design process.	**4**	**2**	**7**
	b).	Explain the major factors and considerations affecting product design.	**4**	**2**	**7**
		OR			
8.		Discuss briefly the concurrent design approach for product design.	**4**	**2**	**14**
		UNIT-V			

9.		Explain briefly about the overview of DFM process.	**5**	**2**	**14**
		OR			
10.	**a).**	Explain the procedure for grants of patents.	**5**	**2**	**7**
	b).	With the help of a flow chart explain the design for environment process.	**5**	**2**	**7**

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as A,B splits or as a single Question for 14 marks