SRI MANAKULA VINAYAGAR ENGINEERING COLLEGE
(An Autonomous Institution)
(Approved by AICTE, New Delhi & Affiliated to Pondicherry University)
(Accredited by NBA-AICTE, New Delhi, ISO 9001:2000 Certified Institution &
Accredited by NAAC with "A" Grade)
Madagadipet, Puducherry - 605 107

DEPARTMENT OF MECHANICAL ENGINEERING

MINUTES OF THIRD BOS MEETING

Venue:

R&D lab, Department of Mechanical Engineering
Sri Manakula Vinayagar Engineering College
Madagadipet, Puducherry – 605 107

Date & Time

11th August 2021 at 10.30 A.M

Department of Mechanical Engineering

Minutes of Board of Studies Meeting

The third Board of Studies meeting of Department of Mechanical Engineering was held on 11th August 2021 at 10:30 A.M in the R&D Lab, Department of Mechanical Engineering, Sri Manakula Vinayagar Engineering College with the Head of the Department in the Chair.

The following members were present for the BoS meeting:

Sl. No	Name of the Member with Designation and official Address	Responsibility in the BoS
1	Dr. K.Velmurugan Professor and Head Department of MECH, SMVEC	Chairman
External Members		
2	Dr. N. Alagumurthi, Ph.D, Professor & Head Department of Mechanical Engineering, Pondicherry Engineering College, Puducherry-605014. Email id: alagumurthi@pec.edu Mobile No.: 9486143090	University Nominee
3	Dr. M. Leenus Jesu Martin, Ph.D, Director for campus SRM Institute of Science and Technology, Tamil Nadu – 603203 Email id: leenusm@srmist.edu.in Mobile No.: 9940036021	Member
4	Dr. A.T. Ravichandran, Ph.D, Dean Academics and Dean School of Mechanical and Construction Engineering Vel Tech Rangarajan Dr.Sagunthala R & D Institute of Science and Technology, Avadi, Chennai – 600062 Email id: atrmathy@gmail.com Mobile No.: 9942940600	Member
Internal Members		
5	Dr. G.G.Sozhamannan, Professor, Specialization: *Manufacturing Engineering*	Member
6	Dr.T.Coumaressin, Associate Professor, Specialization: *Thermal Engineering*	Member
7	Dr. K.Hemalatha, Associate Professor, Specialization: *Engineering Design*	Member

8	Dr.A.Thiagarajan, Associate Professor, Specialization: Product Design & Manufacturing	Member
9	Prof.N.Vijayan, Assistant Professor, Specialization: Mathematics	Member
10	Prof.K.Oudayakumar Associate Professor, Specialization: Physics	Member
11	Dr.K.Karthikeyan Associate Professor, Specialization: Chemistry	Member
12	Dr.D.Jaichithra, Professor, Specialization: English	Member
Co-opted Members		
13	Dr. Anand Gurupatham Deputy General Manager, CAE-Department Head at Renault Nissan, Technology & Business Center, Chennai, Tamil Nadu, India	Industrial Member
Alumni		
14	Mr.P.Madavan, Research Scholar MIT, Anna university, Chennai.	Alumni Member

Agenda of the Meeting

1	**BOS/ MECH./1.1**
	Confirmation of minutes of 2nd BOS meeting
2	**BOS/ MECH./1.2**
	Consideration of revision of curriculum and syllabus of VII and VIII semester of • B.Tech. MECHANICAL to be offered under Regulations 2019 to the students admitted in the academic year 2018-19
3	**BOS/ MECH./1.3**
	Consideration of offering of Professional and Open electives in VII semester and VIII semester
4	**BOS/ MECH./1.4**
	Consideration of revision of curriculum and syllabus of V and VI semester of • B.Tech. MECHANICAL to be offered under Regulations 2020 to the students admitted in the academic year 2019-20
5	**BOS/ MECH./1.5**
	Consideration of offering of Professional and Open electives in V semester and VI semester

6	**BOS/ MECH./1.6**
	Consideration of assessment of quality of question papers of U.G. Programme drawn in previous examinations
7	**BOS/ MECH./1.7**
	Consider and approve the department committee to monitor the Academic Activities
8	**BOS/ MECH./1.8**
	Consider and approve the value-added courses, skill development courses
9	**BOS/ MECH./1.9**
	Consideration of revision of list of panels of question paper setters and Examiners for the examinations of UG Programme for the academic year 2021-22
10	**BOS/ MECH./2.0**
	Any other item with the permission of chair

UG Minutes of the Meeting

Dr. K. Velmurugan, Chairman, BoS opened the meeting by welcoming and introducing the external members, to the internal and co-opted members and thanked them for accepting the invitation to attend the Board of Studies meeting and the meeting thereafter deliberated on agenda items that has been approved.

BOS/ 2021/ MECH/ UG/3.1

Consideration of confirmation of minutes of the previous meeting held on 10.04.2021:

Chairman, BoS, appraised the minutes of 2nd BoS, its implementation and then it is confirmed with the approval for the incorporation of minor revisions needed as mentioned below: **(Annexure 1)**

S. No.	Regulation	Semester	Subject Name with Code	Unit	Particulars
1	2019	Professional Core Elective VI	Hydrogen fuel / U19MEE87	-	The expert member suggested to replaced Hydrogen fuel with courses like Electric vehicles or Mass Rapid Transport System (MRTS), which will enhance the student's knowledge on Railways thus enabling them to pursue their career in Railways. In this respect the course has been introduced Electric and Hybrid Vehicles **(Annexure 1.1)**

2	R19	PE-IV	Industrial Casting Technology/ U19MEE44	-	The syllabus content of the courses should also be practiced in the lab, to gain practical knowledge. For subjects like Industrial Casting Technology, demonstration using casting furnace, Foundry practice can be given as either group exercise or lab technician can demonstrate
3	R19	PE-IV	Non-conventional energy sources/ U19MEE45	IV	In the Course Non-conventional energy sources, unit IV to be renamed as Geothermal and Bio-Mass Sources **(Annexure 1.3)**
4	R19	PE-V	IoT & Smart Manufacturing/ U19MEE55	III	In the course IoT & Smart Manufacturing, Unit III content to be modified **(Annexure 1.4)**
5	R19	VI	Energy & Climate Change/U19MEE65	V	In the course Energy & Climate Change, Unit V Alternate Fuels and Renewable Energy need to be changed, to avoid content repetition**(Annexure 1.5)**

6. In the Employability Enhancement course AutoCAD for Mechanical title to be reframed as AutoCAD for Mechanical Engineering.
   In the Employability Enhancement courses, Trouble and Troubleshooting to be replaced as Trouble shooting and repair of two-wheeler, Trouble shooting and repair of four-wheeler, Trouble shooting and repair of CNC machines Electronic Trouble shooting for Mechanical Engineering. **(Annexure 1.6)**
7. MOOC (Massive Open Online Courses) like NPTEL courses can be made creditable. List of approved courses can be finalized by the department committee. The students have to produce his course completion certificate for claiming credits. If he/she fails, the student should take up the similar type of assessment conducted by the institute for the claim of the credit

<table>
<tr><td></td><td>
8. The MOOC can even be included in professional elective; instead of studying a subject student can do a course in NPTEL. This will benefit students by receiving certificate from IITs. This will provoke self-learning skills among students
9. While organizing Induction program for I year students, technical games related to other department can also be conducted to provoke students' inter-disciplinary subject interest
10. The BOS experts suggested to include Course Equivalence Committee, in the committee list for the redo candidates of different regulations
11. The expert suggested that Japanese can be included in the foreign language classes. As the students with Japanese proficiency find more opportunities in Japan
</td></tr>
<tr><td>BOS/ 2021/ MECH/ UG/3.2</td><td>
Recommended to approve the B.Tech. Degree Regulations 2019 (R-19), Curriculum from I to VIII semesters and syllabus for VII and VIII the B.Tech – Mechanical Engineering for the students admitted in the Academic Year 2019-20 with few suggestion:
1. Subjects like solar energy system should be given more importance as today's future generation industry is going to be ruled by solar technology. Contents like solar maintenance, service and solar panel materials and the technologies involved in fabricating solar panels to be included in the subject.
2. Solar specialization faculty group with interested students can establish solar laboratory with inter-disciplinary tie-up and hands on training can be given to students.
For 8th semester students, theory subjects can be completed within the 1 month and the remaining days can be allotted for doing their projects and internships
</td></tr>
<tr><td>BOS/ 2021/ MECH/ UG/3.3</td><td>
Recommended to approve the Professional and Open electives in VII semester and VIII semester with minor corrections
<table>
<tr><th>S. No.</th><th>Regulation</th><th>Semester</th><th>Subject Name with Code</th><th>Unit</th><th>Particulars</th></tr>
<tr><td>1</td><td>R19</td><td>VIII</td><td>Autotronics U19MEE82</td><td>V</td><td>In the Unit V of subject Autotronics, Gates and Zenier diodes content can be omitted as students learnt the concepts earlier in their first-year subject. (Annexure 2)
In the subject Autotronics topics related to vehicle-to-vehicle communications, Autonomous vehicles can be included.
BOSH handbook can be included in reference books for the course Automotive Electronics</td></tr>
</table>
</td></tr>
</table>

		2	R19	VIII	Optimization Techniques in Engineering Design U19MEE83	V	Optimization Techniques in Engineering Design course syllabus content is heavy, so the experts recommended to reduce the syllabus content **(Annexure 3)**
		3	R19	VIII	Alternative fuels/ U19MEE86	II	In the course Alternative fuels, syllabus content of unit-II can be minimized. Fuel production methods can be eliminated instead characterization of fuels, its properties and applications must be given importance

BOS/ 2021/ MECH/ UG/3.4

Recommended to approve the B.Tech. Degree Regulations 2020 (R-2020), Curriculum from I to VIII semesters and syllabus for V to VI B.Tech – Mechanical Engineering for the students admitted in the Academic Year 2020-21 with minor correction

1. For certain theory courses, simple experiments can be introduced at the end of every unit, as like integrated courses. Where we can ensure same faculty handles both theory and practical.
2. The committee recommended to allot Nanomaterials subjects to Physics department
3. Unit-wise subject expertise teaching can also be practiced, if possible.
4. K6 levels should not be given for theory courses and K1 level should be avoided since it represents basic level.
5. Faculties are strongly insisted to apply MATLAB for analytical subjects and lab experiments
6. Certain open electives offered by other departments for Mechanical engineering students, subject like: Energy and Environment, Conventional and Non-conventional energy sources and electronic product design and packaging, can be omitted to avoid repetition in learning
7. Course Intellectual Property and Rights title can be modified as Intellectual Property Rights & Design
8. The course “Project Management for Engineers”, CO4 to be modified
9. Finite Element Analysis subject can be made as Integrated course
10. Software names not to be mentioned along with experiments especially in CAD and CFD labs
11. In the thermal engineering lab 5 Gas analyzer must be installed
12. In course Geometric Dimensioning and Tolerance, practical exposure

should be given more importance like reading of industrial blue prints can be practiced

13. In the course Industrial casting Technology, the syllabus content design of risers to be modified and the fettling topic to be added, also students should be given knowledge on software's used for solid casting like solid cast and flow cast.

S. No.	Regulation	Semester	Subject Name with Code	Unit	Particulars
1	R20	V	Metrology and Measurements/ U20MET512	III	In the course Metrology and Measurements, Unit-III title starts with Advances in metrology which can be replaced as CMM and laser interferometry and the unit content to be modified with respect the unit topic 'CMM and laser Interferometry' **(Annexure 4)**

BOS/ 2021/ MECH/ UG/3.5

Recommended to approve the Professional and Open electives in V semester and VI semester with minor corrections

S. No.	Regulation	Semester	Subject Name with Code	Unit	Particulars
1	R20	VI	Additive manufacturing/ U20MEE614	-	In the Additive manufacturing elective course K levels to be corrected (**Annexure 5)**
2	R20	-	Turbo machinery/ U20MEE506	-	In Turbo machinery course objectives and outcomes to be verified **(Annexure 6)**

- The syllabus content of Automobile engineering and Alternate fuels to be compared and repetition of content to be verified

BOS/ 2021/ MECH/ UG/3.6

Consideration of assessment of quality of question papers of U.G. Programme drawn in previous examinations

- End semester question papers to be internally audited after the exams for the attainment of knowledge levels and outcomes with students and faculties

Recommended to approve the department committee to monitor the Academic Activities

BOS/ 2021/ MECH/ UG/3.7

S.No.	Committee Name	In-charges
1	Academic Coordinator	Dr.G.G.Sozhamannan
2	IQAC- coordinator	Dr.K.Hemalatha
3	Teaching Coordinator	Dr.J.Pavalavanapandian
4	Research coordinator	Dr.A.Thiagarajan
5	Student activity coordinator	Dr.A.G.Ganesh Kumar
6	Exam coordinator	Dr.T.Coumaressin
7	Placement coordinator	Mr.A.Jeyachandran Mr.L.Martin
8	IIPC coordinator	Dr.L.Saravanan
9	Staff support coordinator	Mr.P.Sathiaprathap
10	Infrastructure coordinator	Mr.E.Manikandan
11	Media, website and MIS coordinator	Mr.R.Hemanthkumar
12	Alumni & scholarship coordinator	Mr.S.Arulpradeep
13	Department Activity coordinator	Mr.D.Karunakaran Mr.P.Jayakumar

BOS/ 2021/ MECH/ UG/3.8

- To Consider and approve the value-added courses, skill development courses for UG students

  The BOS members recommended and approved the list of value-added courses, skill development courses for the UG students **(Annexure 7)**

BOS/ 2021/ MECH/ UG/3.9

- To Consider and approve revision of list of panels of question paper setters and Examiners for the examinations of UG Programme for the academic year 2021-22

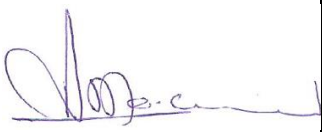
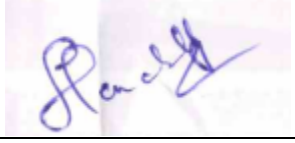
  Recommended to approve the panel of examiners and question paper setters for UG programmes **(Annexure 8)**

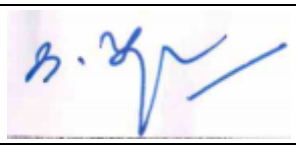
BOS/ 2021/ MECH/ UG/3.10

Other points Discussed:

1. Overall the committee experts were satisfied with our curriculum structure and syllabus framing
2. Curriculum design to be done every year. At the end of every semester feedback to be collected from faculties and students related to depth of knowledge, whether time span is sufficient to complete the syllabus, or any other advanced topics to be included. This has to be recorded in the internal BOS in concurrence with the course coordinator and forwarded to BOS for further approval.
3. The current syllabus for the curriculum 2019-20 and 2020-21 are approved without any further revision, except for the few mentioned course little flaws to be rectified
4. Value added courses on energy auditing, industrial safety can be conducted through industry interaction and students can be certified, which will be an added advantage for their jobs
5. Japanese can be included in the foreign language classes. As the students with Japanese proficiency find more opportunities in Japan
6. As per UGC guidelines 2021-22, for each tutorial hour 1 credit to be allotted. Also, NCC unit is to be made compulsory, separate credit should be allotted for NCC students.
7. The experts recommended to reduce the number exercises in the laboratory experiments

The meeting was concluded at 01:30PM with vote of thanks by Dr. K. Velmurugan, Head of Department, Mechanical Engineering

Sl. No	Name of the Member with Designation and official Address	Responsibility in the BoS	Signature
1	Dr. K.Velmurugan Professor and Head Department of MECH, SMVEC	Chairman	
External Members			
2	Dr. N. Alagumurthi, Ph.D, Professor & Head Department of Mechanical Engineering, Pondicherry Engineering College, Puducherry-605014. Email id: alagumurthi@pec.edu Mobile No.: 9486143090	University Nominee	
3	Dr. M. Leenus Jesu Martin, Ph.D, Director for campus SRM Institute of Science and Technology, Tamil Nadu – 603203 Email id: leenusm@srmist.edu.in Mobile No.: 9940036021	Member	
4	Dr. A.T. Ravichandran, Ph.D, Dean Academics and Dean School of Mechanical and Construction Engineering Vel Tech Rangarajan Dr.Sagunthala R & D Institute of Science and Technology, Avadi, Chennai – 600062 Email id: atrmathy@gmail.com Mobile No.: 9942940600	Member	
Internal Members			
5	Dr.G.G.Sozhamannan, Professor, **Specialization:** ***Manufacturing Engineering***	Member	
6	Dr.T.Coumaressin, Associate Professor, **Specialization:** ***Thermal Engineering***	Member	
7	Dr.K.Hemalatha, Associate Professor, **Specialization:** ***Engineering Design***	Member	
8	Dr.A.Thiagarajan, Associate Professor, **Specialization:** ***Product Design & Manufacturing***	Member	
9	Prof.N.Vijayan, Assistant Professor, **Specialization:** ***Mathematics***	Member	

10	Prof.K.Oudayakumar Associate Professor, **Specialization: *Physics***	Member	
11	Dr.K.Karthikeyan Associate Professor, **Specialization: *Chemistry***	Member	
12	Dr.D.Jaichithra, Professor, **Specialization: *English***	Member	
Co-opted Members			
13	Dr. Anand Gurupatham Deputy General Manager, CAE-Department Head at Renault Nissan, Technology & Business Center, Chennai, Tamil Nadu, India	Industrial Member	
Alumni			
14	Mr.P.Madavan, Research Scholar MIT, Anna university, Chennai.	Alumni Member	

ANNEXURE 1

Annexure 1.1

		L	T	P	C	Hrs
U19MEE87	**ELECTRIC AND HYBRID VEHICLES**	**3**	**0**	**0**	**3**	**45**

Course Objectives

- To understand the basics of electric and hybrid vehicles.
- To explain the concept of electric propulsion unit in EV.
- To provide students an understanding about the energy storage and sizing of the drive system.
- To teach students about energy consumption in EV.
- To explain about the energy management strategies.

Course Outcomes

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

CO1 - Understand the need and working of electric and hybrid vehicles **(K2).**
CO2 - Explain the working of propulsion unit powered by electricity in automobile **(K2)**
CO3 - Understand the concept of energy storage and the sizing of the drive system. **(K2)**
CO4 - Analyze the energy consumption by the drive unit.(**K3)**
CO5 - Analyze and discuss the concept of energy management strategies.(**K3)**

UNIT I INTRODUCTION TO ELECTRIC AND HYBRID VEHICLES (9 Hrs)

Introduction to Hybrid Electric Vehicles, Conventional Vehicles. Hybrid Electric Drive-trains and Electric Drive-trains: Basic concept of electric traction, introduction to various electric drive-train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis.

UNIT II ELECTRIC PROPULSION UNIT (9 Hrs)

Electric Propulsion unit: Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

UNIT III ENERGY STORAGE AND SIZING THE DRIVE SYSTEM (9 Hrs)

Energy Storage: Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles. Battery, Fuel Cell, Super Capacitor and Flywheel based energy storage and its analysis, Hybridization of different energy storage devices.

Sizing the drive system: Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics, selecting the energy storage technology, Communications, supporting subsystems.

UNIT IV ENERGY CONSUMPTION (9 Hrs)

Energy consumption Concept of Hybrid Electric Drive Trains, Architecture of Hybrid Electric Drive Trains, Series Hybrid Electric Drive Trains, Parallel hybrid electric drive trains, Electric Propulsion unit, Configuration and control of DC Motor drives, Induction Motor drives, Permanent Magnet Motor drives, switched reluctance motor

UNIT V ENERGY MANAGEMENT STRATEGIES (9 Hrs)

Energy Management Strategies: Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies. Case Studies: Design of a Hybrid Electric Vehicle (HEV), Design of a Battery Electric Vehicle (BEV).

Text Books

1. A.K. Babu, Electric & Hybrid Vehicles, Khanna Publishers, 2019.
2. Mary Murphy Electric and Hybrid Vehicles: Principles, Design and Technology, Larsen and Keller Publication, 2019.
3. Husain, I. “Electric and Hybrid Vehicles” Boca Raton, CRC Press, 2010.
4. Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003.
5. Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press , 2004

Reference books

1. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley , 2003
2. Chris Mi, M. Abul Masrur, David Wenzhong Gao, Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives, John Wiley & Sons Ltd. , 2011
3. Emadi, A. (Ed.), Miller, J., Ehsani, M., "Vehicular Electric Power Systems" Boca Raton, CRC Press, 2003
4. Larminie, James, and John Lowry, "Electric Vehicle Technology Explained" John Wiley and Sons, 2012
5. Sheldon S. Williamson, "Energy Management Strategies for Electric and Plug-in Hybrid Electric Vehicles", Springer, 2013

Web References

1. https://nptel.ac.in/courses/108/103/108103009/
2. https://onlinecourses.nptel.ac.in/noc20_ee18/preview
3. https://greenmobility-library.org/public/index.php/single-esource/V2xNb3U3eDVSZE55VGt5dlZJZFg4UT09
4. https://afdc.energy.gov/vehicles/electric_basics_hev.html
5. http://autocaat.org/Technologies/Hybrid_and_Battery_Electric_Vehicles/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	2	-	-	-	-	1	-	1-	2	2	2	2
2	3	3	2	2	-	-	-	-	-	-	-	2	2	2	2
3	3	2	2	2	-	1	-	-	-	-	-	2	2	2	2
4	3	3	3	3	1	-	-	-	-	1	-	2	2	2	2
5	3	3	3	3	1	-	1	1	1	1	-	2	2	2	2

Correlation Level: 1- Low, 2 - Medium, 3 - High

Annexure 1.3

U19MEE45	NON - CONVENTIONAL ENERGY SOURCES	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To introduce the basics of NCES and statistical data on conventional energy resources.
- To study about the concept of solar energy and its types
- To learn the wind energy conversion systems
- To provide knowledge on geothermal energy resources and biomass energy conversion systems
- To impart knowledge about tidal, wave and OTEC energy power generation system

Course Outcomes

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

CO1 - Explain the basics of NCES. **(K1)**
CO2 - Extract on the solar energy and its conversion systems. **(K2)**
CO3 - Describe the concepts of Wind energy conversion systems. **(K1)**
CO4 - Describe the harnessing of Geothermal, Ocean energies. **(K1)**
CO5 - Compare the tidal, wave and OTEC energy power generation system. **(K2)**

UNIT I STATISTICS ON CONVENTIONAL ENERGY SOURCES (9 Hrs)

Statistics on conventional energy sources and supply in developing countries, Definition Concepts of NCES, Limitations of RES, Criteria for assessing the potential of NCES. Classification of NCES – Solar, Wind, Geothermal, Bio-mass, Ocean Energy Sources, comparison of these energy sources.

UNIT II SOLAR ENERGY (9 Hrs)

Solar Energy-Energy available form Sun, Solar radiation data, Solar energy conversion into heat, Flat plate and Concentrating collectors, Mathematical analysis of Flat plate collectors and collector efficiency, Principle of Natural and Forced convection, Solar engines-Stirling, Brayton engines, Photovoltaic, p-n junction, solar cells, PV systems, Stand-alone, Grid connected solar power satellite.

UNIT III WIND ENERGY (9 Hrs)

Wind energy conversion, General formula -Lift and Drag- Basis of wind energy conversion – Effect of density, frequency variances, angle of attack, and wind speed. Windmill rotors Horizontal axis and vertical axis rotors. Determination of torque coefficient, Induction type generators- working principle.

UNIT IV GEOTHERMAL AND BIOMASS SOURCES (9 Hrs)

Nature of Geothermal sources, Definition and classification of resources, Utilization for electric generation and direct heating, Well Head power generating units, Basic features Atmospheric exhaust and condensing, exhaust types of conventional steam turbines. Pyrolysis of Biomass to produce solid, liquid and gaseous fuels, Biomass gasification, Construction details of gasifier, usage of biogas for chulhas, various types of chulhas for rural energy needs

UNIT V WAVE, TIDAL AND OTEC ENERGY (9 Hrs)

Wave, Tidal and OTEC energy- Difference between tidal and wave power generation, Principles of tidal and wave power generation, OTEC power plants, Operational of small cycle experimental facility, Design of 5 MW OTEC pro-commercial plant, Economics of OTEC, Environmental impacts of OTEC. Status of multiple product OTEC systems.

Text Books

1. Khan , Non-Conventional Energy Resources, McGraw Hill Education India Private Limited; Third edition, 2017
2. S. S. Thipse, Non-Conventional and Renewable Energy Sources, Narossa publisher 2018.
3. N.K.Bansal, Non-Conventional Energy Resources, Vikas Publishing House, 2014

Reference Books

1. R.Ramesh and K.U.Kumar, Renewable Energy Technologies, Narosa Publishing House, New Delhi, 2004.
2. Ashok V Desai, Non-Conventional Energy, Wiley Eastern Ltd, New Delhi, 5th edition, 2011.
3. MM.Wakil, Power Plant Technology, McGraw Hill Book Co, New Delhi, 2004.
4. Magal, "Solar Power Engineering", Tata McGraw Hill, 2005.

5. Non – Conventional Energy Sources. G.D. Rai, Khanna Publishers, 4th edition, 2009.

Web References

1. https://nptel.ac.in/courses/121/106/121106014/
2. https://nptel.ac.in/courses/108/108/108108078/
3. https://www.coursera.org/courses?query=renewable%20energy
4. https://www.youtube.com/watch?v=GRwJqD4StEU
5. https://www.youtube.com/watch?v=mSIMA6H80mM

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	-	-	1	-	-	-	2	-	-	-	-	1	1	1	1
2	-	-	1	-	-	-	2	-	-	-	-	1	1	1	1
3	-	-	1	-	-	-	2	-	-	-	-	1	1	1	1
4	-	-	1	-	-	-	2	-	-	-	-	1	1	1	1
5	-	-	1	-	-	-	2	-	-	-	-	1	1	1	1

Correlation Level: 1- Low, 2 - Medium, 3 - High

Annexure 1.4

U19MEE55	IOT AND SMART MANUFACTURING	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To present a problem oriented in depth knowledge of IOT and Smart Manufacturing.
- To address the underlying concepts and methods behind IOT and Smart Manufacturing.
- To learn about the smart manufacturing distinguish its signification in comparison to conventional manufacturing.
- To Study about tools for Smart Manufacturing and its application.
- To study about Smart and Empowered working.

Course Outcomes

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

CO1 - Identify different areas of IOT and Smart Manufacturing. **(K1)**
CO2 - Acquire a broad view about automatic storage management and its governance. **(K2)**
CO3 - Get a knowledge about smart manufacturing. **(K1)**
CO4 - Attain knowledge about smart design and find applications of all the areas in daily life. **(K6)**
CO5 - Become familiarize with elimination of error with smart tools in operations. **(K5)**

UNIT I INTERNET OF THINGS (9 Hrs)

The Internet of Things: An overview; Design Principles for Connected Devices; Internet Principles. Thinking about Prototyping – Costs versus ease of prototyping, prototyping and Production, open source versus Closed Source. Proto typing Embedded devices – Electronics, Embedded Computing Basics, Arduino/ Raspberry Pi/ Beagle Bone Black/ etc., Electric Imp and other notable platforms Prototyping of Physical Design. Prototyping online Components – Getting Started with an API, Writing a New API, Real Time Reactions, Other Protocols. Techniques for Writing Embedded Code – Memory Management, Performance and Battery Life, Libraries and debugging.

UNIT II AUTOMATIC STORAGE MANAGEMENT AND SECURITY (9 Hrs)

Automatic Storage Management in a Cloud World – Introduction to Cloud, Relational Databases in the Cloud, Automatic Storage Management in the Cloud. Smart Connected System Design Case Study Internet of Things Privacy, Security and Governance Introduction, Overview of Governance, Privacy and Security Issues, Contribution from FP7 Projects, Security, Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach. Data Aggregation for the IoT in Smart Cities, Security

UNIT III INTRODUCTION TO SMART MANUFACTURING (9 Hrs)

Introduction to "smart manufacturing"- conventional/legacy manufacturing -Smart Manufacturing Processes-Three Dimensions: Demand Driven and Integrated Supply Chains - Dynamically Optimized Manufacturing Enterprises (plant + enterprise operations) - Real Time, Sustainable Resource Management (intelligent energy demand management, production energy optimization and reduction of GHG)

UNIT IV SMART DESIGN/FABRICATION (9 Hrs)

Smart Design/Fabrication - Digital Tools, Product Representation and Exchange Technologies and Standards, Agile (Additive) Manufacturing Systems and Standards. Mass Customization, Smart Machine Tools, Robotics and Automation (perception, manipulation, mobility, autonomy), Smart Perception – Sensor networks and Devices. Smart Applications: Online Predictive Modelling, Monitoring and Intelligent Control of Machining/Manufacturing and Logistics/Supply Chain Processes; Smart Energy Management of manufacturing processes and facilities

UNIT V SMART AND EMPOWERED WORKERS (9 Hrs)

Eliminating Errors and Omissions, Deskilling Operations, Improving Speed/Agility, Improving Information Capture/Traceability, Improving Intelligent Decision Making under uncertainty Assisted/Augmented Production, Assisted/Augmented Assembly, Assisted/Augmented Quality, Assisted/Augmented Maintenance, Assisted/Augmented Warehouse Operations and Assisted Training

Text Books

1. Zaigham Mahmood - The Internet of Things in the Industrial Sector – Springer – 1st edition – 2019
2. Loveleen Gaur Internet of Things: Approach and Applicability in Manufacturing- Chapman and Hall/CRC -1st Edition - 2019

3. A.McEwen and H. Cassimally, Designing the Internet of Things, 1stedition, Wiley, 2014.

Reference Books

1. N. Vengurlekar and P. Bagal, Database Cloud Storage: The Essential Guide to Oracle Automatic Storage Management, 1st edition, McGraw-Hill Education, 2013.
2. B.K. Tripathy **-** Internet of Things (IoT): Technologies, Applications, Challenges and Solutions - CRC Press 1st Edition 2018.
3. S. Jeschke, C. Brecher, H. Song, and D. B. Rawat, Industrial Internet of Things: Cyber manufacturing Systems, Springer, 1st edition, 2017.
4. A. Bahga and V. Madisetti, Internet of Things, A hands-on approach, Create Space Independent Publishing Platform, 1st edition, 2014.
5. M. Kuniavsky, Smart Things: Ubiquitous Computing User Experience Design, 1st edition, Morgan Kaufmann, 2013.

Web References

1. https://nptel.ac.in/courses/106/105/106105195/
2. https://www.digimat.in/nptel/courses/video/106105195/L10.html
3. https://www.youtube.com/watch?v=EV1Ygw6_rCs
4. https://www.sciencedirect.com/journal/internet-of-things
5. https://www.digimat.in/nptel/courses/video/106105195/L01.html

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	-	-	-	-	-	-	-	-	-	-	-	2	-	-
2	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	3	-	-	-	-	-	-	-	-	-	-	-	-	1	-
4	3	3	3	3	-	-	-	-	-	-	-	-	-	-	-
5	3	3	2	3	-	-	-	-	-	-	-	-	1	-	-

Correlation Level: 1- Low, 2 - Medium, 3 - High

Annexure 1.5

U19MEE65 **ENERGY AND CLIMATE CHANGE**

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To impart knowledge on the global warming, the impact of climate change on society
- To recommend adaptation and mitigation measures
- To understand about the climate change effects on environment
- To provide knowledge on mitigating climate change
- To differentiate alternate and renewable fuels

Course Outcomes

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

CO1 - An insight into carbon cycle, physical basis of the natural greenhouse effect, including the meaning of the term radioactive forcing, climate change, global warming and measures **(K3)**

CO2 - Adapt and mitigate the impacts of climate change. **(K2)**

CO3 - Understand the growing scientific consensus established through the IPCC as well as the complexities and uncertainties **(K3)**

CO4 - Plan climate change mitigation and adaptation projects **(K2)**

CO5 - Use of alternate fuels and renewable energy **(K2)**

UNIT I INTRODUCTION (9 Hrs)

Atmosphere – weather and Climate – climate parameters – Temperature, Rainfall, Humidity, Wind – Global ocean circulation – El Nino and its effect – Carbon cycle

UNIT II ELEMENTS RELATED TO CLIMATE (9 Hrs)

Greenhouse gases – Total carbon dioxide emissions by energy sector – industrial, commercial, transportation, residential – Impacts – air quality, hydrology, green space – Causes of global and regional climate change – Changes in patterns of temperature, precipitation and sea level rise – Greenhouse effect

UNIT III IMPACTS OF CLIMATE CHANGE (9 Hrs)

Effects of Climate Changes on living things – health effects, malnutrition, human migration, socioeconomic impacts- tourism, industry and business, vulnerability assessment- infrastructure, population and sector – Agriculture, forestry, human health, coastal areas

UNIT IV MITIGATING CLIMATE CHANGE (9 Hrs)

IPCC Technical Guidelines for Assessing Climate Change Impact and Adaptation -Identifying adaption options – designing and implementing adaption measures – surface albedo environment reflective roofing and reflective paving enhancement of evapotranspiration – tree planting programme – green roofing strategies – energy conservation in buildings – energy efficiencies – carbon sequestration.

UNIT V UP-SCALING RENEWABLE ENERGY: POLICY INCENTIVES (9 Hrs)

Energy source - Biofuels – Energy policies for a cool future – Energy Audit - Energy and climate governance, Global Energy - Energy - Geopolitics - Energy Security - Energy Production - Energy Consumption - Energy Markets - Energy Policy.

Text Books

1. Dash Sushil Kumar, “Climate Change – An Indian Perspective”, Cambridge University Press India Pvt. Ltd, 2014.
2. Velma. I. Grover “Global Warming and Climate” Change. Vol. I and II. Science Publishers, 2005.
3. Twidell and wier” Renewable energy resources”, CRC press (Taylor and Francis), 2015.

Reference Books

1. IPCC Fourth Assessment Report, Cambridge University Press, Cambridge, UK, 2007.
2. Thomas E, Lovejoy and Lee Hannah “Climate Change and Biodiversity”, TERI Publishers, 2018.
3. Jan C. van Dam, Impacts of “Climate Change and Climate Variability on Hydrological Regimes”, Cambridge University Press, 2011.

4. Tiwari and Ghosal" Renewable energy resources" Narosa publications, 2005.
5. Ramesh and Kumar" Renewable Energy Technologies "Narosa publications, 2015.

Web References

1. https://nptel.ac.in/courses/119/106/119106008/
2. https://swayam.gov.in/nd2_arp19_ap55/preview
3. https://nptel.ac.in/courses/103/107/103107157/
4. https://olc.worldbank.org/content/climate-change-online-learning
5. https://nptel.ac.in/courses/119/106/119106015/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	1	-	2	1	1	-	-	-	2	1	2	2
2	3	1	1	2	-	1	2	1	-	-	-	2	2	1	2
3	3	2	2	1	-	2	1	1	-	-	-	1	1	1	2
4	3	2	1	2	-	2	2	1	-	-	-	1	1	2	1
5	3	2	2	1	-	1	2	1	-	-	-	2	2	2	1

Correlation Level: 1- Low, 2 - Medium, 3 - High

Annexure 1.6

EMPLOYABILITY ENHANCEMENT COURSES - SKILL DEVELOPMENT COURSES

Sl. No.	Course Code	Course Title
1	U20MES101	Skill Development Course 1: Demonstration in Civil Engineering
2	U20MES302	Skill Development Course 2 *
		1) Two wheeler Troubleshooting
		2) Troubleshooting of CNC Milling machine
		3) Troubleshooting of CNC lathe machine
3	U20MES403	Skill Development Course 3 *
		1) Four wheeler Troubleshooting
		2) Electronic Troubleshooting for Mechanical Engineers
		3) Hardware Networking
4	U20MES504	Skill Development Course 4: Foreign Language/ IELTS-I
5	U20MES505	Skill Development Course 5: Hands-on Training in 3D Printing
6	U20MES606	Skill Development Course 6: Foreign Language/ IELTS-II
7	U20MES607	Skill Development Course 7: Technical Seminar
8	U20MES608	Skill Development Course 8: NPTEL/MOOC-I
9	U20MES809	Skill Development Course 9: NPTEL/MOOC-II

**** Any one course to be selected from the list***

ANNEXURE 2

U19MEE82	AUTOTRONICS	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To formulate the student understand the working of Ignition system storage battery and principles.
- To make the students understand the working of alternator and charging systems.
- To learn working of fusing systems and wiring involved in auto electrical systems
- To compose the students understand the electrical accessories.
- To enhance the students' knowledge regarding semiconductor and waves.

Course Outcomes

After completion of the course, the students will be able to:

CO1 - Outlining knowledge about ignition systems **(K2)**
CO2 - Associating the working of alternator and charging systems **(K2)**
CO3 - Examining wiring for auto electrical systems **(K3)**
CO4 -Testing the dash board units and electrical accessories **(K3)**
CO5 - Moderating knowledge about semi-conductor and waves. **(K4)**

UNIT I INTRODUCTION (9 Hrs)

Evolution of electronics in automobiles – emission laws – introduction to Euro I, Euro II, Euro III, Euro IV, Euro V standards – Equivalent Bharat Standards. Charging systems: Working and design of charging circuit diagram – Alternators – Requirements of starting system - Starter motors and starter circuits.

UNIT II IGNITION AND INJECTION SYSTEMS (9 Hrs)

Ignition systems: Ignition fundamentals - Electronic ignition systems - Programmed Ignition – Distribution less ignition - Direct ignition – Spark Plugs. Electronic fuel Control: Basics of combustion – Engine fuelling and exhaust emissions – Electronic control of carburetion – Petrol fuel injection – Diesel fuel injection.

UNIT III SENSOR AND ACTUATORS (9 Hrs)

Working principle and characteristics of Airflow rate, Engine crankshaft angular position, Hall effect, Throttle angle, temperature, exhaust gas oxygen sensors – study of fuel injector, exhaust gas recirculation actuators, stepper motor actuator, vacuum operated actuator.

UNIT IV ENGINE CONTROL SYSTEMS (9 Hrs)

Control modes for fuel control-engine control subsystems – ignition control methodologies – different ECU s used in the engine management – block diagram of the engine management system. In vehicle networks: CAN standard, format of CAN standard – diagnostics systems in modern automobiles.

UNIT V APPLICATIONS IN AUTOMOBILE (9 Hrs)

An Application of mobile robot vision to a vehicles information systems –objectives directions-collisions warning and avoidance system – low tire pressure warning systems. Vehicles inelegancy- vision based autonomous road vehicles- architecture for dynamics visions systems.

Text Books

1. N. R. Khatawale Automotive Electrical auxiliary systems,2012
2. ManoDigital Logic and Computer Design ,2014
3. William B.Ribbens Understanding Automotive Electronics,2017

Reference Books

1. Young and Griffith, ButterworthAutomotive Electrical systems,2011
2. C.P.Nakra, DhanpatRai. Basic automotive electrical systems,2009
3. William H. Grouse, TMH Automotive mechanics,2015
4. P.l. Kohli, TMHAutomotive Electrical Equipment,2018
5. A. W. Judge Modem Electrical Equipments,2017

Web References

1. https://nesc.edu.tt › Programmes › All Programmes
2. https://nptel.ac.in/courses/112/107/112107240/
3. https://nptel.ac.in/courses/108/101/108101038/
4. https://www.youtube.com/watch?v=LZ82iANWBL0
5. https://www.youtube.com/watch?v=hs7bABMtOMI&list=PLyqSpQzTE6M9G2SNxKfsVEjcM9MlJau4F

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	1	-	-	-	1	-	-	-	2	2	2	3	1
2	3	3	1	-	-	-	2	-	-	-	3	3	2	2	2
3	3	3	2	-	-	-	1	-	-	-	2	3	2	2	3
4	3	3	1	-	-	-	2	-	-	-	3	2	1	2	3
5	3	3	1	-	-	-	2	-	-	-	2	3	2	2	2

Correlation Level: 1- Low, 2 - Medium, 3 - High

ANNEXURE 3

U19MEE83 OPTIMIZATION TECHNIQUES IN ENGINEERING DESIGN

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To afford the knowledge of Optimization.
- To endow with knowledge on the methods for optimum design.
- To familiarize with various unconstrained optimization.
- To give the knowledge of constrained optimization.
- To present the knowledge of Modern methods of Optimization.

Course Outcomes

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

CO1 - Finding of optimization. **(K2)**
CO2 - Categorizing the various optimum design. **(K2)**
CO3 - Choosing ideas on unconstrained optimization. **(K3)**
CO4 - Mashing about constrained optimization. **(K4)**
CO5 - Grading about Modern methods of optimization like Neural-Network **(K4)**

UNIT I INTRODUCTION TO OPTIMIZATION (9 Hrs)

Engineering application of Optimization – Statement of an Optimization problem - Optimal Problem formulation - Classification of Optimization problem. Optimum design concepts. Definition of Global and Local optima – Optimality criteria - Review of basic calculus concepts – Global optimality

UNIT II LINEAR PROGRAMMING METHODS FOR OPTIMUM DESIGN (9 Hrs)

Evaluation of Linear programming methods for optimum design – Post optimality analysis - Application of LPP models in design and manufacturing.

UNIT III UNCONSTRAINED OPTIMIZATION (9 Hrs)

Optimization algorithms for solving unconstrained optimization problems – Gradient based method. Cauchy's steepest descent method, Newton's method, Conjugate gradient method.

UNIT IV CONSTRAINED OPTIMIZATION (9 Hrs)

Optimization algorithms for solving constrained optimization problems – direct methods – penalty function methods – steepest descent method - Engineering applications of constrained and unconstrained algorithms

.

UNIT V MODERN METHODS OF OPTIMIZATION (9 Hrs)

Modern methods of Optimization, Neural-Network based Optimization, Applications. Use of Matlab to solve optimization problems.

Text Books

1. Rao S. S. - 'Engineering Optimization, Theory and Practice' - New Age International Publishers, 4th Edition, 2012.
2. Kalyanmoy Deb, Optimization for Engineering Design: Algorithms and Examples, Eastern Economy edition, PHI Learning Privtae Limited, 2012.
3. Hardley G. -'Linear Programming' - Narosa Book Distributors Private Ltd., 2002.

Reference Books

1. R.VenkataRao, Vimal J. Savsani, Mechanical Design Optimization Using Advanced Optimization Techniques, Springer,2012.
2. Arora J. - 'Introduction to Optimization Design' - Elsevier Academic Press, New Delhi - 2004
3. Saravanan R. - 'Manufacturing Optimization through Intelligent Techniques', Taylor & Francis (CRC Press), 2006.
4. John Gero , Design Optimization, AP Academic press,2012.
5. Ashok D. Belegundu, Tirupathi R. Chandrupatla, Optimization Concepts and Applications in Engineering, Cambridge umiversity press, 2011

Web References

1. https://nptel.ac.in/courses/112/101/112101298/
2. https://nptel.ac.in/courses/112/106/112106064/
3. https://www.youtube.com/watch?v=LL20TZGXp3Q
4. https://www.youtube.com/watch?v=3Bh_viwz6_0
5. https://www.youtube.com/watch?v=aJKuM4U-eYg

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	-	-	-	-	-	-	2	3	2	3	1
2	3	3	2	2	-	-	-	-	-	-	1	3	2	2	3
3	3	3	2	2	-	-	-	-	-	-	2	3	2	1	3
4	3	3	3	2	-	-	-	-	-	-	1	3	1	2	3
5	3	3	3	2	-	-	-	-	-	-	2	3	2	2	3

Correlation Level: 1- Low, 2 - Medium, 3 - High

ANNEXURE 4

U19MET54	METROLOGY AND MEASUREMENT	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To provide knowledge on various metrological equipment's available in mechanical industry.
- To understand the basic construction and working of linear and angular measurement tools.
- To understand the basics of modern inspection methods and computerized inspection.
- To acquire about the knowledge on form measurement.
- To understand the various measuring techniques for power, flow and temperature used in industries.

Course Outcomes

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

CO1 - Describe the concepts of measurements to apply in various metrological instruments. **(K2)**
CO2 - Outline the principles of linear and angular measurement tools used for industrial applications. **(K2)**
CO3 - Explain the procedure for conducting computer aided inspection. **(K2)**
CO4 - Demonstrate the techniques of form measurement used for industrial components. **(K2)**
CO5 - Apply various measuring techniques of mechanical properties in industrial needs. **(K3)**

UNIT I BASICS OF METROLOGY (9 Hrs)

Introduction to Metrology – Need – Elements – Work piece, Instruments – Persons – Environment – their effect on Precision and Accuracy – Errors – Errors in Measurements – Types – Control – Types of standards.

UNIT II LINEAR AND ANGULAR MEASUREMENTS (9 Hrs)

Linear Measuring Instruments – Evolution – Types – Classification – Limit gauges – gauge design – terminology – procedure – concepts of interchangeability and selective assembly – Angular measuring instruments – Types – Bevel protractor clinometers angle gauges, spirit levels sine bar – Angle alignment telescope – Autocollimator – Applications.

UNIT III CMM, LASER INTERFEROMETRY & MACHINE VISION (9 Hrs)

Basic concept of lasers Advantages of lasers – laser Interferometers – types – DC and AC Lasers interferometer – Applications – Straightness – Alignment. Basic concept of CMM – Types of CMM – Constructional features – Probes – Accessories – Software – Applications – Basic concepts of Machine Vision System – Element – Applications.

UNIT IV FORM MEASUREMENT (9 Hrs)

Principles and Methods of straightness – Flatness measurement – Thread measurement, gear measurement, surface finish measurement, Roundness measurement – Applications.

UNIT V MEASUREMENT OF POWER, FLOW AND TEMPERATURE (9 Hrs)

Force, torque, power - mechanical, Pneumatic, Hydraulic and Electrical type. Flow measurement: Venturimeter, Orificemeter, rotameter, pitot tube – Temperature: bimetallic strip, thermocouples, electrical resistance thermometer – Reliability and Calibration – Readability and Reliability.

Text Books

1. R.K.Rajput, "Engineering Metrology and Instrumentation", S.K. Kataria and Sons Publishers, 2019.
2. R.K.Jain , "Engineering Metrology", Khanna Publishers, 25th Edition 2019.
3. J.P.Hadiya, H.G.Kataria ," Mechanical Measurements and Metrology", Books India Publications, 2018.

Reference Books

1. I.C Gupta, "A Textbook of Engineering Metrology" Paperback Dhanpat Rai Publications, 2019.
2. A.Bewoor and Vinay Kulkarni, "Metrology & Measurement" McGraw Hill Education, 2017.
3. Krishnamurthy Raghavendra, "Engineering Metrology and Measurements" Oxford University Press, 2013.
4. Rega Rajendira,"Principles of Engineering Metrology", Jaico Publishing House, 2008.
5. Backwith, Marangoni, Lienhard, "Mechanical Measurements", Pearson Education, 2006.

\Web References

1. https://nptel.ac.in/courses/112106179/
2. https://nptel.ac.in/courses/112106138/
3. https:// jcboseust.ac.in
4. https://ndl.iitkgp.ac.in/homestudy/engineering
5. http://mech4u.in/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	2	-	1	-	-	-	-	1	-	1	2	1	2
2	3	1	1	-	1	-	-	-	-	1	-	1	2	1	2
3	3	1	1	-	1	-	-	-	-	1	-	1	2	1	2
4	3	1	1	-	1	-	-	-	-	1	-	1	2	1	2
5	3	1	1	-	1	-	-	-	-	1	-	1	2	1	2

Correlation Level: 1- Low, 2 - Medium, 3 - High

ANNEXURE 5

U20MEE614	ADDITIVE MANUFACTURING	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand the basic needs, principle and applications of rapid prototyping.
- To understand the design tools of additive manufacturing.
- To identify the materials, process and application of Photo polymerization and Powder Bed Fusion.
- To learn the principles of Extrusion Based and Sheet Lamination process.
- To understand the application of Beam Deposition process.

Course Outcomes

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

CO1 - Understand the role of additive manufacturing in the design process and the implications for design. **(K2)**
CO2 - Apply the design tools in additive manufacturing for medical applications. **(K3)**
CO3 - Analyze the processes of Photo polymerization and Powder Bed Fusion. **(K4)**
CO4 - Illustrate extrusion based process systems. **(K4)**
CO5 - Develop the additive manufacturing process and materials applications. **(K4)**

UNITI INTRODUCTION (9 Hrs)

Overview – Need - Development of Additive Manufacturing Technology - Principle – AM Process Chain-Classification – Rapid Prototyping- Rapid Tooling – Rapid Manufacturing – Applications- Benefits –Case studies.

UNIT II DESIGN FOR ADDITIVE MANUFACTURING (9 Hrs)

Design tools: Data processing - CAD model preparation – Part orientation and support structure generation – Model slicing –Tool path generation- Design for Additive Manufacturing: Concepts and objectives- AM unique capabilities – DFAM for part quality improvement- Customized design and fabrication for medical applications.

UNIT III PHOTO POLYMERIZATION AND POWDER BED FUSION PROCESSES (9 Hrs)

Photo polymerization: SLA-Photo curable materials – Process - Advantages and Applications. Powder Bed Fusion: SLS-Process description – powder fusion mechanism – Process Parameters – Typical Materials and Application. Electron Beam Melting.

UNIT IV EXTRUSION BASED AND SHEET LAMINATION PROCESSES (9 Hrs)

Extrusion Based System: FDM-Introduction – Basic Principle – Materials – Applications and Limitations – Bioextrusion. Sheet Lamination Process: LOM- Gluing or Adhesive bonding – Thermal bonding.

UNIT V PRINTING PROCESSES AND BEAM DEPOSITION PROCESSES (9 Hrs)

Droplet formation technologies – Continuous mode – Drop on Demand mode – Three Dimensional Printing – Advantages – Bioplotter - Beam Deposition Process: LENS- Process description – Material delivery – Process parameters – Materials – Benefits – Applications.

Text Books

1. Ian Gibson, David W.Rosen, Brent Stucker “Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing” Springer, 2010.
2. Chua C.K., Leong K.F., and Lim C.S., “Rapid prototyping: Principles and applications”, Third edition, World Scientific Publishers, 2010.
3. Andreas Gebhardt “Understanding Additive Manufacturing: Rapid Prototyping, Rapid Manufacturing” Hanser Gardner Publication 2011.

Reference Books

1. A.K.Kamrani and E.A.Nasr, “Rapid Prototyping: Theory and practice”, Springer, 2006.
2. L.W Liou and F.W Liou, “Rapid Prototyping and Engineering applications: A tool box for prototype development”, CRC Press, 2007.
3. Tom Page “Design for Additive Manufacturing” LAP Lambert Academic Publishing, 2012.
4. Amit Bandyopadhyay, Susmita bose , “Additive Manufacturing”, CRC Press, 2015

5. Di Nicolantonio, Massimo, Rossi, Emilio, Alexander, Thomas “Advances in Additive Manufacturing, Modeling Systems and 3D Prototyping”, Proceedings of the AHFE 2019.

Web References

1. https://nptel.ac.in/courses/112/104/112104265/
2. https://nptel.ac.in/courses/112/107/112107078/
3. https://additivenews.com/videos/
4. https://www.journals.elsevier.com/additive-manufacturing
5. https://www.springer.com/journal/40964

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	1	1	2	2	1	2	1	1	-	2	1	2	1
2	3	1	2	-	2	1	-	2	1	-	-	2	2	2	2
3	3	1	1	1	2	2	1	1	1	-	-	2	2	2	3
4	3	1	1	-	1	1	1	1	1	-	-	2	2	2	3
5	3	1	2	-	2	1	1	1	1	1	2	3	3	3	3

Correlation Level: 1- Low, 2 - Medium, 3 - High

ANNEXURE 6

U20MEE506	TURBOMACHINERY	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To study about the classification of turbo machinery and the thermodynamics of fluid flow in turbo machines
- To adopt the knowledge of energy transfer mechanism in turbo machines.
- To gain the knowledge about steam turbines and its characterization.
- To teach about the various hydraulic turbines.
- To learn about the characterization of pumps and compressor..

Course Outcomes

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

CO1 – explain the principle working of turbo machines and analysis of thermodynamic fluid flow in turbo machines. **(K2)**

CO2 – analyse the energy exchange mechanism in all turbo machines. **(K3)**

CO3 – illustrate the operation and principle of steam turbines. **(K2)**

CO4 – explain the principle of hydraulic turbines and able to analyse the design of turbine blades. **(K4)**

CO5 - interpret the working of pumps and compressors and its characteristics (**K3)**

UNIT I INTRODUCTION (9 Hrs)

Introduction: Definition of turbo machine, parts of turbo machines, Comparison with positive displacement machines, Classification, Dimensionless parameters and their significance, Effect of Reynolds number, Unit and specific quantities, model studies.

Thermodynamics of fluid flow: Application of first and second law of thermodynamics to turbo machines, Efficiencies of turbo machines, Static and Stagnation states, Incompressible fluids and perfect gases, overall isentropic efficiency, stage efficiency (their comparison) and polytrophic efficiency for both compression and expansion processes. Reheat factor for expansion process

UNIT II ENERGY EXCHANGE IN TURBO MACHINES (9 Hrs)

Energy exchange in Turbo machines: Euler's turbine equation, Alternate form of Euler's turbine equation, Velocity triangles for different values of degree of reaction, Components of energy transfer, Degree of Reaction, utilization factor, Relation between degree of reaction and Utilization factor, Problems.

General Analysis of Turbo machines: Radial flow compressors and pumps – general analysis, Expression for degree of reaction, velocity triangles, Effect of blade discharge angle on energy transfer and degree of reaction, Effect of blade discharge angle on performance, Theoretical head – capacity relationship, General analysis of axial flow pumps and compressors, degree of reaction, velocity triangles, Problems.

UNIT III STEAM TURBINES (9 Hrs)

Steam Turbines: Classification, Single stage impulse turbine, condition for maximum blade efficiency, stage efficiency, Need and methods of compounding, Multi-stage impulse turbine, expression for maximum utilization factor. Reaction turbine – Parsons's turbine, condition for maximum utilization factor, reaction staging. Problems.

UNIT IV HYDRAULIC TURBINES (9 Hrs)

Hydraulic Turbines: Classification, various efficiencies. Pelton turbine – velocity triangles, design parameters, Maximum efficiency. Francis turbine - velocity triangles, design parameters, runner shapes for different blade speeds. Draft tubes- Types and functions. Kaplan and Propeller turbines - velocity triangles, design parameters.

UNIT V PUMPS AND COMPRESSORS (9 Hrs)

Centrifugal Pumps: Classification and parts of centrifugal pump, different heads and efficiencies of centrifugal pump, Minimum speed for starting the flow, Maximum suction lift, Net positive suction head, Cavitation, Need for priming, Pumps in series and parallel. Problems. Centrifugal Compressors: Stage velocity triangles, slip factor, power input factor, Stage work, Pressure developed, stage efficiency and surging and problems. Axial flow Compressors: Expression for pressure ratio developed in a stage, work done factor, efficiencies and stalling. Problems.

Text Books

1. V. Kadambi and Manohar Prasad, An Introduction to Energy Conversion, Volume III, Turbo machinery, New Age International Publishers, 7th Edition 2018.
2. Maneesh Dubey, BVSSS Prasad, Archana Nema, Turbomachinery, Tata McGraw Hill Co. Ltd., 2018.
3. B.K.Venkanna, Fundamentals of Turbo machinery, Phi Learning Private Limited, 2009.

Reference Books

1. S. M. Yahya, Turbines, Compressors and Fans, Tata McGraw Hill Co. Ltd., 2nd edition, 2002
2. D. G. Shepherd, Principals of Turbo machines, The Macmillan Company, 1964.
3. S. L. Dixon, Fluid Mechanics and Thermodynamics of Turbo machines, Elsevier, 2005.
4. M. S. Govindegouda and A. M. Nagaraj, Text Book of Turbo machines, M. M. Publications, 4th Edition, 2008
5. R. K. Turton, Principles of Turbomachinery, Springer Netherlands, 2012.

Web References

1. https://nptel.ac.in/courses/101/101/101101058/
2. https://nptel.ac.in/courses/112/103/112103249/
3. https://www.youtube.com/watch?v=473XQrJjDZE
4. https://www.youtube.com/watch?v=mLwb4Pk2RZo
5. https://www.sciencedirect.com/science/article/abs/pii/S1359431118361039

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	1	1	-	-	-	-	-	-	-	-	1	2	-
2	3	2	2	2	-	-	-	-	-	-	-	-	-	-	-
3	3	3	1	2	-	-	-	-	-	-	-	-	-	2	-
4	3	2	2	3	-	-	-	-	-	-	-	-	-	-	-
5	3	3	2	3	-	-	-	-	-	-	-	-	1	1	-

Correlation Level: 1- Low, 2 - Medium, 3 - High

ANNEXURE 7

EMPLOYABILITY ENHANCEMENT COURSES – (A). CERTIFICATION COURSES

Sl. No	Course Code	Course Title
1	U19MECX1	Python Programming
2	U19MECX2	AutoCAD for Mechanical
3	U19MECX3	CATIA
4	U19MECX4	CREO
5	U19MECX5	Solid works
6	U19MECX6	Fusion 360
7	U19MECX7	ANSYS
8	U19MECX8	Automation – I
9	U19MECX9	Automation – II

EMPLOYABILITY ENHANCEMENT COURSES – (B). SKILL DEVELOPMENT COURSES

Sl. No	Course Code	Course Title
1	U19MES31	Skill Development Course 1: General Proficiency - I
2	U19MES32	Skill Development Course 2*
		1) Two wheeler Troubleshooting
		2) Troubleshooting of CNC Milling machine
		3) Troubleshooting of CNC lathe machine
3	U19MES41	Skill Development Course 3 : General Proficiency - II
4	U19MES42	Skill Development Course 4*
		1) Four wheeler Troubleshooting
		2) Electronic Troubleshooting for Mechanical Engineers
		3) Hardware Networking
5	U19MES51	Skill Development Course 5 : Foreign Language/ IELTS -I
6	U19MES52	Skill Development Course 6 : Presentation Skills using ICT
7	U19MES61	Skill Development Course 7 : Foreign Language/ IELTS - II
8	U19MES62	Skill Development Course 8 : Technical Seminar
9	U19MES63	Skill Development Course 9 : NPTEL / MOOC - I
10	U19MES81	Skill Development Course 10 : NPTEL / MOOC - II

**** Any one course to be selected from the list***

ANNEXURE 8

- To Consider and approve revision of list of panels of question paper setters and Examiners for the examinations of UG Programme for the academic year 2021-22

  Recommended to approve the panel of examiners and question paper setters for UG programmes **(Annexure 8**

Annexure 8

SRI MANAKULA VINAYAGAR ENGINEERING COLLEGE
(An Autonomous Institution)
(Approved by AICTE, New Delhi & Affiliated to Pondicherry University)
(Accredited by NBA-AICTE, New Delhi, ISO 9001:2000 Certified Institution & Accredited by NAAC with "A" Grade)
Madagadipet, Puducherry - 605 107

Department of Mechanical Engineering

Panel of Examiners for Valuation of End Semester Examinations

	Name of the Examiner	Specialization	Designation, Department and Institution in which currently working	Contact number and mail id
1	Dr.T.Sekar	Engineering Design	Associate Professor Department of Mechanical Engineering Government college of Technology Coimbatore-13	9092500393 drtsekar76@gct.ac.in
2	Dr.S.Gopalakannan	Manufacturing Engineering	Professor Department of Mechanical Engineering Adhiparasakthi Engineering college Melmaruvathure-632 506	9944949026 gopalakannan75@gmail.com
3	Dr.A.Madhanagopal	Engineering Design	Assistant Professor Department of Mechanical Engineering University college of Engineering Arani-632326	7708455794 Monmadhan248475@gmail.com
4	Dr. K.Rajmohan	Engineering Design	Assistant Professor Department of Mechanical Engineering University college of Engineering Panruti-607106	9894102756 rajnvl74@gmail.com
5	Dr.S.Arunkumar	Manufacturing Engineering	Associate Professor Department of Mechanical Engineering Vinayaka Mission's kirupananda Variyar Engineering College,Salem	9952722454 arun_da78@yahoo.co.in

6	Dr.V.Gnanamoorthy	Thermal Engineering	Assistant Professor Department of Mechanical Engineering University college of Engineering Villupuram-605103	9942005782 cvgnana@gmail.com
7	Dr.S.Rajasekaran	Thermal Engineering	Assistant Professor Department of Mechanical Engineering University college of Engineering Villupuram-605103	9655549494 rajasekaran.aut@gmail.com
8	Dr.G.Hariharan	Thermal Engineering	Assistant Professor Department of Mechanical Engineering University college of Engineering Kanchipuram-605103	9884956025 cmghari2004@gmail.com
9	Dr. A.Sathiamourtty	Energy Technology	Associate Professor Dept. of Mechanical Engg. Pondicherry Engineering College	8300460801 asm@pec.edu
10	Dr.C..Senthilkumar	Manufacturing Engineering	Assistant Professor Department of Mechanical Engineering University college of Engineering Panruti-607106	9894856176 csmfgau@gmail.com
11	Dr.V.Gurusamy	Engineering Design	Assistant Professor Department of Marine Engineering Sri vengateswara college of engineering, Chennai.	9994436427 vguru@svce.ac.in
12	Dr.R.Ashok Gandhi	Manufacturing Engineering	Associate Professor Department of Mechanical Engineering Sri Sairam Engineering College Chennai.	9962290907 ashokgandhi.mech@sairam.edu.in
13	Dr.Nadanakumar	Thermal Engineering	Assistant Professor(S.G) School of Mechanical Science Hindustan Institute of Science Chennai	9443693363 vin.nadanakumar@gmail.com
14	Dr.D.Mala	Thermal Engineering	Assistant Professor Department of Mechanical Engineering University college of Engineering Panruti-607106	8903804130 mala_lingam@yahoo.com

15	Dr.U.Mohammed.Iqbal	Manufacturing Engineering	Associate Professor Department of Mechanical Engineering S.R.M Institute of Science and Technology Kattankulathur-603203.	9600429006 mohammeu@srmist.edu.in
16	Dr.G.B.M.Mohanraj	Manufacturing Engineering	Professor Department of Mechanical Engineering Sri Manakula Vinayagar Engineering college Madagadipet-605107	9600989508 gbmraj@gmail.com
17	Dr.G.G.Sozhamannan	Manufacturing Engineering	Professor Department of Mechanical Engineering Sri Manakula Vinayagar Engineering college Madagadipet-605107	9677858206 cholaking3007@gmail.com
18	Dr.T.Coumaressin	Energy Engineering	Associate Professor Department of Mechanical Engineering Sri Manakula Vinayagar Engineering college Madagadipet-605107	9994138268 coumaressinmech09@gmail.com
19	Dr.K.Hemalatha	Engineering Design	Associate Professor Department of Mechanical Engineering Sri Manakula Vinayagar Engineering college Madagadipet-605107	9443536684 hemalatharohit@gmail.com
20	Dr.A.Thiyagarajan	Manufacturing Engineering	Associate Professor Department of Mechanical Engineering Sri Manakula Vinayagar Engineering college Madagadipet-605107	6379367126 thiagusmvec@gmail.com

Department of Mechanical Engineering

Minutes of Board of Studies

The **Third Board of Studies** meeting for M. Tech and Ph. D Programmes, Department of Mechanical Engineering was held on **11th August 2021** at 10:30 A.M in the R&D Lab, Department of Mechanical Engineering, Sri Manakula Vinayagar Engineering College with the Head of the Department in the Chair.

The following members were present for the BoS meeting:

Sl. No	Name of the Member with Designation and official Address	Responsibility in the BoS
1	Dr. K.Velmurugan Professor and Head Department of MECH, SMVEC	Chairman
External Members		
2	Dr. N. Alagumurthi, Ph.D, Professor & Head Department of Mechanical Engineering, Pondicherry Engineering College, Puducherry-605014. Email id: alagumurthi@pec.edu Mobile No.: 9486143090	University Nominee
3	Dr. M. Leenus Jesu Martin, Ph.D, Director for campus SRM Institute of Science and Technology, Tamil Nadu – 603203 Email id: leenusm@srmist.edu.in Mobile No.: 9940036021	Member
4	Dr. A.T. Ravichandran, Ph.D, Dean Academics & Dean School of Mechanical and Construction Engineering Vel Tech Rangarajan Dr.Sagunthala R & D Institute of Science and Technology, Avadi, Chennai – 600062 Email id: atrmathy@gmail.com Mobile No.: 9942940600	Member
Internal Members		
5	Dr.G.G.Sozhamannan, Professor, **Specialization:** ***Manufacturing Engineering***	Member
6	Dr.T.Coumaressin, Associate Professor, **Specialization:** ***Thermal Engineering***	Member

7	Dr.K.Hemalatha, Associate Professor, **Specialization:** ***Engineering Design***	Member
8	Dr.A.Thiagarajan, Associate Professor, **Specialization:** ***Product Design & Manufacturing***	Member
9	Prof.N.Vijayan, Assistant Professor, **Specialization:** ***Mathematics***	Member
10	Prof.K.Oudayakumar Associate Professor, **Specialization:** ***Physics***	Member
11	Dr.K.Karthikeyan Associate Professor, **Specialization:** ***Chemistry***	Member
12	Dr.D.Jaichithra, Professor, **Specialization:** ***English***	Member
Co-opted Members		
13	Dr. Anand Gurupatham Deputy General Manager, CAE-Department Head at Renault Nissan, Technology & Business Center, Chennai, Tamil Nadu, India	Industrial Member
Alumni		
14	Mr.P.Madavan, Research Scholar MIT, Anna university, Chennai.	Alumni Member

Agenda of the Meeting

1. Consideration of confirmation of minutes of the previous meeting held on 10.04.2021

and ratify the note on action taken on the decisions PG programmes of the previous meeting

2. To consider and ratify the value added and skill development courses in PG programmes from the Academic Year 2021-22
3. Approval for the panel of examiners.
4. Consideration and approve of Ph. D regulation 2021-22.
5. Any other item with the permission of chair

PG and Ph.D Minutes of the Meeting

Dr. K.Velmurugan, Chairman, BoS opened the meeting by welcoming and introducing the external members, to the internal and co-opted members and thanked them for accepting to become the member of the Board of Studies and the meeting thereafter deliberated on agenda items that had been approved by the Chairman.

BOS/ 2021/ MECH/ PG/3.1

Consideration of confirmation of minutes of the previous meeting held on 10.04.2021

- The chairman BoS Confirmed the minutes of 2nd Board of Studies meeting with no further modification.
- To consider and ratify the note on action taken on the decisions PG programmes of the previous meeting.

BOS/ 2021/ MECH/ PG/3.2

To consider and ratify the value added and skill development course in PG programmes from the Academic Year 2021-22:

Sl.No	Name of the course
1	CATIA
2	CNC Programme
3	Rapid Prototyping
4	3D Printing and Scanning
5	Fusion 360
6	Solidworks
7	Autodesk Inventor
8	CFD
9	Creo (Modeling and Simulation)
10	Ansys -Multiphysics
11	Automation-I (Pneumatics)
12	Automation-II (Hydraulic)
13	CAD/CAM
14	Industry 4.0
15	Piping Design
16	Deep Learning
17	NDT Level I&II
18	Safety Course (Boiler)
19	Six Sigma
20	Tool Designing
21	MATLAB
22	Additive Manufacturing
23	IOT & Machine learning
24	Industrial Automation &Robotics
25	Tool &Die Manufacturing

BOS/ 2021/ MECH/ PG/3.3

Approval for the panel of examiners:

The list of question paper setters for End semester Examination was presented and recommended by BoS Members to academic council. **Annexure I**

BOS/ 2021/ MECH/ PG/3.4

Consideration and approve of Ph. D Course Work in Mechanical Engineering.

The members reviewed the Ph. D regulations and suggested to change the **Standard point scale for grading** for the Course work in R21.

- As per the recommendations of the BOS members, we changed the grade scale for the course work in R21. The course work details along with point scale for grading is included in Ph. D Regulations 2021-22. (**Annexure-II**).

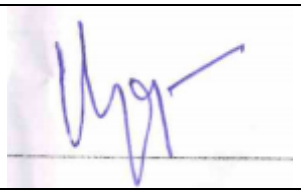
BOS/ 2021/ MECH/ PG/3.5

Other points Discussed

- Course coordinator committee meeting along with students' representatives to be conducted at the end of the semester, to discuss about the discrepancies faced like depth of syllabus, hours allotted for completing the syllabus and students' feedbacks related to the curriculum and the subjects.

The meeting was concluded at 01:30PM with vote of thanks by Dr.K.Velmurugan, Head of Department, Mechanical Engineering

Sl. No	Name of the Member with Designation and official Address	Responsibility in the BoS	Signature
1	Dr. K.Velmurugan Professor and Head Department of MECH, SMVEC	Chairman	
External Members			
2	Dr. N. Alagumurthi, Ph.D, Professor & Head Department of Mechanical Engineering, Pondicherry Engineering College, Puducherry-605014. Email id: alagumurthi@pec.edu Mobile No.: 9486143090	University Nominee	
3	Dr. M. Leenus Jesu Martin, Ph.D, Director for campus SRM Institute of Science and Technology, Tamil Nadu – 603203 Email id: leenusm@srmist.edu.in Mobile No.: 9940036021	Member	
4	Dr. A.T. Ravichandran, Ph.D, Dean Academics and Dean School of Mechanical and Construction Engineering Vel Tech Rangarajan Dr.Sagunthala R & D Institute of Science and Technology, Avadi, Chennai – 600062 Email id: atrmathy@gmail.com Mobile No.: 9942940600	Member	
Internal Members			
5	Dr.G.G.Sozhamannan, Professor, **Specialization:** ***Manufacturing Engineering***	Member	
6	Dr.T.Coumaressin, Associate Professor, **Specialization:** ***Thermal Engineering***	Member	
7	Dr.K.Hemalatha, Associate Professor, **Specialization:** ***Engineering Design***	Member	
8	Dr.A.Thiagarajan, Associate Professor, **Specialization:** ***Product Design & Manufacturing***	Member	

9	Prof.N.Vijayan, Assistant Professor, **Specialization: *Mathematics***	Member	
10	Prof.K.Oudayakumar Associate Professor, **Specialization: *Physics***	Member	
11	Dr.K.Karthikeyan Associate Professor, **Specialization: *Chemistry***	Member	
12	Dr.D.Jaichithra, Professor, **Specialization: *English***	Member	
Co-opted Members			
13	Dr. Anand Gurupatham Deputy General Manager, CAE-Department Head at Renault Nissan, Technology & Business Center, Chennai, Tamil Nadu, India	Industrial Member	
Alumni			
14	Mr.P.Madavan, Research Scholar MIT, Anna university, Chennai.	Alumni Member	

Annexure-I

SRI MANAKULA VINAYAGAR ENGINEERING COLLEGE

(Approved by AICTE, New Delhi & Affiliated to Pondicherry University)
(Accredited by NBA-AICTE, New Delhi, ISO 9001:2000 Certified Institution & Accredited by NAAC with "A" Grade)
(An Autonomous Institution)
(As per UGC Regulations 2018)
Madagadipet, Puducherry - 605 107

DEPARTMENT OF MECHANICAL ENGINEERING

M.Tech Manufacturing Engineering

QUESTION PAPER SETTER DETAILS-ODD SEMESTER 2021-2022

Sl. No	Sem	Name of the Subject	Question Paper Setter Details		
			Setter 1	Setter 2	Setter 3
1	1	P20BST105/ Engineering Probability and Statistics	**Dr. S. Tamilselvan** Professor Department of Mathematics, Annamalai University, Chidambaram -608002 Contact No: 9443073937 E-Mail: stamilselvan@hotmail.com	**Dr. S. Vijayabalaji** Assistant Professor Department of Mathematics University College of Engineering Panruti- Contact No: 9443682630 E-Mail:balaji1977harshini@gmail.com	**Dr. Pazhani Balamurugan** Associate Professor Department of Mathematics Annamalai University, Chidambaram -608002 Contact No: 9488026946 E-Mail: spbm1966@gmail.com
2	1	P20MET101/ Mechanical Behavior of Materials	**Dr. K. Pajaniradja** Professor Department of Mechanical Engineering PEC Puducherry -605104 Contact No: 9894045673 E-Mail: palaniradja72@pec.edu	**Dr. B. Karthikeyan** Professor Department of Mechanical Engineering Annamalai university Chidambaram-608002 Contact No: 9443665677 E-Mail: profbkau@gmail.com	**Dr. A. K. Lakshminarayanan** Associate Professor Department of Mechanical Engineering SSN Tamil Nadu 600020 Contact No: 9940196356 E-Mail: lakshminarayananak@ssn.edu.in

3	1	P20MET102/ Automation in Manufacturing	**Dr. R. Elansezhian** Associate Professor Department of Mechanical Engineering PEC Puducherry -605104 Contact No: 9952884403 E-Mail: elansezhianr@pec.edu	**Dr.A.Senthil kumar** Assistant Professor Department of Mechanical Engineering University College of Engineering Panruti- 607 106. Contact No: 99948 25959 E-Mail: ask@tau.edu.in	**Dr. Rajesh Ranganathan** Professor Department of Mechanical Engineering CIT- Coimbatore- 641 014 Contact No: 97508 54530 E-Mail: rajesh.ranganathan@cit.edu.in
4	1	P20MET103/ Tool Design Engineering	**Dr. S. Mohamed Ali** Professor Department of Mechanical Engineering PEC Puducherry -605104 Contact No: 9443099866 E-Mail: smdali@pec.edu	**Dr. R. Kalaivanan** Professor Department of Mechanical Engineering Annamalai university Chidambaram-608002 Contact No: 9894857644 E-Mail: rkv1966@yahoo.co.in	**Dr. V. C. Sathish Gandhi** Professor Department of Mechanical Engineering University College of Engineering Nagercoil, Nagercoil - 629004 Contact No: 9894500097 E-Mail: vcsgandhi@gmail.com
5	1	P20CCT101/ Research Methodology And IPR	**Dr.A.V. Raviprakash** Professor Department of Mechanical Engineering PEC Puducherry -605104 Contact No: 9487061455 E-Mail: avrp@pec.edu	**Dr. N. M. Sivaram** Assistant Professor Department of Mechanical Engineering NIT Puducherry, Karaikal – 609605 Contact No: 04368 265 230 E-Mail: sivaram.nm@nitpy.ac.in	**Dr.K.Mathiyazhagan** **Associate Professor** **Head of Research Centre** Thiagarajar School of Management, Madurai, Tamil Nadu-625005 Contact No: 9698239312 E-Mail: madii1984@yahoo.com
6	1	P20MEE105/ Cellular Manufacturing	**Dr. L. Poovazhagan** Associate Professor Department of Mechanical Engineering SSN, Tamil Nadu 600020 Contact No: 9962521304 E-Mail: poovazhaganl@ssn.edu.in	**Dr.C.Senthilkumar** Assistant Professor Department of Mechanical Engineering University College of Engineering Panruti- 607 106. Contact No: 9894856176 E-Mail: csmfg_au@yahoo.com	**Dr. M V A Raju Bahubalendruni** Assistant Professor Department of Mechanical Engineering NIT Puducherry, Karaikal – 609605 Contact No:- 04368 265 230 E-Mail: mvaraju.b@nitpy.ac.in

Annexure-II

Ph. D Course Work

Scheme

COMPULSORY			
Sl. No	**Course Code**	**COURSE TITLE**	**Credit**
1.	20RPE01	Research And Publication Ethics (RPE)	2
2.	20RRM02	Research Methodology	2
ELECTIVE ADVANCE LEVEL (Any Two)			
3.	20RXX 01	ELECTIVE-1	4
4.	20RXX 02	ELECTIVE-2	4
5.	20RXX 03	ELECTIVE-3	4
6.	20RXX 04	ELECTIVE-4	4

Scheme of Examination and Passing:

- This course will have 100% external (Institution written examination of 3 hours duration for each course paper). All external examinations will be held at the end of course work and will be conducted by the Institute as per the existing norms.
- Each question paper will be of 100 Marks.
- Each question paper will consist of 10 questions of 20 marks each and student should answer **Any Five questions** out of 10 questions.

Standard point scale for grading:

Letter Grade	Grade Points	Percentage Range
O (Outstanding)	10	≥80.00
A^+(Excellent)	9	70.00-79.99
A (Very Good)	8	60.00-69.99
B^+(Good)	**7**	**55.00-59.99**
B (Above Average)	6	50.00-54.99
C (Average)	5	45.00-49.99
P (Pass)	4	40.00- 44.99
D (Promoted)	3	30.00-39.99
F(Fail)	0	<30.00
Ab (Absent)	-	-

A Ph.D. scholar has to obtain a **minimum of 55% of marks** or its equivalent grade in the UGC 7- point scale (or an equivalent grade/CGPA in a point scale wherever grading system is followed) in the course work in order to be eligible to continue in the program and submit the dissertation/thesis.