

Programme Specification

Programme: M. Tech. in Manufacturing Technologies and Engineering Management	
Faculty	Faculty of Engineering and Technology
Department	Department of Mechanical and Manufacturing Engineering
Programme	M. Tech. in Manufacturing Technologies and Engineering Management
Dean of Faculty	Dr. M. Arulanantham
HOD	Dr. T.N. Srikantha Dath

1. Title of the Award	
	M. Tech. in Manufacturing Technologies and Engineering Management
2. Modes of study	
	Full Time
3. Awarding Institution / Body	
	M. S. Ramaiah University of Applied Sciences – Bengaluru, India
4. Joint Award	
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5. Teaching Institution	
	Faculty of Engineering & Technology
	M S Ramaiah University of Applied Sciences - Bengaluru, India
6. Date of Programme Specification	
	May 2019
7. Date of Programme Approval by the Academic Council of MSRUAS	
	August 2019
8. Next Review Date	
	May 2021
9. Programme Approving Regulatory Body and Date of Approval	
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10. Programme Accrediting Body and Date of Accreditation	
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11. Grade Awarded by the Accreditation Body	
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12. Programme Accreditation Validity	
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13. Programme Benchmark	
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14. Rationale for the Programme	
	<p>Manufacturing is one of the key wealth producing sectors of an economy. Manufacturing provides important material support for infrastructure and industries. Globally manufacturing sector provides employment to 14 % of the population and contributes 16 % to GDP. At present manufacturing sector is growing at a rate of 1.5-1.7% globally. In India, it is growing at a rate of 2-2.5% and its share of GDP is around 15-16 %, employing nearly 45 million people.</p> <p>Manufacturing technology is an interacting combination of people, materials, tools, machines, automation and procedures designed to work together for producing good quality products. The tools of manufacturing technology magnify the efforts of individual workers and turn raw materials into quality products required by the customers at affordable cost. Manufacturing operations basically involve procurement of raw materials, processing, assembly, testing and dispatch of products to the customer. Engineering management is concerned with integration of technological problem-solving ability of engineering and the organizational, administrative, and planning abilities of management. It involves various contemporary management methodologies to oversee the operational performance and to improve the efficiency of an organization. Knowledge of materials is required while deciding the manufacturing processes.</p> <p>The university was offering two standalone programmes, namely, Advanced Manufacturing Technologies and Engineering and Manufacturing Management. However, with the advent of digital manufacturing and increased applications of information technology in manufacturing, it is now a necessity for an engineer to possess the skills of both manufacturing technologies and engineering management. With this in view, the Manufacturing Technologies and Engineering Management Programme is proposed, integrating the salient features of both the programmes offered earlier.</p> <p>This course is aimed at exposing the students to advanced knowledge in the areas of Manufacturing Technologies, Engineering Management and Materials Engineering along with the relevant simulation tools. Further, based on their orientation, the students are provided with opportunities to delve deeper and obtain in-depth knowledge in a specific stream. This programme offers the students a comprehensive master's degree with both technical as well as management orientation. This programme provides the perfect foundation for students aspiring to become professionals in manufacturing.</p>

15. Programme Aim

The programme integrates the salient features of two disciplines namely, manufacturing technologies and engineering management. The programme aims to prepare the students to solve operational problems in manufacturing and service industries. The students are exposed to various simulation tools to further strengthen their knowledge and skills in the respective domains of chosen specialization.

16. Programme Objectives

The objectives of the programme are to enable the students to:

1. Resolve manufacturing issues after considering strategic and financial implications
2. Select the appropriate materials and manufacturing processes for efficient and effective manufacturing
3. Optimize the manufacturing operations by applying advanced concepts of manufacturing technologies and engineering management in a shop-floor
4. Analyze and suggest suitable manufacturing technologies for the relevant functional applications
5. Develop manufacturing and automation strategies for efficient operations
6. Design robust manufacturing systems for achieving excellence
7. Practice team work, effective communication of ideas and lifelong learning

17. Intended Learning Outcomes of the Programme

The Intended Learning Outcomes (ILOs) are listed under four headings:

1. Knowledge and Understanding, 2. Cognitive Skills 3. Practical Skills and 4. Capability / Transferable Skills.

1. Knowledge and Understanding

After undergoing this programme, a student will be able to:

- KU1:** Explain principles of project management, manufacturing management, materials and process selections
- KU2:** Explain the impact of operational strategies and process specifications on the overall goals of the organization
- KU3:** Discuss the significance of modelling and simulation for manufacturing processes
- KU4:** Discuss manufacturing technologies and competitive manufacturing management concepts

2. Cognitive Skills

After undergoing this programme, a student will be able to:

- CS1:** Analyse and improve the operational performance of an organization through analytical modelling and simulations
- CS2:** Analyze the suitability of the appropriate manufacturing technologies for enhancing organizational competitiveness
- CS3:** Analyse process parameters and their effect on resultant component features and production rate
- CS4:** Examine the projects and manufacturing operations with a systems approach and analyze the scope for continuous improvement

3. Practical Skills

After undergoing this programme, a student will be able to:

- PS1:** Select appropriate materials and the corresponding processes for producing a component/product
- PS2:** Work with simulation tools to model and simulate casting, forging, sheet metal forming and welding
- PS3:** Optimize the operations, control the quality of products and services in an organization and evaluate the performance of a system
- PS4:** Formulate manufacturing strategies to meet business objectives

4. Capability / Transferable Skills

After undergoing this programme, a student will be able to:

- TS1:** Manage information, develop technical reports and make presentations
- TS2:** Work under various constraints to meet business objectives
- TS3:** Work in sync with a team for achieving the organizational objectives
- TS4:** Effectively communicate and facilitate smooth transfer of technical know-how between individuals and groups for addressing knowledge gaps

18. Programme Structure

The Programme consists of four terms as shown below. A student is required to successfully complete the following modules and earn credits for the award of the degree.

Complete details of each of the modules such as ILO's, content, resources, teaching-learning processes and other related information are outlined in Module Specification of the respective programme.

SEMESTER 1

Sl.No.	Code	Course Title	Theory (h/W/S)	Tutorials (h/W/S)	Practical (h/W/S)	Total Credits	Max. Marks
1	19MME501A	Computer Aided Design and Engineering	3		2	5	100
2	19MME502A	Engineering Materials and Processes	3	1		4	100
3	19MEC501A	Project Management	3		2	5	100
4	19MEC502A	Quality Management and Six Sigma	3	1		4	100
5	19MEC503A	Manufacturing Systems and Automation	3	1		4	100
6	19FET508A	Research Methodology & IPR	2	--	--	2	50
7	19FET509A	Professional Communication	1	--	--	0	
Total			18	3	4	24	550
Total number of contact hours per week			25 hours				
Number of credits can be registered			Minimum	19	Maximum	24	

SEMESTER 2

Sl.No.	Code	Course Title	Theory (h/W/S)	Tutorials (h/W/S)	Practical (h/W/S)	Total Credits	Max. Marks
1	19MEC504A	Quality By Design	3	1		4	100
2	19MEE5X1A	<i>Refer Elective Module Table</i>	3	1		4	100
3	19MEE5X2A	<i>Refer Elective Module Table</i>	3	1		4	100
4	19MEE5X3A	<i>Refer Elective Module Table / MOOC</i>	3	1		4	100
5	19MEE5X4A	<i>Refer Elective Module Table / MOOC</i>	3	1		4	100
6	19FET510A	Value Education	1			0	

	Total	16	5	X	20	500
	Total number of contact hours per week	21 hours				
	Number of credits can be registered	Minimum	16	Maximum	20	

SEMESTER 3

Sl.No.	Code	Course Title	Theory (h/W/S)	Tutorials (h/W/S)	Practical (h/W/S)	Total Credits	Max. Marks
1	19MEP521A	Internship			10	4	100
2	19MEP522A	Group project			15	8	200
3	19MEP523A	Dissertation-Phase -1					
Total					25	12	300
Total number of contact hours per week			XX hours				
Number of credits can be registered			Minimum	XX	Maximum	XX	

SEMESTER 4

Sl.No.	Code	Course Title	Theory (h/W/S)	Tutorials (h/W/S)	Practical (h/W/S)	Total Credits	Max. Marks
1	19MEP523A	Dissertation and Publication – Phase -II			24	24	400
Total					24	24	400
Total number of contact hours per week			24 hours				
Number of credits can be registered			Minimum	24	Maximum	24	

Elective Course List			
Stream / Specialization	S. No.	Course Code	Module Title
Stream-1: Manufacturing Technologies	E11	19MTE511A	Metal Casting Technologies
	E12	19MTE512A	Metal Forming Technologies
	E13	19MTE513A	Machining Technologies
	E14	19MTE514A	Polymers and Composites
Stream-2: Engineering Management	E21	19MTE521A	Kaizen and Lean Operations
	E22	19MTE522A	Supply Chain Management
	E23	19MTE523A	Manufacturing System Simulation
	E24	19MTE524A	Manufacturing Strategy and Business Economics
Stream-3: Materials Engineering	E31	19MTE531A	Additive Manufacturing
	E32	19MTE532A	Material Testing and Characterization
	E33	19MTE533A	Surface Engineering Techniques
	E34	19MTE514A	Polymers and Composites

19. Programme Delivery Structure

A Programme is delivered from Monday to Saturday of the week as per the Time-Table for every batch.

20. Teaching and Learning Methods

The module delivery comprises of a combination of few or all of the following:

1. Face to Face Lectures using Audio-Visuals
2. Workshops, Group Discussions, Debates, Presentations
3. Demonstrations
4. Guest Lectures
5. Laboratory/Field work/Workshop
6. Industry Visit
7. Seminars
8. Group Exercises
9. Project Exhibitions
10. Technical Festivals

21. Courses

Programme has six Professional core courses (PC1- PC6), four Professional elective courses (PE1 – PE4), two audit courses (NC), and one compulsory course (CC) followed by Group Project, Internship and Dissertation & Publication courses.

Core courses (PC1- PC6) are Programme Specialization courses which normally include both theory and laboratory sessions. Alternate activities are planned in case of laboratory sessions do not exist in a module.

Compulsory course (CM) is Research Methodology and IPR course which is mandatory.

All courses of the programmes are categorized as indicated in the **Annexure I**.

22. Electives

There are 4 electives (PE1 – PE4) in the programme. The electives are grouped such a way that a student can choose a set of electives to specialize in a chosen field/stream. However, if the student wishes to opt for elective module that spans multiple streams, the case may be considered subject to the affordability of academic logistics and approval by the module leader, HODs and Deans.

For every elective offered, there will be a minimum and a maximum number of registrations that is decided by the department.

There is also a provision for the students to choose PE3 and PE4 through on-line mode such as MOOC's, SWAYAM, NPTEL and other equivalent platforms. The guidelines prescribed by the University for such courses to be adhered to. The student can also earn 3 or 4 credits by participating in the international competitions like technical presentation/ conference/ publications in the journal etc and winning the award in that. In that case he/she can be exempted from one of the elective courses of the programme.

23. Group Project

The main objective of group project is to provide an ambiance to work in groups towards achieving a common goal. A group shall have up to 5 students. In case of Group Project work is based on interdisciplinary in nature, team can be constituted with members from across departments of the Faculty.

The students are required to develop a report for assessment and also need to demonstrate the working of the product. The IPR rights of all such work lies with the University only. The project should be approved by a committee constituted by respective HoDs before the start of the project. For further details related to the Group Project refer to Module Specification of the respective programmes

24. Industry Internship/Other Activities

A student can opt for an internship in an industry, a business or research organization during the module.

Alternately, can undertake a mini-project requiring self-directed study that can be perused within the affiliated Faculty.

Prior approval of the internship / mini-project by the HoD and Dean is mandatory. It is also necessary for the student to submit a report and make a presentation to the members of the panel constituted by the HoD for assessment.

For further details related to this module, please refer to Module Specification of the respective programmes.

25. Dissertation and Publication

This module has two parts – Dissertation and Publication.

Every student, has to undertake the dissertation work individually on a chosen relevant topic. The topic needs to be approved by the committee constituted by HoD.

Publication is a stage wherein dissertation work of the student is converted into a technical paper to be published in reputed conferences/journals.

For further details related to the this module refer to Module Specifications of the respective programmes

26. Course Assessment

- Every course will be assessed for a weight of 100%
- For the courses having 100% theory
- There are two components-Component-1 and Component-2
- Component-1 (CE) carries a weight of 50% and Component -2 (SEE) carries a weight of 50%
- Component-1 (CE): 50% weight

The course leader will indicate the mode of assessment in consultation and approval of the respective HoD and the faculty Dean, before commencement of the semester.

The template for weightage of CE and SEE in percentages for each theory course is indicated in Table below.

ILO No.	Intended Learning Outcome	CE (Weightage: 50 %)				SEE
		Assessment Type	Comp-1a	Comp-1b	Comp-1c	(Weighta 50 %)
		Comp Weightage (%)	00	00	00	Sem Exam
1	ILO-1					
2	ILO-2					
3	ILO-3					
4	ILO-4					
5	ILO-5					
6	ILO-6					

CE – can be from any combination of the following:

Assignments, term Tests, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, others, if any.

Component - 2 (SEE): 50% weight

- A 3 hour duration Semester End Examination will be conducted for a maximum of 100 marks and will be reduced to 50% weight.
- A student is required to score a minimum of 40% marks in Semester end examination and 40% marks overall in each theory course.
- For Laboratory/ Practical courses
 - Total Marks : 50
 - Component 1(CE) : Laboratory Report: 50% Weight
 - Component 2(SEE) Semester End Examination: 50% Weight
- A 3 hour duration Semester End Examination will be conducted for a maximum of 50 marks.

The course leader will indicate the mode of assessment in consultation and approval of the respective HoD and the faculty Dean, before commencement of the semester.

The template for weightage of CE and SEE in percentages for each course is indicated in Table below.

ILO No.	Intended Learning Outcome	CE (Weightage: 50 %)					SEE (Weightage 50 %):
		Assessment Type	Conductio n of Lab Exercises)	(Viva)	(Lab Record Submissio n)	(Lab Test)	SEE
		Comp Weightage (%)					50
1	ILO-1						
2	ILO-2						

A student is required to score a minimum of 40% marks in Semester end examination and 40% marks overall in each laboratory course.

27. Failure in Course and Makeup Examinations

Makeup Examinations are provided for the students who are not able to meet all pass criteria prescribed for a module during the regular term and fail in the module.

For further details related to makeup examination, please refer to M.Tech. Programme Academic Regulations document.

28. Attendance

Please refer to M.Tech. Programme Academic Regulations document for attendance requirements and condonation related details.

29. Award of Grades

As per the M.Tech. Programme Academic Regulations document.

30. Student Support for Learning

Students are provided with various facilities to support learning such as the following:

1. Course notes
2. Reference books in the library
3. Magazines and Journals
4. Internet facility
5. Computing facility
6. Laboratory facility
7. Workshop facility
8. Staff support
9. Lounges for discussions
10. Any other support that enhances their learning

31. Quality Control Measures

Following are the Quality Control Measures:

1. Review of course notes
2. Review of question papers and assignment questions
3. Student Feedback Analysis
4. Moderation of assessed work
5. Opportunities for the students to see their assessed work
6. Review by external examiners and external examiners reports
7. Staff Student Consultative Committee meetings
8. Student exit feedback analysis
9. Subject Assessment Board (SAB)
10. Programme Assessment Board (PAB)

32. Curriculum Map

Module Code	Intended Learning Outcomes											
	Knowledge and Understanding				Cognitive (Thinking) Skills (Critical, Analytical, Problem Solving, Innovation)				Practical Skills			
	KU1	KU2	KU3	KU4	CS1	CS2	CS3	CS4	PS1	PS2	PS3	PS4
19MME501A			X		X							
19MME502A	X			X		X			X			
19MEC501A	X			X				X			X	
19MEC502A				X				X			X	
19MEC503A		X		X			X	X			X	
19MEC504A			X		X						X	
19MEE511A			X				X			X		
19MEE512A							X			X		
19MEE513A				X			X					
19MEE514A				X					X			
19MEE521A		X		X				X			X	
19MEE522A		X		X				X			X	
19MEE523A			X		X			X		X	X	X
19MEE524A				X				X			X	X
19MEE531A				X			X		X			
19MEP532A	X		X						X			
19MEP533A							X		X			
19MEP521A	X	X	X	X	X	X	X	X	X	X	X	X
19MEP522A	X	X	X	X	X	X	X	X	X	X	X	X
19MEP523A	X	X	X	X	X	X	X	X	X	X	X	X
19FET508A												
19FET509A												
19FET510A												

33. Capability / Transferable Skills Map

Module Code	Group work	Self-learning	Research Skills	Written Communication Skills	Verbal Communication Skills	Presentation Skills	Behavioural Skills	Information Management	Personal management/ Leadership Skills
19MME501A	X	X	X	X	X	X		X	
19MME502A	X	X	X	X	X	X		X	
19MEC501A	X	X	X	X	X	X	X	X	X
19MEC502A	X	X	X	X	X	X	X	X	X
19MEC503A	X	X	X	X	X	X		X	
19MEC504A	X	X	X	X	X	X		X	
19MEE511A	X	X	X	X	X	X		X	
19MEE512A	X	X	X	X	X	X		X	
19MEE513A	X	X	X	X	X	X		X	
19MEE514A	X	X	X	X	X	X		X	
19MEE521A	X	X	X	X	X	X	X	X	X
19MEE522A	X	X	X	X	X	X	X	X	X
19MEE523A	X	X	X	X	X	X		X	
19MEE524A	X	X	X	X	X	X		X	X
19MEE531A	X	X	X	X	X	X		X	
19MEE532A	X	X	X	X	X	X		X	
19MEE533A	X	X	X	X	X	X		X	
19MEP521A		X	X	X	X	X		X	
19MEP522A	X	X	X	X	X	X	X	X	X
19MEP523A		X	X	X	X	X		X	
19FET508A	X	X	X	X	X	X		X	
19FET509A	X	X	X	X	X	X	X	X	
19FET510A				X	X	X	X	X	X

34. Co-curricular Activities

Students are encouraged to take part in co-curricular activities like seminars, conferences, symposium, paper writing, attending industry exhibitions, project competitions and related activities to enhance their knowledge and network.

35. Cultural and Literary Activities

To remind and ignite the creative endeavors, annual cultural festivals are held and the students are made to plan and organize the activities.

36. Sports and Athletics

Students are encouraged to develop a habit of taking part in outdoor and indoor games on regular basis.

