RAMAIAH
UNIVERSITY
OF APPLIED SCIENCES

Programme Specifications

M. Tech. Programme

Programme: Advanced Machinery Design	Department: Mechanical and Manufacturing Engineering

Faculty of Engineering & Technology

M.S. Ramaiah University of Applied Sciences

University House, New BEL Road, MSR Nagar, Bangalore – 560 054

www.msruas.ac.in

Programme Specification

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

	1.	**Title of the Award**
		M. Tech. in Advanced Machinery Design
	2.	**Modes of study**
		Both Full Time and Part 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**
		Various sectors like aerospace, automotive, infrastructure, agriculture, power engineering and machine tools need machineries and equipment. Manufacturing sector is developing and adopting newer manufacturing technologies and processes creating demand for special purpose machines and qualified engineers. The manufacturing sector is growing at a rate of 2.3-2.6% globally and in India it is 4.4-4.6%. It is estimated that there is an annual demand for 500-600 specialized design engineers.
		Design engineers need to be well versed in mechanisms, kinematics and dynamics of machines, materials, manufacturing processes, tribology, machine structures, control systems, electrical and electronics to conceptualize, design and optimization of machinery. Designers should be capable of using modern design tools to model, simulate, analyze, optimize and validate the designs.
		The department has been offering Advanced Machinery Design programme at postgraduate level since 2008 addressing above requirements. Student undergoing this programme are exposed to detailed design procedure through various courses. They are also trained in usage of modern design tools to design machineries for specific applications.
		The graduates are getting opportunities in well-known design and manufacturing companies; few of them are turning entrepreneurs and others pursue research. The faculty of engineering and technology plans for further development of Advanced Machinery Design programme and compete with the best universities in the world to attract high quality graduates as well as teaching talent from all over the country and abroad.

15. Programme Aim

The aim of the programme is to produce postgraduates with advanced knowledge and understanding of contemporary machinery design; higher order critical, analytical, problem solving and transferable skills; ability to think rigorously and independently to meet higher level expectations of industry, academics, research or take up entrepreneurship.

16. Programme Objectives

Students will be taught modelling, simulation, analysis, synthesis and optimization of machinery at element and system level for building and test machinery.

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

1. Summarize machinery design concepts for farming equipment, construction machinery, general engineering machines, material handling equipment, etc.
2. Explain underlying engineering principles for design and control of machinery
3. Identify materials and processing knowledge for design of machine elements
4. Use CAE tools to model, simulate and analyze the behavior of machinery systems for design optimization and performance improvement
5. Design and develop machinery systems to meet varied functional and operational requirements
6. Develop a career in Advanced Machinery Design
7. Practice Teamwork, lifelong learning and continuous improvement

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 the importance of various engineering materials and processing techniques

KU2: Discuss the design principles applied to advanced machinery systems

KU3: Identify the types of load acting on machine elements and explain their effect

KU4: Identify the scope for optimisation for improved design

2. Cognitive Skills

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

CS1: Synthesise a mechanism for development of a machine

CS2: Plan and arrive at detailed engineering design of a machine and its components

CS3: Create models, simulate, analyse and optimise the design

CS4: Design, model and simulate appropriate controls for machine operation

3. Practical Skills

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

PS1: Use commercially available tools for simulation and analysis of mechanisms, structures and controls

PS2: Select materials for machine elements using commercially available database based on functionality

PS3: Conduct tests of machine systems and structures

PS4: Estimate life of components using simulation

4. Capability / Transferable Skills

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

TS1: Manage information, develop technical reports and make presentations

TS2: Build, Manage and Lead a team to successfully complete a project and communicate across teams and organizations to achieve professional objectives

TS3: Work under various constraints to meet project targets

TS4: Adopt to the chosen profession by continuously upgrading his/her knowledge and understanding through Life-long Learning philosophy

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	19MME502A	Engineering Materials and Processes	3	1		4	100
2	19AMD501A	Advanced Mechanics of Materials	3	1		4	100
3	19AMD502A	Synthesis and Dynamics of Mechanisms	3	1	2	5	100
4	19AMD503A	Finite Element Analysis of Mechanical Structures	3	1	2	5	100
5	19AMD504A	Drives and Controls	3	1		4	100
6	19FET508A	Research Methodology & IPR	2	--	--	2	50
7	19FET509A	Professional Communication	1	--	--	0	
		Total	**18**	**3**	**4**	**24**	**550**
	25 hours						
	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	19AMD505A	Vibrations in Machinery	3	1		4	100
2	19AMD5X1A	*Refer Elective Module Table*	3	1		4	100
3	19AMD5X2A	*Refer Elective Module Table*	3	1		4	100
4	19AMD5X3A	*Refer Elective Module Table / MOOC*	3	1		4	100
5	19AMD5X4A	*Refer Elective Module Table / MOOC*	3	1		4	100
9	19FET510A	Value Education	1			0	
			16	**5**	**X**	**20**	**500**
			21 hours				
			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	19AMP521A	*Internship*			10	**4**	100
2	19AMP522A	Group project			**15**	**8**	200
3	19AMP523A	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	19AMP523A	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 Modules List			
Stream / Specialization	S. No.	Course Code	Module Title
Stream -1: Design Optimization	E11	**19AMD511A**	Fatigue and Fracture
	E12	**19AMD512A**	Industrial Tribology
	E13	**19AMD513A**	Design of Machinery
	E14	**19AMD514A**	Optimization Techniques
Stream-2: Machinery Design	E21	**19AMD511A**	Fatigue and Fracture
	E22	**19AMD522A**	Engineering System Design
	E23	**19AMD523A**	Machine Tool Design
	E24	**19AMD524A**	Industrial Machinery Design

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 (PM1- PM6), 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 inter-disciplinary 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

   a. Every course will be assessed for a weight of 100%
   b. For the courses having 100% theory
   c. There are two components-Component-1 and Component-2
   d. Component-1 (CE) carries a weight of 50% and Component -2 (SEE) carries a weight of 50%
   e. 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	(Weightage: 50 %)
		Comp Weightage (%)	00	00	00	Sem End 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. A 3 hour duration Semester End Examination will be conducted for a maximum of 100 marks and will be reduced to 50% weight.
   b. A student is required to score a minimum of 40% marks in Semester end examination and 40% marks overall in each theory course.
   c. For Laboratory/ Practical courses
       a. Total Marks : 50
       b. Component 1(CE) : Laboratory Report: 50% Weight
       c. Component 2(SEE) Semester End Examination: 50% Weight
   d. 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	Conduction of Lab Exercises)	(Viva)	(Lab Record Submission)	(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
19MME502A											X	
19AMD501A		X	X			X					X	
19AMD502A	X	X	X		X	X	X		X	X		
19AMD503A			X	X		X	X		X	X		
19AMD504A	X	X	X		X	X		X	X	X		X
19FET508A												
19FET509A												
19AMD505A	X	X	X			X	X		X	X		X
19AMD511A	X	X	X			X	X		X	X		X
19AMD512A		X	X			X	X				X	
19AMD513A	X	X	X	X	X	X	X	X	X	X	X	
19AMD514A		X	X	X		X	X		X	X		
19AMD510A												
19AMD522A		X	X		X	X			X		X	
19AMD523A		X	X			X					X	
19AMD524A		X	X		X	X	X	X	X	X		X
19AMP521A	X	X	X	X	X	X	X	X	X	X	X	X
19AMP522A	X	X	X	X	X	X	X	X	X	X	X	X
19AMP523A	X	X	X	X	X	X	X	X	X	X	X	X

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
19MME502A	X	X	X	X	X	X		X	X
19AMD501A	X	X	X	X	X	X		X	X
19AMD502A	X	X	X	X	X	X		X	X
19AMD503A	X	X	X	X	X	X		X	X
19AMD504A	X	X	X	X	X	X		X	X
19FET508A	X	X	X	X	X	X		X	
19FET509A	X	X	X	X	X	X	X	X	
19AMD505A	X	X	X	X	X	X		X	X
19AMD511A	X	X	X	X	X	X		X	X
19AMD512A	X	X	X	X	X	X		X	X
19AMD513A	X	X	X	X	X	X		X	X
19AMD514A	X	X	X	X	X	X		X	X
19AMD510A				**X**	**X**	**X**	**X**	**X**	**X**
19AMD522A	X	X	X	X	X	X		X	X
19AMD523A		X	X	X	X	X		X	X
19AMD524A	X	X	X	X	X	X		X	X
19AMP521A		X	X	X	X	X		X	
19AMP522A	X	X	X	X	X	X	X	X	X
19AMP523A		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.

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