Programme Specifications

Programme: Automotive Powertrain Design
Department: Automotive & Aeronautical Engineering

Faculty of Engineering & Technology
M. S. Ramaiah University of Applied Sciences

University House, New BEL Road, MSR Nagar, Bangalore – 560 054
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Programme Specifications: Automotive Powertrain Design

Faculty	Engineering and Technology
Department	Automotive and Aeronautical Engineering
Programme	Automotive Powertrain Design
Dean of Faculty	Prof. H. K. Narahari
HOD	Prof. Raja R.

1.   Title of the Award

M.Tech. in Automotive Powertrain Design

2.   Modes of Study

Full-Time☒Part-Time☒

3.   Awarding Institution /Body

M.S. Ramaiah University Of Applied Sciences – Bangalore, India

4.   Joint Award

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5.   Teaching Institution

Faculty of Engineering and Technology (FET)

M S Ramaiah University of Applied Sciences - Bangalore, India

6.   Date of Programme Specifications

February 2016 (Revised version of 2014)

7.   Date of Programme Approval by the Academic Council of MSRUAS

May 2016

8.   Next Review Date

May 2018

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**

Mobility plays an important role in the development of economy of the world. Particularly, the road transport is very important for day to day movement of people and goods. It is estimated that there will be 1.4 billion vehicles on road by 2020 and around 50% of them in non OECD countries including India and China. Though the road vehicles have a history of more than a century, the development of newer vehicles, creating new designs, improving the existing designs, adoption of new materials and manufacturing methods and introduction of new technologies to improve their performance is a continuing process.

The road transport vehicles are automobiles and commercial vehicles. Normally, we refer the personal transport vehicles as automobiles and the bigger vehicles used for transportation of goods and public as commercial vehicles. The developed countries like the USA, the UK, Germany, France, Italy, Sweden, Japan and South Korea have made mark in design and production of road vehicles. Automotive companies like GM, Ford, Chrysler, Jaguar, Daimler- Benz, BMW, Volkswagen, Renault, Volvo, Toyota, Honda, Suzuki, Nissan, Hyundai, Tata Motors, Mahindra and Mahindra are well known worldwide. Almost all of these companies have established their operations in India too. In addition, companies which provide technology support for automobile development like Robert Bosch, Delphi, Continental and a number of design companies are all located in India. India is one of the largest two wheeler producer in the world; Hero Motors, Bajaj, TVS Motors are the famous two wheeler manufacturers in India. The companies are involved in development of technologies to meet stringent emission norms, reduction of emission of greenhouse gases, safety standards and ease of driving and even autonomous vehicles.

In India, the mobility growth is exponential. In the year 2006, India released Automotive Mission Plan; as per this plan by 2016, India plans to become a hub for automotive design and manufacturing and aspires to contribute 10% to Indian GDP and create 25 million jobs additionally. In the last decade, many multinational automotive companies have established their operations in India and the car sales in India have grown exponentially.

Automotive companies are recruiting a considerable number of graduates in India for the last 8-9 years. Each company recruits around 200-800 fresh engineering graduates annually and 25 % of them are postgraduates specialized in automotive engineering.

It is the primary responsibility of the universities to produce quality graduates to sustain growth of automobile sector. An automobile may broadly be subdivided into running system, powertrain and body system. A powertrain system consists of a power source, clutch, transmission, differential, axles and the wheels. The power flows from power source to wheels through power train subsystems. The power source can be a conventional IC engine, battery powered motor or a hybrid source. The vehicle performance depends on powertrain design and it is the source for emission of greenhouse gases. The success of a vehicle model depends on intelligent design and development of powertrain. To the best our

Knowledge, unique programme on powertrain design is not offered at India and most part of the world. Hence, Faculty of Engineering and Technology at MSRUAS found it necessary to develop and introduce a programme in powertrain design at postgraduate level. The programme focuses on design, development, testing and management of powertrain system. Graduates will have opportunities in the well known automotive companies mentioned earlier; a few of them may take up entrepreneurship and some of them may pursue research. The faculty has facilities to effectively teach, train and pursue research in automotive powertrain area.

15. Programme Aim

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

16. Programme Objectives

Students will be able to apply the knowledge, understanding and skills acquired to design, model, simulate, analyze and evaluate powertrain system/subsystems. They will also be trained to explore alternate powertrain technologies to meet the current and future challenges.

The objectives of the programme are to train and educate the students on the following:

1. Knowledge and understanding of the construction, working principles and functional requirements of modern automotive powertrain systems with emphasis on performance and emissions

2. Design, model, simulate, analyze and validate automotive powertrain components/systems using CAD, CAE, CFD, MBD, MATLAB and Simulink tools

3. Selection of materials and manufacturing processes for automotive powertrain components and systems

4. Identification and Selection of appropriate modern electronic systems for managing the powertrain

5. Evaluation of the performance of automotive powertrain components / systems by conducting physical test

6. Develop a career in Powertrain design segment for automotive industries

7. 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.

17.1   Knowledge and Understanding

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

KU1:   Identify and describe the various components/subsystems, materials and manufacturing processes required for automotive powertrain

KU2:   Explain the underlying engineering principles that govern the powertrain design, usage of various software tools and techniques for performance improvement

KU3:   Explain the role and applications of electronics in powertrain management

KU4:   Evaluate newer technologies over the current technologies

17.2   Cognitive Skills

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

CS1:   Design powertrain system/subsystems for automobiles

CS2:   Create models, simulate and analyze powertrain system/subsystems for their performance

CS3:   Design electronic controls for powertrain control and management

CS4:   Modify the existing design for enhanced performance using advanced technologies and material selection

17.3   Practical Skills

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

PS1:   Use CAE software tools to create geometric models of powertrain system /subsystems /components and analyse for their structural, kinematic, dynamic and thermal behaviour

PS2:   Use CFD software to simulate flow around the engine comportment and also simulate internal flows of engine subsystems for performance improvement

PS3:   Construct numerical test cases and perform IC Engine combustion simulations to improve performance with reduction in emissions

PS4:   Tests physically powertrain system/subsystems to evaluate their performance

17.4   Capability/Transferable Skills

After undergoing the 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

A student is required to successfully complete the following modules for the award of the degree. The programme is delivered as per the Time-Table for every batch.

Module Code	Modules	Credits	Duration (Weeks)
Programme: Automotive Powertrain Design			
	Department- Common Modules		
AAE501	1. Computer Aided Engineering	5	5
AAE503	2. Automotive Materials and Manufacturing Processes	5	5
AAE502	3. Vehicle Aerodynamics and Thermal Management	5	5
	Programme - Specialization Modules		
APT501	1. Modern Automotive Power Plants	5	5
APT502	2. Design and Simulation of Automotive Engines - I	5	5
APT503	3. Design and Simulation of Automotive Engines - II	5	5
APT504	4. Design and Simulation of Automotive Engines - III	5	5
APT505	5. Transmission and Driveline Design	5	5
APT506	6. Powertrain Controls and Simulation	5	5
	Faculty-Common Modules		
FET501	1. Principles of Management and Soft Skills Development	3	3
FET502	2. Research Methodology	3	3
	Elective Module (Any One of 6)	5	5
FET503	1. Industry Internship		
FET504	2. Seminar		
FET505	3. Training		
FET506	4. Student Competition		
FET507	5. Visit to Industries and Exhibitions		
FET508	6. Teaching and Training		
APT599	**Group Work-Project**	10	10
APT600	**Dissertation**	30	26
	Mandatory Module (Any One)	4	4
FET509	1. Conference Publication		
FET510	2. Journal Publication		
		100	96

Note:

1. The Vacations and other activities shall be as per the Time-Table for the corresponding batch.

19. Module Delivery Structure- Full-Time

A module is delivered from Monday to Friday of the week. The lecture classes will be normally held from 9.30 AM to 1.00 PM with 30 minutes of break. The laboratory classes will be held in the afternoon from 2.00PM to 5.00 PM during the first two weeks of the module.

Week-1	Week-2	Week-3	Week-4	Week-5
Module Delivery	Module Delivery	Study Work	Study Work	Assignment submission & Presentation
			Examination	

For Part-Time, the classes are normally held on Saturday and Sunday and the module delivery is for 8 weeks.

20.   Teaching and Learning Methods

The module delivery comprises of a combination of two or more 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.   Elective Module

Elective module can be any one of the following -

FET503   Industry Internship
Internship is to be done with a company or any business or research organization for the module duration. The student is required to submit a report for assessment and also make a presentation to a team of examiners. The internship should be in the company related to the programme. A student is required to find internship on his/her own but the student placement office may assist in getting internship.

FET504   Seminar
A student can deliver a seminar of one hour duration of his/her original study on a contemporary topic after personal visits/survey/collection data. It should not be a collection of information from books/web resources and delivering a presentation/preparing a report. Topic of seminar should be registered at the beginning of the elective module. At the end, seminar must be delivered to a team of examiners and also a word processed report must be submitted for assessment.

FET505   Training
A student can undergo training in any institution or any other organization in a specific subject area that falls under the broad category of his/her specialization. He/she need to submit a complete report on the training undergone and also make a presentation to a team of examiners for assessment.

FET506   Student Competition
A student can take part in a technical competition approved by the department; a report shall be submitted followed by a presentation to a team of examiners for

assessment.

FET507   Visit to Industries and Exhibitions

A student is required to make industry visits and international exhibitions as per the recommendations of the department and submit a report; and make a presentation to a team of examiners for assessment.

FET508   Teaching and Training

A student can teach a module in his / her area of specialization in any institute approved by the department. The student must submit the teaching notes and also make a presentation to a team of examiners for assessment.

FET509   Conference Publication

A student can submit a paper and make a presentation in a conference which is approved by the department. The same paper shall be presented for assessment and the student is required to make a presentation to a team of examiners for assessment.

FET510   Journal Publication

A student can publish a paper in a technical journal. The proof of submission and a copy of the paper shall be submitted to the department. It will be assessed based on a presentation to a team of examiners.

22. Group Project

APT599   A group shall have up to 5 students. The purpose of group project is that the group should be able to design a product in their area of specialization and develop it. 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 students are required to sign an agreement before the commencement of the project. The project should be approved by a committee of examiners before the start of the project. Students can choose a project from the database of projects available with the concerned department. The detailed procedure and evaluation procedure will be provided in Operation Manual / Student Handbook

23. Dissertation

APT600   A student chooses a topic for the Dissertation from the database of the projects available with the concerned department. . The detail procedure for executing and assessing dissertation is available as standard template in i-portal.

24. Assessment and Grading

A module assessment will have two components:
     Component - 1
         Assignment 50% weight
     Component -2
         Examination 50% weight
     (Note: For more details on the break-ups, please refer to the Module Specifications)

A student is required to score a minimum of 40% in each of the components and an overall 40% for successful completion of a module and earning the credits.

Note: Final marks awarded in each of the modules will be confirmed only after SAB/PAB as explained in Academic Regulations of M.Tech. Programme.

25.   Failure and Readmissions

If a student fails in a module, he/she is required to re-attend the module when offered next time by re-registering to the module.

26.   Attendance

A student is required to have a minimum of 85% attendance to be eligible to write the examination. Less than 85% attendance is considered FAIL; such a student is required to follow the same procedure as that of a failed student.

Any condoning of shortfall of the attendance is as per the Academic Regulations for M.Tech. Programme.

27.   Award of Class

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

28.   Student Support for Learning

Student are given the following support:

1. Module 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

29.   Quality Control Measures

Following are the Quality Control Measures:

1. Review of module notes
2. Review of question papers and assignment questions
3. Student feedback
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
9. Subject Assessment Board
10. Programme Assessment Board

30. 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
AAE501									X			
AAE503	X							x		X		
AAE502										x		
APT501	X	X		X	X	X		X				X
APT502		X			X				X			
APT503		X		X	X	X		X		X		X
APT504		X		X	X	X		X			X	
APT505	X	X		X	X	X		X				X
APT506		X	X	X		X	X					X
FET501												
FET502												
FET503					X				X	X		
FET504	X	X	X	X	X	X						
FET505										X	X	X
FET506					X	X						X
FET507	X	X	X	X	X							
FET508	X	X	X	X	X	X						
FET509	X	X	X	X	X	X			X	X	X	
FET510	X	X	X	X	X	X			X	X	X	
APT599	X	X	X	X	X	X	X	X	X	X	X	X
APT600	X	X	X	X	X	X	X	X	X	X	X	X

31. Capability/ Transferable Skills Map

Module Code	Group work	Self learning	Research Skills	Written Communication Skills	Verbal Communication Skills	Presentation Skills	Behavioral Skills	Information Management	Personal management/ Leadership Skills
AAE501		X		X	X	X			X
AAE503		X		X	X	X			X
AAE502		X		X	X	X			X
APT501	X	X	X	X	X	X			X
APT502		X	X	X	X	X			X
APT503		X	X	X	X	X			X
APT504		X	X	X	X	X			X
APT505	X	X	X	X	X	X			X
APT506		X	X	X	X	X			X
FET501	X			X	X	X	X		X
FET502			X	X	X	X		X	
FET503		X		X	X	X	X		
FET504		X	X	X	X	X		X	
FET505				X	X	X			
FET506	X	X	X	X	X	X	X	X	X
FET507		X		X	X	X		X	
FET508		X		X	X	X	X	X	X
FET509		X	X	X	X	X			
FET510		X	X	X	X	X			
APT599	X	X	X	X	X	X	X	X	X
APT600		X	X	X	X	X	X	X	X

32. 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.

33. Cultural and Literary Activities

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

34. 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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