RAMAIAH UNIVERSITY OF APPLIED SCIENCES

Programme Specifications

B. Tech. Programme

Programme:	Department:
Automotive Engineering	Aerospace 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

University's Vision, Mission and Objectives

The M. S. Ramaiah University of Applied Sciences (MSRUAS) will focus on student-centric professional education and motivates its staff and students to contribute significantly to the growth of technology, science, economy and society through their imaginative, creative and innovative pursuits. Hence, the University has articulated the following vision and objectives.

Vision

MSRUAS aspires to be the premier university of choice in Asia for student centric professional education and services with a strong focus on applied research whilst maintaining the highest academic and ethical standards in a creative and innovative environment

Mission

Our purpose is the creation and dissemination of knowledge. We are committed to creativity, innovation and excellence in our teaching and research. We value integrity, quality and teamwork in all our endeavors. We inspire critical thinking, personal development and a passion for lifelong learning. We serve the technical, scientific and economic needs of our Society.

Objectives

1. To disseminate knowledge and skills through instructions, teaching, training, seminars, workshops and symposia in Engineering and Technology, Art and Design, Management and Commerce, Health and Allied Sciences, Physical and Life Sciences, Arts, Humanities and Social Sciences to equip students and scholars to meet the needs of industries, business and society
2. To generate knowledge through research in Engineering and Technology, Art and Design, Management and Commerce, Health and Allied Sciences, Physical and Life Sciences, Arts, Humanities and Social Sciences to meet the challenges that arise in industry, business and society
3. To promote health, human well-being and provide holistic healthcare
4. To provide technical and scientific solutions to real life problems posed by industry, business and society in Engineering and Technology, Art and Design, Management and Commerce, Health and Allied Sciences, Physical and Life Sciences, Arts, Humanities and Social Sciences
5. To instill the spirit of entrepreneurship in our youth to help create more career opportunities in the society by incubating and nurturing technology product ideas and supporting technology backed business
6. To identify and nurture leadership skills in students and help in the development of our future leaders to enrich the society we live in
7. To develop partnership with universities, industries, businesses, research establishments, NGOs, international organizations, governmental organizations in India and abroad to enrich the experiences of faculties and students through research and developmental programmes

Programme Specifications: B. Tech. (Automotive Engineering)

Faculty	Engineering and Technology
Department	Aerospace Engineering
Programme Code	013
Programme Name	B.Tech. (Automotive Engineering)
Dean of the Faculty	Prof. H. M. Rajashekara Swamy
Head of the Department	Prof. Raja R

1. **Title of the Award:** B.Tech. (Automotive Engineering)
2. **Mode of Study:** Full-Time
3. **Awarding Institution /Body:** M. S. Ramaiah University of Applied Sciences, Bengaluru
4. **Joint Award:** Not Applicable
5. **Teaching Institution:** Faculty of Engineering and Technology, M. S. Ramaiah University of Applied Sciences, Bengaluru
6. **Date of Programme Specifications:** October 2020
7. **Date of Programme Approval by the Academic Council of MSRUAS:** 23-Oct-2020
8. **Next Review Date:** May 2024
9. **Programme Approving Regulating Body and Date of Approval:** All India Council for Technical Education, New Delhi, 30-Jun-2020
10. **Programme Accredited Body and Date of Accreditation:** Not Applicable
11. **Grade Awarded by the Accreditation Body:** Not Applicable
12. **Programme Accreditation Validity:** Not Applicable
13. **Programme Benchmark:** Not Applicable
14. **Rationale for the Programme**

Automotive engineering is one of the specialized disciplines of engineering. Designing and manufacturing of automotive components and system have been there world over for many centuries. Automotive Engineering is a specialized discipline, critical to the success of many enterprises. It plays a key role in energy, transportation, development of infrastructure and manufacturing of automotive vehicles.

Presently, automotive engineers are contributing in research and development pertaining to environmental, bio-fuel fields, electric vehicle, use of machine learning and artificial intelligence towards development of autonomous vehicle. Automotive engineers are responsible for selection and processing of eco-friendly materials, fuels and processes, design and fabrication of automotive components and systems to improve the quality of transportation.

The automotive engineering programme at Faculty of Engineering and Technology at RUAS has been developed by the members of the faculty based on interactions with various universities and industries in India and abroad.

The curriculum is outcome based and helps students to develop critical thinking abilities and

imbibe relevant practical skills for a smooth transition from academics to real-lifework environment. Opportunities are provided for the students to do their internship in India or abroad depending on their preferences.
The alumni of the faculty hold respected positions in industry and business in India and abroad.
The faculty interacts with the industry and business offering engineering and consultancy, product design and development services along with training modules to practicing professionals.
The student admitted to the programme in automotive engineering is given a strong foundation in real-life problem solving which quite are with many institutions is offering similar programme.

15. Programme Mission

The purpose of the programme is creation of innovative problem solvers in multi-disciplinary settings, entrepreneurs and leaders applying the knowledge, understanding, cognitive abilities, practical skills and transferrable skills gained through systematic, flexible and rigorous learning in the chosen academic domain.

16. Graduate Attributes (GAs)

GA-1. **Engineering knowledge:** Ability to apply knowledge of mathematics, science, and Engineering fundamentals to solve complex problems in engineering

GA-2. **Problem Analysis:** Ability to analyse engineering problems, interpret data and arrive at meaningful conclusions involving mathematical inferences

GA-3. **Design and Development of Solutions:** Ability to design an engineering system, component, or process to meet desired needs considering public health and safety, and the cultural, societal, and environmental considerations

GA-4. **Conduct Instigations of Complex Problems:** Ability to understand and solve complex engineering problems by conducting experimental investigations

GA-5. **Modern Tool Usage:** Ability to apply appropriate tools and techniques and understand utilization of resources appropriately to complex engineering activities

GA-6. **The Engineer and Society:** Ability to understand the effect of engineering solutions on legal, cultural, social, and public health and safety aspects

GA-7. **Environment and Sustainability:** Ability to develop sustainable solutions and understand their effect on society and environment

GA-8. **Ethics:** Ability to apply ethical principles to engineering practices and professional responsibilities

GA-9. **Individual and Teamwork:** Ability to work as a member of a team, to plan and to integrate knowledge of various engineering disciplines and to lead teams in multidisciplinary settings

GA-10. **Communication:** Ability to make effective oral presentations and communicate technical ideas to a broad audience using written and oral means

GA-11. **Project Management and Finance:** Ability to lead and manage multidisciplinary teams by applying engineering and management principles

GA-12. **Life-long learning:** Ability to adapt to the changes and advancements in technology and engage in independent and life-long learning

17. Programme Outcomes (POs)

B.Tech. graduates will be able to:

PO-1. Apply knowledge of mathematics, science, basic engineering fundamentals and engineering specialization concerned for the solution of complex engineering problems

PO-2. Identify, formulate and analyze engineering problems using first principles of mathematics, science and engineering to interpret data and reach substantiated conclusions

PO-3. Provide solutions to engineering problems by designing systems, components or processes to meet the specified needs considering public health, safety, societal and the environmental considerations

PO-4. Apply the knowledge of laboratory techniques and research methods to solve complex engineering problems through experimental investigations, analysis and interpretation of results

PO-5. Gain proficiency in modelling complex engineering activities by selecting appropriate techniques and IT Tools and utilize available resources effectively

PO-6. Understand the effect of engineering solutions on legal, cultural, social, public health and safety aspects and the consequent responsibilities

PO-7. Develop sustainable engineering solutions and assess their effect on society and environment

PO-8. Understand and apply ethical principles to engineering practices and professional responsibilities

PO-9. Function effectively as an individual or a team player to handle diverse problems in multi-disciplinary settings

PO-10. Make oral and written presentations to communicate technical ideas effectively to engineering community and society at large

PO-11. Apply the knowledge of engineering and management principles to manage projects in multi-disciplinary environments with consideration to cost and time

PO-12. Recognize and engage in lifelong learning to adapt to changing needs and advancements in technology

18. Programme Goal

The programme goal is to produce graduates having critical, analytical and problem-solving skills, and ability to think independently, and to pursue a career in Automotive Engineering.

19. Program Educational Objectives (PEOs)

The Programme educational objectives of the B.Tech. (Automotive Engineering) Programme are:

PEO-1. To Provide students with knowledge in mathematics, science and core engineering area to enable them to deliver efficient solutions for complex engineering problems using analytical and cognitive skills

PEO-2. To enable students to design and develop the sustainable innovative solutions for industry and societal requirements by conducting engineering investigations through experimentation and usage of modern tools.

PEO-3. To inculcate ethics, communication, leadership, soft, managerial and entrepreneurial skills for successful career in industries and to engage in lifelong learning

20. Programme Specific Outcomes (PSOs)

At the end of the B.Tech. (Automotive Engineering) program, the graduate will be able to:

PSO-1. Apply the knowledge in automotive domain including Automotive Systems, Vehicle Dynamics, Automotive Structures , Vehicle Aerodynamics , Materials, Electronic Control and safety systems, Product Design, Electric and Hybrid Vehicles, Autonomous Systems, NVH and Automotive advanced technologies to develop efficient solutions for complex problems in automotive engineering and allied areas

PSO-2. Design and develop the sustainable solutions using automotive engineering principles, concepts, experimentation and appropriate tools to address industry and societal requirements

PSO-3. Demonstrate ethics, leadership qualities, communication, entrepreneurial skills and involvement in lifelong learning for betterment of organisation, environment and society

21. Programme Structure:

Semester 1 (Physics Cycle)							
Sl. No.	**Code**	**Course Title**	**Theory (h/W/S)**	**Tutorials (h/W/S)**	**Practical (h/W/S)**	**Total Credits**	**Max. Marks**
1	20MTB101A	Engineering Mathematics-1	3	1	0	4	100
2	20PHB102A	Engineering Physics	3	0	0	3	100
3	20CES101A	Engineering Mechanics	3	0	0	3	100
4	20ECS102A	Elements of Electronics Engineering	3	0	0	3	100
5	20MES103A	Engineering Drawing	1	0	4	3	100
6	20PHL103A	Engineering Physics Laboratory	0	0	2	1	50
7	20ECL104A	Basic Electronics Laboratory	0	0	2	1	50
8	20TSH101A	Constitution, Human Rights and Law	2	0	0	2	50
		Total	**15**	**1**	**8**	**20**	**650**
		Total number of contact hours per week	**24**				

Semester 1 (Chemistry Cycle)							
Sl. No.	**Code**	**Course Title**	**Theory (h/W/S)**	**Tutorials (h/W/S)**	**Practical (h/W/S)**	**Total Credits**	**Max. Marks**
1	20MTB101A	Engineering Mathematics - 1	3	1	0	4	100
2	20CHB105A	Engineering Chemistry	3	0	0	3	100
3	20MES105A	Elements of Mechanical Engineering and Work shop Practice	2	0	2	3	100
4	20EES107A	Elements of Electrical Engineering	3	0	0	3	100
5	20CSS108A	Elements of Computer Science and Engineering	3	0	0	3	100
6	20CHL106A	Engineering Chemistry Laboratory	0	0	2	1	50
7	20CSL109A	Computer Programming Laboratory	0	0	2	1	50
8	20EEL109A	Basic Electrical Engineering Laboratory	0	0	2	1	50
9	20TSH102A	Professional Communication	2	0	0	2	50
		Total	**16**	**1**	**8**	**21**	**700**
		Total number of contact hours per week	**25**				

Semester 2 (Physics Cycle)							
Sl. No.	**Code**	**Course Title**	**Theory (h/W/S)**	**Tutorials (h/W/S)**	**Practical (h/W/S)**	**Total Credits**	**Max. Marks**
1	20MTB104A	Engineering Mathematics - 2	3	1	0	4	100
2	20PHB102A	Engineering Physics	3	0	0	3	100
3	20CES101A	Engineering Mechanics	3	0	0	3	100
4	20ECS102A	Elements of Electronics Engineering	3	0	0	3	100
5	20MES103A	Engineering Drawing	1	0	4	3	100
6	20PHL103A	Engineering Physics Laboratory	0	0	2	1	50
7	20ECL104A	Basic Electronics Laboratory	0	0	2	1	50
8	20TSH101A	Constitution, Human Rights and Law	2	0	0	2	50
		Total	**15**	**1**	**8**	**20**	**650**
Total number of contact hours per week			**24**				

Semester 2 (Chemistry Cycle)							
Sl. No.	**Code**	**Course Title**	**Theory (h/W/S)**	**Tutorials (h/W/S)**	**Practical (h/W/S)**	**Total Credits**	**Max. Marks**
1	20MTB104A	Engineering Mathematics - 2	3	1	0	4	100
2	20CHB105A	Engineering Chemistry	3	0	0	3	100
3	20MES105A	Elements of Mechanical Engineering and Work shop Practice	2	0	2	3	100
4	20EES106A	Elements of Electrical Engineering	3	0	0	3	100
5	20CSS107A	Elements of Computer Science and Engineering	3	0	0	3	100
6	20CHL106A	Engineering Chemistry Laboratory	0	0	2	1	50
7	20CSL108A	Computer Programming Laboratory	0	0	2	1	50
8	20EEL109A	Basic Electrical Engineering Laboratory	0	0	2	1	50
9	20TSH102A	Professional Communication	2	0	0	2	50
		Total	**16**	**1**	**8**	**21**	**700**
Total number of contact hours per week			**25**				

Semester 3							
Sl. No.	**Code**	**Course Title**	**Theory (h/W/S)**	**Tutorials (h/W/S)**	**Practical (h/W/S)**	**Total Credits**	**Max. Marks**
1	20MTB201A	Engineering Mathematics - 3	3	1	0	4	100
2	20AUC202A	Automotive Materials	3	0	0	3	100
3	20AUC203A	Elements of Automotive Systems and Autonomous Vehicle	3	0	0	3	100
4	20AUC204A	Strength of Materials	3	1	0	4	100
5	20AUC205A	Fluid Mechanics and Machines	3	1	0	4	100
6	20AUL206A	Automotive Systems Laboratory	0	0	2	1	50
7	20AUL207A	Materials and Testing Laboratory	0	0	2	1	50
8	20AUL208A	Fluid Mechanics and Machines Laboratory	0	0	2	1	50
		Total	**14**	**4**	**6**	**21**	**650**
		Total number of contact hours per week	**24**				

Semester 4							
Sl. No.	**Code**	**Course Title**	**Theory (h/W/S)**	**Tutorials (h/W/S)**	**Practical (h/W/S)**	**Total Credits**	**Max. Marks**
1	20MTB211A	Engineering Mathematics - 4	3	1	0	4	100
2	20AUC212A	Thermodynamics for Engineers	3	1	0	4	100
3	20AUC213A	Manufacturing Processes for Automotive Systems	4	0	0	4	100
4	20AUC214A	Theory of Machines	3	1	0	4	100
5	20AUC215A	3D Modeling and Machine Drawing	1	0	4	3	100
6	20AUL216A	Manufacturing Processes Laboratory	0	0	2	1	50
7	20AUL217A	Kinematics and Dynamics Simulation Laboratory	0	0	2	1	50
8	20AUC218A	Artificial Intelligence and Machine Learning	3	1	0	4	50
9	20CEM210A	Environmental Studies	2	0	0	0	Audit
		Total	**19**	**4**	**10**	**25**	**650**
		Total number of contact hours per week	**33**				

Semester 5							
Sl. No	**Code**	**Course Title**	**Theory (h/W/S)**	**Tutorials (h/W/S)**	**Practical (h/W/S)**	**Total Credits**	**Max. Marks**
1	20AUC301A	Propulsion Systems for Electric and Hybrid Vehicle	4	0	0	4	100
2	20AUC302A	Finite Element Analysis	3	1	0	4	100
3	20AUC303A	Automotive Electrical and Electronic Systems	3	0	0	3	100
4	20AUC304A	Design of Automotive Components	3	1	0	4	100
5	20AUC305A	Control System Engineering and Laboratory	3	0	2	4	100
6	20AUL306A	Automotive Powertrain Laboratory	0	0	2	1	50
7	20AUL307A	CAE Laboratory	0	0	2	1	50
Total			**16**	**2**	**6**	**21**	**600**
Total number of contact hours per week			**24**				

Semester 6							
Sl. No.	**Code**	**Course Title**	**Theory (h/W/S)**	**Tutorials (h/W/S)**	**Practical (h/W/S)**	**Total Credits**	**Max. Marks**
1	20AUC311A	Vehicle Body Engineering and Crashworthiness	4	0	0	4	100
2	20AUC312A	Automotive Noise, Vibration and harshness	3	0	0	3	100
3	20AUC313A	Vehicle Dynamics and Handling	3	1	0	4	100
4	20ASC314A	Computational Intelligence in Automotive Applications	4	0	0	4	100
5	20AUL315A	Automotive Noise and Vibrations Laboratory	0	0	2	1	100
6	20AUL316A	Vehicle Simulations Laboratory	0	0	2	1	50
Total			**14**	**1**	**4**	**17**	**600**
Total number of contact hours per week			**19**				

Semester 7							
Sl. No.	**Code**	**Course Title**	**Theory (h/W/S)**	**Tutorials (h/W/S)**	**Practical (h/W/S)**	**Total Credits**	**Max. Marks**
1	20AUE41XA	Professional Core Elective -1	4	0	0	4	100
2	20AUE42XA	Professional Core Elective -2	4	0	0	4	100
	20AUE43XA	Professional Core Elective -3	4	0	0	4	100
3	20OXXXXXX	Open Elective-1/online Course	3	0	0	3	100
4	20AUP401A	Seminar	0	0	2	1	50
5	20AUP402A	i) Project -I	0	0	8	4	100
	20AUP403A	ii) Internship (Any one from i) and ii))					
Total			**15**	**0**	**10**	**20**	**550**
Total number of contact hours per week			**25**				

Semester 8							
Sl. No.	**Code**	**Course Title**	**Theory (h/W/S)**	**Tutorials (h/W/S)**	**Practical (h/W/S)**	**Total Credits**	**Max. Marks**
1	20AUE44XA	Professional Core Elective -4	4	0	0	4	100
2	20OXXXXXX	Open Elective -2 / Online Course	3	0	0	3	100
3	20AUP404A	Project Work -2	0	0	16	8	100
Total			**7**	**0**	**16**	**15**	**300**
Total number of contact hours per week			**23**				

Professional Core Electives (PCE):						
Stream ▶ / Group ▼		**AI and ML for Autonomous Vehicles**	**Control Systems**	**Automotive Systems**	**Data Sciences and Analytics**	**Applied Mathematics**
PCE-1, Sem. 7	**Course Code**	20AUE411A	20AUE412A	20AUE413A	20MTE401A	20MTE411A
	Course Title	Autonomous Vehicles and Future Mobility	Robust Control Systems	Vehicle Aerodynamics and Styling	Probability and Statistics	Advanced Mathematics
PCE-2 Sem. 7	**Course Code**	20AUE421A	20AUE422A	20AUE423A	20CSE421A	20MTE421A
	Course Title	Sensing and Control for Autonomous Vehicles	Adaptive Control Systems	Light Weight and Novel Materials	Data Sciences and Foundation	Optimization Techniques -1
PCE-3 Sem.7	**Course Code**	20AUE431A	20AUE423A	20AUE433A	20CSE431A	20MTE431A
	Course Title	Deep Learning for Automotive Applications	Automotive Control Systems	Design of Automotive Systems	Data Science Algorithm and Applications	Advanced Numerical Methods
PCE-4 Sem. 8	**Course Code**	20AUE441A	20AUE424A	20AUE443A	20CSE441A	20MTE441A
	Course Title	Battery Management Algorithm for Electric Vehicle	Modeling, Dynamics and Control of Electrified Vehicles	Fatigue and Fracture Mechanics	Data Analytics	Optimization Techniques -2

Note:

1. Students are required to select **three** Professional Core Elective Courses in the 7th Semester, one each from PCE-1, PCE-2 and PCE-3 Groups.
2. Students are required to select **one** Professional Core Elective course in the 8th Semester from the PCE-4 Group.

22. Open Elective Courses

A number of Open Elective Courses from Faculties of engineering, management and commerce, art and design, hospitality management and catering technology, pharmacy, dental sciences are offered as mentioned in the University's website. Students can choose the Open Electives on their own choice.

22.1. Innovation Courses in Lieu of Open Elective Courses

Students can take the following 3-credit innovation courses in lieu of Open Elective Courses.

a) Design Thinking and Innovation (20INO250A)
b) Skill Development (20INO251A)
c) Industrial Problem Solving and Hackathons (20INO252A)

23. Course Delivery: As per the Timetable

24. Teaching and Learning Methods

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

25. Assessment and Grading

25.1. Components of Grading

There shall be **two components** of grading in the assessment of each course:

Component 1, Continuous Evaluation (CE): This component involves multiple subcomponents (SC1, SC2, etc.) of learning assessment. The assessment of the subcomponents of CE is conducted during the semester at regular intervals. This subcomponent represents the formative assessment of students' learning.

Component 2, Semester-end Examination (SEE): This component represents the summative assessment carried out in the form an examination conducted at the end of the semester.

Marks obtained CE and SEE components have equal weightage (CE: 50% and SEE: 50%) in determining the final marks obtained by a student in a Course.

The complete details of Grading are given in the Academic Regulations.

25.2. Continuous Evaluation Policies

Continuous evaluation depends on the type of the course as discussed below:

25.2.1 Theory Courses

The following **TWO options** are available for each Faculty to perform the CE exercise.

Option 1 for a Theory Course:

Theory Course			
SC1	SC2	SC3	SC4
25 Marks	25 Marks	25 Marks	25 Marks

In Option 1, there shall be four subcomponents of CE (SC1, SC2, SC3 and SC4). Each subcomponent is evaluated individually for 25 marks. It is mandatory that two of the four subcomponents are term-tests. The remaining two subcomponents can be of any of the following types:

a) Online Test
b) Assignments/Problem Solving
c) Field Assignment
d) Open Book Test
e) Portfolio
f) Reports
g) Case Study
h) Group Task
i) Any other

After the four subcomponents are evaluated, the CE component marks are determined as:
CE Component Marks = (Total of the marks obtained in all the four subcomponents) ÷ 2

An additional subcomponent (SC5) may be used at the discretion of the Faculty/Department. The department can conduct the 5th subcomponent SC5 if this subcomponent gives benefit to students. If the Department/Faculty conducts the SC5 subcomponent of evaluation, and the score obtained by the student in SC5 is greater than the lowest score of the previous four subcomponents SC1 to SC4, then it replaces the lowest of the four scores.

Option 2 for a Theory Course:

Theory Course			
SC1	SC2	SC3	SC4
25 Marks	25 Marks	25 Marks	25 Marks

In Option 2, there shall be four subcomponents, each carrying 25 marks. Out of these, there shall be two assignments and two term-tests. The assignments can be of any of the following types:

a) Online Test
b) Problem Solving
c) Field Assignment
d) Open Book Test
e) Portfolio
f) Reports
g) Case Study
h) Group Task
i) Any other

After the four subcomponents of CE are evaluated, the CE component Marks are determined as:

CE Component Marks = (Best of two Assignment Marks) + (Best of two Term-Test Marks)
Each Faculty Dean, in consultation with the heads of all departments in the Faculty and the Faculty Academic Registrar, decides whether Option 1 or Option 2 is adopted for each programme offered by the Faculty. He/she notifies the students about the option at the beginning of the semester.

25.2.2 Laboratory Course

For a laboratory course, the scheme for determining the CE marks is as under:

Laboratory Course		
SC1	SC2	SC3 (Optional)
25 Marks	25 Marks	25 Marks

The subcomponents can be of any of the following types:

a) Laboratory / Clinical Work Record
b) Experiments
c) Computer Simulations
d) Creative Submission
e) Virtual Labs
f) Viva / Oral Exam
g) Lab Manual Report
h) Any other (e.g. combinations)

After the subcomponents of CE are evaluated, the CE component Marks are determined as:

CE Component Marks = (Total of the best two subcomponent marks out of the three) ÷ 2

25.2.3 Course Having a Combination of Theory and Laboratory

For a course that contains the combination of theory and laboratory sessions, the scheme for determining the CE marks is as under:

For a Course having a Combination of Theory and Laboratory Sessions			
SC1 (Theory)	SC2 (Theory)	SC3 (Theory)	SC4 (Laboratory)
25 Marks	25 Marks	25 Marks	25 Marks

There shall be four subcomponents, each carrying 25 marks. Out of these, there shall be two term-tests and an assignment to evaluate the students' performance in theory. The fourth subcomponent shall be set to evaluate the students' performance in the laboratory.

The theory assignment can be of any of the following types:

a) Online Test
b) Problem Solving
c) Field Assignment
d) Open Book Test
e) Portfolio
f) Reports
g) Case Study
h) Group Task
i) Any other

The laboratory subcomponent can be of any of the following types:

a) Laboratory / Clinical Work Record
b) Experiments
c) Computer Simulations
d) Creative Submission
e) Virtual Labs
f) Viva / Oral Exam
g) Lab Manual Report
h) Any other (e.g. combinations)

After the four subcomponents are evaluated, the CE component marks are determined as:
CE Component Marks = (Total of the marks obtained in all the four subcomponents) ÷ 2

26. Minor Programme

The details of the following aspects of the minor programmes are presented in the **Academic Regulations** for the B. Tech. Degree Programme:

1. Programme Structure
2. Eligibility to Minor Programme
3. Registration to Minor Programme
4. Certification for Minor Programme

27. Student Support for Learning

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

28. Quality Control Measures

1. Review of Course Notes
2. Review of Question Papers and Assignment Questions
3. Student Feedback
4. Moderation of Assessed Work
5. Opportunities for 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 (SAB)
10. Programme Assessment Board (PAB)

29. Programme Map (Course-PO-PSO Map)

Sem.	Course Title	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
1	Engineering Mathematics-1	3	3	2	3						2			3	3	2
1	Engineering Physics	3	3	3	3	1	1	1						3	3	
1	Engineering Mechanics	3	3	3										3		
1	Elements of Electronics Engineering	3	3											3		
1	Engineering Drawing	3	2			2					1			3	2	1
1	Engineering Physics Laboratory	3	2		3			2		1	2			3	3	2
1	Basic Electronics Laboratory	3	3			3					3			3	3	3
1	Constitution, Human Rights and Law	2	2	3				3						3	3	
2	Engineering Mathematics -2	3	3	2	2	2					1			3	2	1
2	Engineering Chemistry	3	3	3	2		3	3			3			3	3	3
2	Elements of Mechanical Engineering and Work shop Practice	3	3											3		
2	Elements of Electrical Engineering	3	3	3	2	2	2	2		1	1	1	1	3	2	1
2	Elements of Computer Science and Engineering	2	1	3	2	2	2		1			1	2	3	2	2
2	Engineering Chemistry Laboratory	3	2		3			2		1	3			3	3	3
2	Computer Programming Laboratory	2	1	3	2	2	2		1			1	2	3	2	2
2	Basic Electrical Engineering Laboratory	3	3	3	2	2				1	1			3	2	1
2	Professional Communication									3	3					3
3	Engineering Mathematics-3	3	3	3	2	2				1	1			3	2	1
3	Automotive Materials	3	3	3			1	2	1	1	1			3	2	1
3	Elements of Automotive Systems and Autonomous Vehicle	3	3	3	2	2	1	1			1			3	2	1
3	Strength of Materials	3	3	3	2	3	2	3	1	2	2	2	2	3	3	2
3	Fluid Mechanics and Machines	3	3	2	3	2	1	2	1	2	1	1	1	3	3	2
3	Automotive Systems Laboratory	3	3		3						1			3	3	1
3	Materials and Testing Laboratory	3	3		3		2		3	2	2			3	3	3
3	Fluid Mechanics and Machines Laboratory	3	3		3		2		3	2	2			3	3	3
4	Engineering Mathematics - 4	3	3	2		2				1	1			3	2	1
4	Thermodynamics for Engineers	3	3	3		1		2			1			3	2	1
4	Manufacturing Processes for Automotive Systems	3	3	3	1		1	1	2		1	1		3	1	2
4	Theory of Machines	3	3	3	1	3	2	2		2	2	3	2	3	3	3
4	3D Modeling and Machine Drawing	3	3	3	2	2					2			3	2	2
4	Manufacturing Processes Laboratory	3	3	3	3	3	3	2	2	2	1	1	2	3	3	2

Sem	Course Title	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
4	Kinematics and Dynamics Simulation Laboratory	3	3	3	3	3		2			3	2	2	3	3	3
4	Artificial Intelligence and Machine Learning	3	3	3	1	3	2	2				1	1	3	3	1
4	Environmental Studies	1					3		1					1	3	1
5	Propulsion Systems for Electric and Hybrid Vehicle	3	3	3		2		2			1			3	2	1
5	Finite Element Analysis	3	3	3		3					1			3	3	1
5	Automotive Electrical and Electronic Systems	3	3	3			2	2	1		1		1	3	2	1
5	Design of Automotive Components	3	3	3			3	3	2	2				3	3	3
5	Control System Engineering and Laboratory	3	3	3		2								3	2	
5	Automotive Powertrain Laboratory	3	3		3		2		3	2	2			3	3	3
5	CAE Laboratory	3	3	3		3					3			3	3	3
6	Vehicle Body Engineering and Crashworthiness	3	3	3			3							3	3	
6	Automotive Noise, Vibration and harshness	3	3	3	2									3	2	
6	Vehicle Dynamics and Handling	3	3	3	3	2	3	3	1	2	3	2	3	3	3	3
6	Computational Intelligence in Automotive Applications	3	3	3										3		
6	Automotive Noise and Vibrations Laboratory	3	3	3	3	2			2	2				3	3	2
6	Vehicle Simulations Laboratory	3	3	3	3	3	2	3	2	2	3	3		3	3	3
7	Autonomous Vehicles and Future Mobility	3	3	3			2	2	2		2	1	1	3	2	2
7	Robust Control Systems	3	3	1										3		
7	Vehicle Aerodynamics and Styling	3	3	3			3	3	3		3	2	2	3	3	3
7	Probability and Statistics	3	3	2	2						2			3	2	2
7	Advanced Mathematics	3	3	2	3						2			3	3	2
7	Sensing and Control for Autonomous Vehicles	3	3	1										3	2	
7	Adaptive Control Systems	3	3	2										3		
7	Light Weight and Novel materials	3	3	3	2		1	1	1		1			3	2	1
7	Data Sciences and Foundation	2	1	3	2	2	2		1			1	2	3	2	2
7	Optimization Technqiues-1	3	3	3			1				2			3	1	2
7	Deep Leaning for Automotive Applications	3	3	3	3									3	3	
7	Automotive Control Systems	3	3	1										3		
7	Design of Automotive Systems	3	3	3	3	3	3	3	2	2	2	2	2	3	3	2
7	Data Sciences Algorithm and Applications	2	1	3	2	2	2		1			1	2	3	2	2
7	Advanced Numerical Methods	3	3	2	2	2					2			3	2	2
7	Project Work-1	3	3	3	3	3	3	2	1	3	3	3		3	3	3
7	Internship	3	3	3	3	3			2	2	3	2	2	3	3	3
7	Seminar	3	3	3	2	2			2	2	3	1	1	3	2	3

Sem	Course Title	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
8	Battery Management Algorithm for Electric Vehicle	3	3	3										3		
8	Modeling, Dynamics and Control of Electrified Vehicles	3	3	3			3	2					2	3	3	
8	Fatigue and Fracture Mechanics	3	3	1										3		
8	Data Analytics	2	1	3	2	2	2		1			1	2	3	2	2
8	Optimization Techniques-2	3	3	3			1					2		3	1	2
8	Project Work-2	3	3	3	3	3	3	2	1	3	3	3		3	3	3

30. Co-curricular Activities

Students are encouraged to take part in co-curricular activities like seminars, conferences, symposia, paper writing, attending industry exhibitions, project competitions and related activities for enhancing their knowledge and networking.

31. Cultural and Literary Activities

Annual cultural festivals are held to showcase the creative talents in students. They are involved in planning and organizing the activities.

32. Sports and Athletics

Students are encouraged to take part in sports and athletic events regularly. Annual sports meet will be held to demonstrate sportsmanship and competitive spirit.