



K.E. Society's
Rajarambapu Institute of Technology, Rajaramnagar
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)
Curriculum Structure and Evaluation Scheme

To be Implemented for 2022-26 Batch
 Department of Automobile Engineering

Rev: AT/RIT/01/2022-26 NEP

Class: S.Y. B.Tech. Automotive Technology

Semester: III

Course Code	Course	Teaching Scheme				Evaluation Scheme					
		L	T	P	Credits	Scheme	Theory (Marks)			Practical (Marks)	
							Max	Min. for passing (%)		Max.	Min. for passing (%)
SH2032	Engineering Mathematics – III	3	1	-	4	ISE	20	40	40	----	----
						UT1	15			----	----
						ESE	50			----	----
AT201	Applied Thermodynamics	3	-	-	3	ISE	20	40	40	----	----
						UT1	15			----	----
						UT2	15			----	----
						ESE	50	40	----	----	
AT203	Engineering Mechanics	3	-	-	3	ISE	20	40	40	----	----
						UT1	15			----	----
						UT2	15			----	----
						ESE	50	40	----	----	
AT205	Fluid Mechanics & Machinery	3	-	-	3	ISE	20	40	40	----	----
						UT1	15			----	----
						UT2	15			----	----
						ESE	50	40	----	----	
AT207	Automotive Systems	3	-	-	3	ISE	20	40	40	----	----
						UT1	15			----	----
						UT2	15			----	----
						ESE	50	40	----	----	
SH2173	Environmental Science	1*	-	-	1	ISE	50	40		----	----
						ESE	50	40		----	----
AT211	Engineering Mechanics Lab.	-	-	2	1	ISE	----	----		100	50
AT213	C++ Programming Lab.	-	-	2	1	ISE	----	----		50	50
						ESE	----	----		50	50
AT215	Automotive Systems Lab.	-	-	2	1	ISE	----	----		100	50
AT217	Machine Drawing Lab.	1	-	2	2	ISE	----	----		50	50
						ESE	----	----		50	50
AT219	Technical Aptitude – I	-	-	2*	1	ISE	----	----		50	50
						ESE	----	----		50	50
SH2603	Environmental Science Project	-	-	2	1	ISE	----	----		100	50
	Open Elective – II Professional Skills Development and Foreign Languages - I	-	-	2	1	ISE	----	----		60	50
						ESE	----	----		40	50
	TOTAL	17	1	14	25						
	TOTAL CONTACT HOURS	32									

ISE = In Semester Evaluation, UT1 = Unit Test 1, UT2 = Unit Test 2, ESE = End Semester Examination

Total Contact Hours/week: 32

Total Credits : 25

Note*: One-hour extra lecture to be allotted in the time-table.

Technical Aptitude-I: 1. Engineering Mathematics-III 2. Applied Thermodynamics 3. Engineering Mechanics





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Department of Automobile Engineering

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Open Elective – II:

Sr. No.	Subject Name		Course Code
1.	Professional Skills Development and Foreign Languages - I	Professional Leadership Skills	SH2633
2.		Interpersonal Skills ['Jeevanvidya' for Work Life Balance]	SH2613
3.		Innovation Tools and Methods for Entrepreneurs	SH2693
4.		Personal Effectiveness and Body Language	SH2593
5.		German Language - Basic Level	SH2733
6.		Japanese Language - Level III	SH2713

Note:

1. A student has to complete any two courses out of six choices offered under Choice Based Professional Skills Development Programme. A course in each semester will be allocated without any repetition.
2. Foreign language course selected in F.Y. Sem-I will remain the same with next levels in Sem-III and IV. (No new entries in S.Y. B.Tech. Sem.-III)





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Department of Automobile Engineering

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Class: S.Y. B.Tech. Automotive Technology

Semester: IV

Course Code	Course	Teaching Scheme				Evaluation Scheme					
		L	T	P	Credits	Scheme	Theory (Marks)		Practical (Marks)		
							Max	Min. for passing (%)	Max	Min. for passing (%)	
AT202	Automotive Materials & Manufacturing Technology	3	-	-	3	ISE	20	40	40	---	---
						UT1	15			---	---
						UT2	15			---	---
						ESE	50			---	---
AT204	Mechanics of Materials	3	-	-	3	ISE	20	40	40	---	---
						UT1	15			---	---
						UT2	15			---	---
						ESE	50			---	---
AT206	Electric Drives	3	-	-	3	ISE	20	40	40	---	---
						UT1	15			---	---
						UT2	15			---	---
						ESE	50			---	---
AT208	Heat Transfer	3	-	-	3	ISE	20	40	40	---	---
						UT1	15			---	---
						UT2	15			---	---
						ESE	50			---	---
AT210	Automotive Electronics & Embedded Systems	3	-	-	3	ISE	20	40	40	---	---
						UT1	15			---	---
						UT2	15			---	---
						ESE	50			---	---
AT212	Solid Modelling Lab.	-	-	2	1	ISE	---	---	50	50	
						ESE	---	---	50	50	
AT214	Thermal Engg. & Fluid Mechanics Lab.	-	-	2	1	ISE	---	---	100	50	
AT216	Automotive Electrical & Electronics Lab.	-	-	2	1	ISE	---	---	100	50	
AT218	Python Programming	-	-	4	2	ISE	---	---	50	50	
						ESE	---	---	50	50	
AT220	Technical Aptitude - II	-	-	2*	1	ISE	---	---	50	50	
						ESE	---	---	50	50	
	Open Elective – III Professional Skills Development and Foreign Languages - II	-	-	2	1	ISE	-	-	60	50	
						ESE	-	-	40	50	
	TOTAL	15	0	14	22						
	TOTAL CONTACT HOURS	29									

ISE = In Semester Evaluation, UT1 = Unit Test 1, UT2 = Unit Test 2, ESE = End Semester Examination

Total Contact Hours/week : 29

Total Credits : 22

Note: During summer vacation students should undergo garage training of minimum 4 weeks or certification of any Solid Modelling software (Minimum 40 Hrs). The evaluation of this will be carried out in Third Year B. Tech. Semester-V

Note*: One-hour extra lecture to be allotted in the timetable.

Technical Aptitude-II: 1. Fluid Mechanics & Machinery 2. Mechanics of Materials 3. Heat Transfer





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Open Elective – III:

Sr. No.	Subject Name		Course Code
1.	Professional Skills Development and Foreign Languages - II	Professional Leadership Skills	SH2633
2.		Interpersonal Skills ['Jeevanvidya' for Work Life Balance]	SH2613
3.		Innovation Tools and Methods for Entrepreneurs	SH2693
4.		Personal Effectiveness and Body Language	SH2593
5.		German Language - Advanced Level	SH2643
6.		Japanese Language - Level IV	SH2623

Note:

1. A student has to complete any two courses out of six choices offered under Choice Based Professional Skills Development Programme. A course in each semester will be allocated without any repetition.
2. Foreign language course selected in F.Y. Sem-I will remain the same with next levels in Sem-III and IV. (No new entries in S.Y. B.Tech. Sem.-III)





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Class: T.Y. B.Tech. (Automotive Technology)

Semester: V

Course Code	Course	Teaching Scheme				Evaluation Scheme					
		L	T	P	Credits	Scheme	Theory (Marks %)		Practical (Marks %)		
							Max.	Min. for Passing	Max.	Min. for Passing	
AT351	Theory of Machines	3	-	-	3	ISE	20	40	40	---	---
						UT1	15		---	---	---
						UT2	15		---	---	---
						ESE	50		---	---	---
	Program Elective - I	2	-	-	2	ISE	20	40	40	---	---
						UT1	15		---	---	---
						UT2	15		---	---	---
						ESE	50		---	---	---
	Open Elective - I	3	-	-	3	ISE	20	40	40	---	---
						UT1	15		---	---	---
						UT2	15		---	---	---
						ESE	50		---	---	---
	Multidisciplinary Minor - I	3	-	-	3	ISE	20	40	40	---	---
						UT1	15		---	---	---
						UT2	15		---	---	---
						ESE	50		---	---	---
	Multidisciplinary Minor - III	3	-	-	3	ISE	20	40	40	---	---
						UT1	15		---	---	---
						UT2	15		---	---	---
						ESE	50		---	---	---
SH3034	Scholastic Aptitude - I	2	-	-	2	ISE	20	40	40	---	---
						UT1	15		---	---	---
						UT2	15		---	---	---
						ESE	50		---	---	---
	Multidisciplinary Minor - IV	-	-	4	2	ISE	---	---	50	50	
						ESE	---	---	50	50	
AT353	Theory of Machines Lab.	-	-	2	1	ISE	---	---	100	50	
AT3291	Technical Aptitude - III	-	-	2	1	ESE	---	---	100	50	
AT349	Summer Internship	-	-	-	2	ISE	---	---	100	50	
TOTAL		16	-	08	22						
TOTAL CONTACT HOURS		24									

ISE = In Semester Evaluation, UT-1 = Unit Test-1, UT-2 = Unit Test-2, ESE = End Semester Exam.

Total Contact Hours/week : 24

Total Credits : 22

Technical Aptitude Courses : Theory of Machines, Material Science, Mechanical Measurement & Metrology





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Program Elective – I:

Sr. No.	Course Code	Discipline	Course
1	AT3091	Automotive Design	Automotive Product Design and Development
2	AT337		Hydraulics & Pneumatics
3	AT339	Automotive Service & Management	Transport Management
4	AT341		Automotive Maintenance

Open Elective – I

Sr. No.	Course Code	Course Name	Offered By Department
1	OE345	Soft Computing	Computer Science & Information Technology
2	OE343	Data Science	Computer Science & Engineering (Artificial Intelligence and Machine Learning)
3	OE347	New Product Design & Development	Mechanical Engineering
4	OE349	Non-Conventional Energy Sources	Mechanical Engineering
5	OE351	Hydrogen & Fuel Cell Technology	Mechanical Engineering
6	OE3044	Renewable Energy Sources	Automobile Engineering
7	OE353	Factory Automation	Mechatronics Engineering
8	OE355	Cyber Physical Systems	Mechatronics Engineering
9	OE3104	Network Administration	Computer Science & Engineering
10	OE3064	Environmental Impact Assessment	Civil Engineering
11	OE3084	Materials Management	Civil Engineering
12	OE341	Energy Auditing and Management	Electrical Engineering
13	OE357	Internet of Things	Electronics & Telecommunication Engineering
14	OE359	Drone Technology	Electronics & Telecommunication Engineering





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Class: T.Y. B.Tech. (Automotive Technology)

Semester: VI

Semester: VI											
Course Code	Course	Teaching Scheme				Evaluation Scheme					
		L	T	P	Credits	Scheme	Theory (Marks %)		Practical (Marks %)		
							Max.	Min. for Passing	Max.	Min. for Passing	
AT328	Automotive Power Plant	3	-	-	3	ISE	20	40	40	---	---
						UT1	15			---	---
						UT2	15			---	---
						ESE	50			40	---
AT330	Design of Machine Elements	3	-	-	3	ISE	20	40	40	---	---
						UT1	15			---	---
						UT2	15			---	---
						ESE	50			40	---
AT332	Research Methodology	2	-	-	2	ISE	20	40	40	---	---
						UT1	15			---	---
						UT2	15			---	---
						ESE	50			40	---
	Program Elective - II	3	-	-	3	ISE	20	40	40	---	---
						UT1	15			---	---
						UT2	15			---	---
						ESE	50			40	---
	Open Elective - II	3	-	-	3	ISE	20	40	40	---	---
						UT1	15			---	---
						UT2	15			---	---
						ESE	50			40	---
	Multidisciplinary Minor - V	3	-	-	3	ISE	20	40	40	---	---
						UT1	15			---	---
						UT2	15			---	---
						ESE	50			40	---
	Multidisciplinary Minor - II	3	-	-	3	ISE	20	40	40	---	---
						UT1	15			---	---
						UT2	15			---	---
						ESE	50			40	---
SH3064	Scholastic Aptitude - II	2	-	-	2	ISE	20	40	40	---	---
						UT1	15			---	---
						UT2	15			---	---
						ESE	50			40	---
AT341	Automotive Power Plant & Vehicle Testing Lab.	-	-	4	2	ISE	---	---	50	50	
						ESE	---	---	50	50	
AT3241	Technical Aptitude - IV	-	-	2	1	ESE	---	---	100	50	
AT3261	Capstone Project Phase - I	-	-	2	1	ISE	---	---	100	50	
	TOTAL	22	-	8	26						
	TOTAL CONTACT HOURS	30									

ISE = In Semester Evaluation, UT-1 = Unit Test-1, UT-2 = Unit Test-2, ESE = End Semester Exam.

Total Contact Hours/week : 30

Total Credits : 26

Technical Aptitude Courses: Design of Machine Elements, Power Plant Engg., Industrial Engg.





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Program Elective – II:

Sr. No.	Course Code	Discipline	Course
1	AT334	Automotive Design	Mechanics of Composite Materials
2	AT336		Sensors and Actuators
3	AT338	Automotive Service & Management	Vehicle Body Repair
4	AT340		Automotive Dealership Management

Open Elective -II			
Sr. No.	Course Code	Course Name	Offered By Department
1	OE3401	Cyber security	Computer Science & Information Technology
2	OE342	Data Mining	Computer Science & Engineering (Artificial Intelligence and Machine Learning)
3	OE3024	Reliability Engineering	Automobile Engineering
4	OE344	Supply Chain Analytics	Mechatronics Engineering
5	OE346	Mobile Robotics	Mechatronics Engineering
6	OE348	Information Technology Foundation Program	Computer Science & Engineering
7	OE3381	Disaster Management	Civil Engineering
8	OE350	Operations Research	Civil Engineering
9	OE3182	Industrial Drives	Electrical Engineering
10	OE352	Image Processing	Electronics & Telecommunication Engineering
11	OE354	Fuzzy logic and Neural Network	Electronics & Telecommunication Engineering
12	OE3284	Supply Chain Management	Mechanical Engineering
13	OE3324	Entrepreneurship Development	Mechanical Engineering
14	OE356	Project Management	Mechanical Engineering





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Class: Final Year B.Tech. (Automotive Technology)

Semester: VII

Course Code	Course	Teaching Scheme				Evaluation Scheme					
		L	T	P	Credits	Scheme	Theory (Marks %)		Practical (Marks %)		
							Ma x.	Min. for Passing	Max.	Min. for Passing	
AT459	Electric and Hybrid Electric Vehicles	2	-	-	2	ISE	20	40	40	---	---
						MSE	30			---	---
						ESE	50			---	---
AT461	Automotive System Design	3	-	-	3	ISE	20	40	40	---	---
						MSE	30			---	---
						ESE	50			---	---
AT4031	Vehicle Dynamics	3	-	-	3	ISE	20	40	40	---	---
						MSE	30			---	---
						ESE	50			---	---
	Program Elective – III	3	-	-	3	ISE	20	40	40	---	---
						MSE	30			---	---
						ESE	50			---	---
	Program Elective - IV	3	-	-	3	ISE	20	40	40	---	---
						MSE	30			---	---
						ESE	50			---	---
	Program Elective – III Lab.	-	-	2	1	ISE	--	---	---	50	50
						ESE	--			50	50
AT475	Automotive System Design Lab.	-	-	2	1	ISE	--	---	---	50	50
						ESE	--	---	---	50	50
AT477	Automotive Simulation Lab.	-	-	2	1	ISE	--	---	---	100	50
AT479	Automotive Diagnostics Lab.	-	-	2	1	ISE	--	---	---	50	50
						ESE	--	---	---	50	50
AT481	Capstone Project Phase - II	-	-	6	3	ISE	--	---	---	50	50
						ESE	--	---	---	50	50
	TOTAL	14	-	14	21						
	TOTAL CONTACT HOURS	28									

ISE = In Semester Evaluation, MSE = Mid Semester Exam, ESE = End Semester Exam.

Total Contact Hours/week : 28

Total Credits : 21





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Program Elective – III:

Sr. No.	Course Code	Discipline	Course
1	AT463	Automotive Design	Finite Element Methods
2	AT4191		Automotive NVH
3	AT4351	Automotive Service & Management	Automotive Air Conditioning
4	AT465		Motor Insurance Practices

Program Elective – IV:

Sr. No.	Course Code	Discipline	Course
1	AT4071	Automotive Design	Automotive Aerodynamics
2	AT4171		Computational Fluid Dynamics
3	AT4151	Automotive Service & Management	Industrial Engineering
4	AT467		Special Purpose Vehicles

Program Elective – III Lab.:

Sr. No.	Course Code	Discipline	Course
1	AT469	Automotive Design	Finite Element Methods Lab.
2	AT4451		Automotive NVH Lab.
3	AT471	Automotive Service & Management	Automotive Air Conditioning Lab.
4	AT473		Motor Insurance Practices Lab.





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Choice Based Internship Model
Model I: Industry Internship (II)

Class: Final Year B.Tech. (Automotive Technology)

Semester: VIII

Course Code	Course	Teaching Scheme				Evaluation Scheme					
		L	T	P	Credits	Scheme	Theory (Marks %)		Practical (Marks %)		
							Max.	Min. for Passing	Max.	Min. for Passing	
OE4382	Finance for Engineers (Online Course)	2	-	-	2	ISE	25	40	40	---	---
						ESE	75	40		---	---
OE4362	Engineering Management & Economics (Online Course)	2	-	-	2	ISE	25	40	40	---	---
						ESE	75	40		---	---
IP4024	Industry Internship & Project	-	-	-	1	ISE	---	----		50	50
					2	ESE	---	---		50	50
	TOTAL	-	-	-	16						

ISE: In Semester Evaluation, ESE: End Semester Exam

Total Contact Hours/week : --
Total Credits : 16

Note:

- Weekly Contact hours are not mentioned as student is expected to be in industry regularly for 20 weeks. However, student needs to report to Institute mentors as and when required.
- For online course, lecture videos of each unit will be made available through college platform to the students. For each unit there will be separate assignment. Students need to submit all assignments within specified time.

Weightage: 25% weightage for unit wise assignments + 75% weightage for final exam. Final exam will be held at college campus.





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Model II: Research Internship (RI)

Class: Final Year B.Tech. (Automotive Technology)

Semester: VIII

Course Code	Course	Teaching Scheme				Evaluation Scheme					
		L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)	
							Max.	Min. for Passing		Max.	Min. for Passing
OE4382	Finance for Engineers (Online Course)	2	-	-	2	ISE	25	40	40	---	---
						ESE	75	40		---	---
OE4362	Engineering Management & Economics (Online Course)	2	-	-	2	ISE	25	40	40	---	---
						ESE	75	40		---	---
RE4044	Research Internship	-	-	-	12	ISE	---	---		50	50
						ESE	---	---		50	50
	TOTAL	-	-	-	16						

ISE: In Semester Evaluation, ESE: End Semester Exam

Total Contact Hours/week : --

Total Credits : 16

Note:

- 1] Weekly Contact hours are not mentioned as student is expected to be in outside research organization regularly for 20 weeks. However, student needs to report to Institute mentors as and when required.
- 2] For online course, lecture videos of each unit will be made available through college platform to the students. For each unit there will be separate assignment. Students need to submit all assignments within specified time.
- 3] Students who opt for a research internship need to undergo a minimum of one month of research internship in outside research organizations or laboratories.

Weightage: 25% weightage for unit wise assignments + 75% weightage for final exam. Final exam will be held at college campus.





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Model III: Entrepreneurial Internship (ED)

Class: Final Year B.Tech. (Automotive Technology)

Semester: VIII

Course Code	Course	Teaching Scheme			Credits	Evaluation Scheme					
		L	T	P		Scheme	Theory (Marks %)			Practical (Marks %)	
							Max.	Min. for Passing		Max.	Min. for Passing
ED4104	Project Management (Online Course)	-	-	-	2	ISE	25	40	40	-	-
						ESE	75	40		-	-
ED4044	Commercial Aspects of the Project (Online Course)	-	-	-	2	ISE	25	40	40	-	-
						ESE	75	40		-	-
ED4064	Entrepreneurship Development Program (EDP)	-	-	-	1	ISE	---	--		100	50
ED4084	Entrepreneurial Internship	-	-	-	11	ISE	--	--		50	50
						ESE	--	--		50	50
	TOTAL	-	-	-	16						

ISE: In Semester Evaluation, ESE: End Semester Exam

Total Contact Hours/week : -

Total Credits : 16

Note:

1] Weekly Contact hours are not mentioned as student is expected to be in outside research organization regularly for 20 weeks. However, student needs to report to Institute mentors as and when required.

2] For online course, lecture videos of each unit will be made available through college platform to the students. For each unit there will be separate assignment. Students need to submit all assignments within specified time.

3] Students who opt for an entrepreneurial internship need to undergo a one-month internship at an outside reputed organization or firm

Weightage: 25% weightage for unit wise assignments + 75% weightage for final exam. Final exam will be held at college campus.

4] A one-week Entrepreneurship Development Program (EDP) will be conducted after completion of 7th semester and before start of 8th semester.



Multidisciplinary Minor

- Student should choose any one specialization given by the department and complete all the five courses under the specialization
- Following are the baskets of multidisciplinary minor courses

Multidisciplinary Minor Baskets					
MDM Basket Name	Sr. No.	Course Code	Course Name	Semester	Offered by Department
Automobile Engineering	1	ATMD201	Automobile Systems	III	Automotive Technology
	2	ATMD202	I. C. Engines	IV	
	3	ATMD301	Automotive Safety & Ergonomics	V	
	4	ATMD303	Automotive Engineering Lab.	V	
	5	ATMD302	Electric Vehicles	VI	
Construction Engineering	1	CEMD201	Building Construction and Planning	III	Civil Engineering
	2	CEMD202	Building Estimation and Valuation	IV	
	3	CEMD301	Infrastructure Engineering	V	
	4	CEMD303	Smart Cities and Sustainable Development	V	
	5	CEMD302	Public Health Engineering	VI	
Software Programming	1	CSMD201	Introduction to Data Structures	III	Computer Science & Engineering
	2	CSMD202	Problem solving using JAVA	IV	
	3	CSMD301	Fundamentals of Database Systems	V	
	4	CSMD303	Object-oriented Programming in Python	V	
	5	CSMD302	Artificial Intelligence	VI	
Electrical Power System	1	EEMD201	Electrical Power Generation	III	Electrical Engineering
	2	EEMD202	Power System	IV	
	3	EEMD301	Electrical Machines	V	
	4	EEMD303	Electrical Technology Lab	V	
	5	EEMD302	Smart Grid	VI	



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Electronics System Design	1	ECMD201	Electronics Devices and Applications	III	Electronics & Telecommunication Engineering
	2	ECMD202	Electronics Communication Systems	IV	
	3	ECMD301	System Analysis using MATLAB	V	
	4	ECMD303	PCB Design and Fabrication	V	
	5	ECMD302	Electronics for Industrial Applications	VI	
Software Development	1	CIMD201	Data Structures	III	Computer Science & Information Technology
	2	CIMD202	Computer Algorithms	IV	
	3	CIMD301	Introduction to DBMS	V	
	4	CIMD303	OOP using Java	V	
	5	CIMD302	Software Engineering	VI	
Elements of Mechanical Engineering	1	MEMD201	Materials and Applications	III	Mechanical Engineering
	2	MEMD202	Design and Drawing of Machine Components	IV	
	3	MEMD301	Manufacturing and Assembly Process	V	
	4	MEMD303	Refrigeration and Air Conditioning	V	
	5	MEMD302	Power Plant Engineering	VI	
Mechatronics Engineering	1	MCMD201	Fundamentals of Mechatronics	III	Mechatronics Engineering
	2	MCMD202	Industrial Fluid Power	IV	
	3	MCMD301	Sensor and Instrumentation	V	
	4	MCMD303	Industrial Automation	V	
	5	MCMD302	Industrial Robotics	VI	
Artificial Intelligence	1	AIMD201	Object Oriented Programming	III	Computer Science & Engineering (AI-ML)
	2	AIMD202	Data Structures and Algorithms	IV	
	3	AIMD301	Machine Learning	V	
	4	AIMD303	Business Intelligence	V	
	5	AIMD302	Principles of AI	VI	





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B.Tech. in Automotive Technology with Double Minor (Multidisciplinary and Specialization Minor)





B. Tech. in Automotive Technology with Double Minor degree

- To get B. Tech. in Automotive Technology with Double Minor degree student need to earn extra 18 credits by completing 6 minor courses (One minor course / semester)
- Minor courses can be completed through online platforms
- Student can choose any one specialization given by the department and complete all the six courses under the specialization to earn total 188 Credits which consist 170 credits of regular Multidisciplinary Minor courses and 18 Credits of Double Minor courses.
- Following are the baskets of Minor courses

Double Minor Baskets					
Double Minor Basket Name	Sr. No.	Course Code	Course Name	Semester	Offered by Department
Electric Vehicle	1	ATDM201	Powertrain for EV	III	Automotive Technology
	2	ATDM202	Battery Management Systems for Electric Vehicles	IV	
	3	ATDM301	Hybrid Vehicles	V	
	4	ATDM302	Fuel Cell Technology	VI	
	5	ATDM401	Charging Infrastructure	VII	
	6	ATDM402	Autonomous Vehicle	VIII	
Water Resource Management	1	CEDM201	Water Economics and Governance	III	Civil Engineering
	2	CEDM202	Availability and Management of Groundwater Resources	IV	
	3	CEDM301	Pollutants and Water Supply	V	
	4	CEDM302	Integrated Waste Management For A Smart City	VI	
	5	CEDM401	Advanced Geomatics Engineering	VII	
	6	CEDM402	Optimization Methods for Civil Engineering	VIII	





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Data Science	1	CSDM201	Principles of Data Science	III	Computer Science & Engineering
	2	CSDM202	Data Wrangling with Python	IV	
	3	CSDM301	Data management and representation	V	
	4	CSDM302	Exploratory Data Analysis	VI	
	5	CSDM401	Business Analytics	VII	
	6	CSDM402	NPTEL/SWAYAM	VIII	
Electric Vehicle and Renewable Energy Systems	1	EEDM201	Technologies for Clean And Renewable Energy Production	III	Electrical Engineering
	2	EEDM202	Renewable Energy Engineering: Solar, Wind and Biomass Energy Systems	IV	
	3	EEDM301	Solar Photovoltaics Fundamentals, Technology and Applications	V	
	4	EEDM302	Introduction to Hybrid and Electric Vehicles	VI	
	5	EEDM401	Fundamentals of Electric vehicles: Technology and Economics	VII	
	6	EEDM402	Electric vehicles and Renewable energy	VIII	
Internet of Things	1	ECDM201	Sensors and Actuators	III	Electronics & Telecommunication
	2	ECDM202	Wireless Sensor Networks	IV	
	3	ECDM301	IoT protocols and Security	V	
	4	ECDM302	Embedded System Design for IoT	VI	
	5	ECDM401	Android Application Design	VII	
	6	ECDM402	Cloud Integration using AWS	VIII	
Artificial Intelligence and Data Science	1	CIDM201	Artificial Intelligence	III	Computer Science & Information Technology
	2	CIDM202	Data Science with R programming	IV	
	3	CIDM301	Machine Learning	V	
	4	CIDM302	Business Intelligence	VI	
	5	CIDM401	Deep learning	VII	
	6	CIDM402	Data Ethics and Privacy	VIII	





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AI Based Condition Monitoring	1	MEDM201	Fundamentals of Structural Dynamics	III	Mechanical Engineering
	2	MEDM202	Principles of Vibration control	IV	
	3	MEDM301	Machinery Fault Diagnosis	V	
	4	MEDM302	Instrumentation and Data Recording	VI	
	5	MEDM304	Double Minor IV Lab	VI	
	6	MEDM401	AI Tools and Signal Processing	VII	
	7	MEDM402	AI Based Condition Monitoring	VIII	
Autotronics	1	MCDM201	Fundamentals of Automotive Systems	III	Mechatronics Engineering
	2	MCDM202	Automotive Electrical and Electronics	IV	
	3	MCDM301	Automotive Communication System	V	
	4	MCDM302	Automotive Driver Assistant System	VI	
	5	MCDM401	Engine Control System	VII	
	6	MCDM402	Automotive Diagnostics	VIII	
Artificial Internet of Things - AIOT	1	AIDM201	Introduction to Internet of Things	III	Computer Science & Engineering (Artificial Intelligence and Machine Learning)
	2	AIDM202	IoT Protocols	IV	
	3	AIDM301	IoT System Design	V	
	4	AIDM302	Industry 4.0 and IIoT	VI	
	5	AIDM401	Internet of Things Technology and Applications	VII	
	6	AIDM402	NPTEL/SWAYAM	VIII	





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B.Tech. in Automotive Technology with Honor and Multidisciplinary Minor





**B. Tech. in Automotive Technology with Honor and
Multidisciplinary Minor degree**

- To get B. Tech. in Automotive Technology with Honor and Multidisciplinary Minor degree student need to earn extra 18 credits by completing 6 Honor courses (One course / semester)
- Honor course can be completed through online platforms
- Student can choose any one specialization given by the department and complete all the six courses under the specialization to earn total 188 Credits which consist 170 credits of regular Multidisciplinary Minor courses and 18 Credits of Honor courses.
- Following are the baskets of Honor courses

Specialization: Vehicle Design & Development			
Sr. No.	Course Code	Course Name	Offered in Semester
1	ATHO201	Automotive Styling and Ergonomics	III
2	ATHO202	Automotive Body & Structure Design	IV
3	ATHO301	Engine Design	V
4	ATHO302	Vehicle Testing and Certification	VI
5	ATHO401	Automotive Safety	VII
6	ATHO402	Design of Electric Vehicles	VIII





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B. Tech. in Automotive Technology-Honors with Research and Multidisciplinary Minor





Honors with Research and Multidisciplinary Minor

The Student will work on Research Project or Dissertation for 18 Credits in the Fourth Year in respective discipline. The distribution of 18 Credits for Research project in Sem-VII and Sem-VIII is given below. To get B.Tech in Electrical Engineering-Honors with Research and Multidisciplinary Minor degree Student need to earn total 206 Credits which consist 170 credits of regular Multidisciplinary Minor courses, 18 Credits of Honor courses and 18 credits of Research courses.

Class: Final Year B.Tech.

Semester: VII

Course Code	Course	Teaching Scheme				Evaluation Scheme					
		L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)	
							Max.	Min. for passing		Max.	Min. for passing
REH401	Intellectual Property Rights	-	-	-	2	ISE	50	40	40	---	---
						ESE	50	40		---	---
REH403	Research Project (Synopsis) Phase - I	-	-	-	2	ISE	--	--	--	50	50
						ESE	--	--		50	50
REH405	Research Specific Core Course - I (Online NPTEL course)	-	-	-	3	ISE	50	40	40	--	--
						ESE	50	40		--	--
	TOTAL	-	-	-	7						

ISE: In Semester Evaluation, ESE: End Semester Exam.

Note: For Evaluation of Online NPTEL course ISE Marks will be marks obtained by students in the assignments given by NPTEL, students who will secure NPTEL certification will be only eligible for ESE of the same course which will be conducted at institute

Class: Final Year B.Tech.

Semester: VIII

Course Code	Course	Teaching Scheme				Evaluation Scheme					
		L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)	
							Max.	Min. for passing		Max.	Min. for passing
REH402	Research Project Phase - II	-	-	-	11	ISE	--	--	--	50	50
						ESE	--	--		50	
	TOTAL	-	-	-	11						

ISE: In Semester Evaluation, ESE: End Semester Exam.





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Class:- Final Year B.Tech.	Semester: VII
Course Code: AT459	Course: Electric and Hybrid Electric Vehicles

L	T	P	Credits
2	-	-	2

Course Description:

Electric and hybrid electric vehicles are being seen as substitutes for conventional IC engine powered vehicles. In view of current and future transportation challenges, HEV technology is poised for significant growth. Policy initiatives of Government of India like NEMMP and FAME encourage this technology and help penetrate into the market. Research is going on to find solutions to the current limitations of this technology. This course exposes the students to the EV and HEV technology and equips them to avail emerging opportunities in the area of HEV technology in automotive industry.

Course Outcomes:

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

1. Appreciate the need of EVs and HEVs in today's transportation context.
2. Design an electric vehicle application for given requirements.
3. Present the hybrid electric vehicle technology in detail.

Prerequisite:

A basic course on Automobile Engineering and Electrical Machines is recommended as pre-requisites for this course.

Course Content:

Unit No.	Description	Hrs.
1.	Introduction and background Environment impact, market scenario, conventional drive train elements, I C engine characteristics, performance curves of conventional typical manual transmission, ideal power curve, well to wheel analysis, carbon credits, GoI policy initiatives	06
2.	Electric vehicles - technology and design Configurations of EVs, Electric motor characteristics, design process and issues, modelling and performance estimation, energy consumption, regenerative brakes	06
3.	Hybrid electric vehicle technology Concept, modes and operation patterns, architectures of hybrid drive trains, series hybrid drive train, parallel hybrid drive train with torque coupling and speed coupling	06
4.	Energy sources and drives for EVs Electrochemical batteries (Lead acid and Li-ion), Battery performance parameters, Ragone plots, charging of batteries, battery management system (BMS), super capacitors, electric motors used for EVs and HEVs like dc motors, induction motors, PM motors, synchronous motors, SRM, selection of batteries and motors	06





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References:

Text Books-

- Ehsani, Gao and Emadi, Modern Electric, Hybrid Electric and Fuel cell vehicles, 2nd edition, CRC Press, 2010

Reference Books-

- James Larminie, John Lowry, Electric Vehicle Technology Explained, John Wiley & Sons
- Iqbal Hussain, Electric & Hybrid Vehicles: Design Fundamentals, 2nd edition, CRC Press, 2003
- Robin Hardy, Iqbal Husain, Electric and Hybrid Vehicles, CRC Press
- Dr. Mike Westbrook, M H Westbrook, The Electric Car: Development & Future of Battery, Hybrid & Fuel-Cell Cars





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Class: - Final Year B.Tech.	Semester-VII	L	T	P	Credits
Course Code: AT461	Course Name: Automotive System Design	3	-	-	3

Course Description:

Automotive System Design is offered as the core course at the seventh semester of Automobile Engineering undergraduate programme. This subject includes the design of different systems in vehicle like transmission system, control system, braking system. As Automobile Engineering student, this course has very much importance to design and develop the vehicular systems.

Course Outcomes:

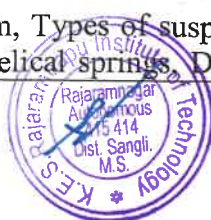
After successful completion of the course, students will be able to,

1. Design of clutch for automotive application.
2. Design gear box for automotive application.
3. Design leaf spring and coil spring for automotive suspension.
4. Design braking system (internal expanding shoe type) for a vehicle.
5. Design front axle, differential, propeller shaft & final drive for automotive application.

Prerequisite: Strength of materials, machine component design.

Course Content

Unit No	Description	Hrs
1	System Design System design approach, requirements of systems design, Historical perspective of system design, Design for machining, design for assembly, Statistical analysis of tolerances, Future trends in system design, Design considerations for system design.	06
2	Design of Clutch Requirements and functional design, Uniform wear and pressure theory-expressions, Design of clutch components – clutch shaft & hub and flange, Design of clutch components – torsional springs, Design of rivets and segments, Design of pressure plate assembly components, Design of clutch linkage, Numericals based on clutch system design, Design of centrifugal clutch	06
3	Design of Gear Box Selection of gear ratios & final drive ratio, Design of gears, shafts, splines and housing, Overview of gearbox component design, Design considerations of epicycle gear box, Selection of bearings.	05
4	Design of Suspension System Requirements of a suspension system, Types of suspension spring, material for springs, Design of close coiled helical springs, Design of semi-elliptical	07





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	leaf spring, cantilever leaf spring, Selection of materials for leaf spring, Design of damper for automotive application.	
5	Design of Brake System Design of Mechanical brakes, Hydraulic brakes, stopping distance, Design of internal shoe brake, effect of expanding, Mechanism of shoes on total braking torque, Calculation of mean lining pressure and heat generation during braking operation, Braking of vehicle moving in a curved path.	06
6	Final Drive, Axles & Propeller Shafts Design Design of final drive & differential gearing, Design of front & rear axles, Design of Propeller shafts for bending. Torsion & rigidity, Design of universal joints, Design of slip joints.	06

References -

Text books:

- S. P. Patil Mechanical System Design Publisher: Jaico

Reference Books:

- Anup Goel Mechanical System Design Technical Publication.
- Ghutukade Daji Design of Mechanical Systems TechNeo Publication





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Class: Final Year B.Tech.	Semester: VII
Course Code: AT4031	Course: Vehicle Dynamics

L	T	P	Credits
3	-	-	3

Course Description:

This course deals with mechanics and dynamics of a road vehicle and thus equips him/her for a research-oriented career in the automotive industry. The knowledge and skills gained are equally important for design and development challenges in the industry. By applying the knowledge of this course, the student shall be able to predict behavior of the vehicle for a given situation/set of data.

Course Learning Outcomes:

At the end of the course the student will be able to:

1. Evaluate vehicle acceleration performance & stability of vehicle over the range of operating conditions.
2. Determine braking performance of a vehicle when provided with specifications.
3. Evaluate the response of tires for various operating conditions.
4. Evaluate handling characteristics of a vehicle for a given set of data.
5. Apply ride concepts while designing a suspension system for a vehicle.

Prerequisite: Engineering Mechanics, Dynamics of Machines, and Automotive Systems

Course Content

Unit No	Description	Hrs
1.	Performance Characteristics of Vehicle Introduction to vehicle dynamics, Fundamental approach to modeling- lumped mass, coordinate systems, Newton's second law, Dynamic axle loads. Equation of motion and maximum tractive effort. Aerodynamics forces and moments. Power plant and transmission characteristics.	06
2.	Stability of Vehicles: Load distribution for three-wheeler and four-wheeler. Stability of vehicle running on slope, banked road and during turn, calculation of Tractive effort, maximum acceleration and reaction forces for different drives.	06
3.	Longitudinal Dynamics Vehicle Load Distribution – Acceleration and Braking - Brake Force Distribution, Braking Efficiency and Braking Distance	06
4.	Tire Dynamics An Introduction, Mechanical Properties of Rubber - Slip, Grip and Rolling Resistance - Tire Construction and Force Development - Contact Patch and Contact Pressure Distribution. cornering properties of tires, Tire vibration	06
5.	Lateral Dynamics Low-speed cornering, High-speed cornering, Cornering equations, Neutral steer, Understeer and oversteer, Under-steer gradient, Testing of handling characteristics Suspension effects on Cornering, Summary of under-steer effects,	06





6.	Vertical Dynamics Excitation sources, Vehicle suspension properties – suspension isolation, suspension stiffness, suspension damping, and wheel hop resonance, Suspension nonlinearities, Rigid body bounce/pitch motions, bounce/pitch frequencies.	06
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References -

Text Books:

1. Gillespie T. D., Fundamentals of Vehicle Dynamics, SAE International.
2. Wong J. Y., Theory of Ground Vehicles, Willey & Sons.

Reference Books:

1. Pacejka H. B., Tyre and Vehicle Dynamics, Butterworth Heinemann.
2. N. K. Giri, Automotive Mechanics, Khanna Publishers.
3. G. Genta, Motor Vehicle Dynamics, World Scientific.
4. Rajamani Rajesh, Vehicle Dynamics, and Control, Springer.





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Class: - Final Year B.Tech.	Semester-VII
Course Code: AT463	Course Name: Finite Element Methods

L	T	P	Credits
3	-	-	3

Course Description:

Finite element methods is offered as the course at the seventh semester of Automobile Engineering undergraduate programme. Basically, finite element methods are a mathematical tool to solve real life problems. This subject is base for the numerical analysis of problems from different disciplines. Comparison with other analysis methods, meshing and formulation of finite element equation, structural, thermal, higher order elements is the major contents of the syllabus. The FEM is gaining popularity day by day and sought-after dream career for Automobile engineers. The course is introductory at undergraduate level and build the necessary theoretical background for development of finite element codes. As Automobile Engineering student, this course has very much importance to use and develop the simulation software based on finite element method.

Course learning outcomes-

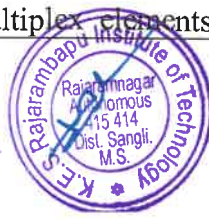
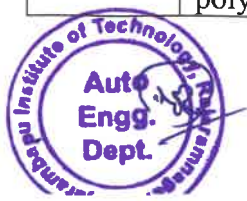
After completion of this course student shall be able to

1. Discretize the physical domain using appropriate elements
2. Check the finite element model.
3. Develop FEA codes for analysis of structural problems.
4. Analyze thermal problems using FEA.
5. Develop iso-parametric formulation for irregular geometries.

Prerequisite:

The pre requisite for study of this subject from students end is that, they must have undergone calculus and matrix algebra. The students must have adequate knowledge about theory of elasticity, heat transfer and dynamics, which can be enhanced further.

Course Content		
Unit No	Description	Hrs
1	Introduction Basic idea of FEM, comparison with experimental and analytical methods, comparison with other numerical methods, Steps of finite element analysis, direct stiffness method.	06
2	Discretization Discretization-need, element types, selection of elements, no of elements, node numbering scheme, element quality checks, Meshing Techniques, Checking of finite element models. Thumb rules of discretization	06
3	Interpolation models Need of interpolation polynomial, classification of elements based on polynomial. Simplex complex multiplex elements, Compatibility and	05





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	completeness requirement. Shape functions, global, natural and local coordinate system. Linear and higher order elements	
4	Structural analysis Basic concepts of theory of elasticity, Variational formulation of structural problems, one dimensional and two-dimensional structural analysis. Assembly and solution of finite element equations. Analysis of truss structure	07
5	Thermal analysis Weighted residual methods. General finite element formulation of heat transfer problems, one-dimensional two-dimensional heat transfer analysis.	06
6	Higher order and isoparametric elements. One- and two-dimensional higher order elements, isoparametric elements, evaluation of finite element equation for higher order elements, numerical integration, Lagrange's interpolation polynomial	06

References -

Text books:

1. Rao S. S., Finite Elements Method in Engineering, Elsevier,
2. Nitin Gokhale, Sanjay Deshpande, Sanjeev Bedekar, Anand Thite, Practical Finite Element Analysis, Finite to Infinite Pune

Reference Books:

- Robert D Cook , Concepts and applications of finite element analysis, JohnWiley & Sons,
- David V Hutton, Fundamentals of Finite element analysis, Tata McGraw Hill
- Frank L. Stasa, Applied finite Element Analysis for Engineers, CBS International Edition.
- J. N. Reddy, Finite Element Method, McGraw -Hill International Edition.
- Bathe K. J. Finite Elements Procedures, PHI.
- Chandrupatla T. R., Finite Elements in engineering, PHI.





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Class: - Final Year B.Tech.	Semester-VII	L	T	P	Credits
Course Code: AT4191	Course Name: Automotive NVH	3	-	-	3

Course Description:

There are many sources of vibration and noise in an automobile and therefore there is a need to measure the noise and vibration level in the automotive systems and subsequently to recommend the measures to minimize it. The course curriculum is designed keeping this need in mind to make the students aware about the fundamentals of noise and vibration and to develop an ability in them to measure and analyze the noise and vibration in the mechanical and automotive systems. The course contents include revision of the basics of vibration, multi degree of freedom longitudinal and torsional vibrations and vibration measuring instruments. The basic concepts of noise, its measurement and control methods are also included in the course curriculum.

Course Learning Outcomes:

At the end of the course, the learners will be able to:

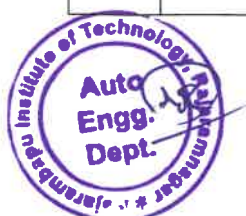
1. Demonstrate an awareness about fundamental concepts of noise and vibration necessary to understand noise and vibration mechanisms in engineering applications.
2. Formulate mathematical model for multi degree of freedom vibration system.
3. Select appropriate transducer for measurement of vibration in automotive / mechanical systems
4. Select appropriate transducer for measurement of noise in automotive / mechanical systems.
5. Analyze the automotive systems to characterize noise and vibration in them.
6. Apply methods for noise and vibration control in automotive applications.

Prerequisite:

Dynamics of Machines, Engineering Mathematics

Course Content

Unit No	Description	Hrs
1.	Fundamentals of Noise and Vibration Introduction, Basic concepts, single and multi-degree of freedom vibrations, methods to derive equation of motion, matrix formulation, influence coefficients, Harshness Noise: Definition, sources, fundamentals terms, units (decibel, dB (A) and SPL)	06
2.	Multi Degree of Freedom Vibrations Matrix method, Matrix iteration method, Mode shape orthogonality, torsional vibrations- two rotor and three rotor systems, geared system, Stodola's method, discrete and continuous systems	06
3.	Vibration measurement and applications	06





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	Vibration measurement system, vibration transducers: Piezoelectric transducers and linear variable differential transformer transducer, Vibration pickups: Vibrometer, Accelerometer, Vibration exciters- Mechanical exciters, impact hammer and electrodynamic shaker, signal conditioners, selection of accelerometers.	
4.	Noise measurements and instrumentation Noise measurement system, Microphones – types of Microphones, Sound intensity measurement, noise severity criteria, various types of acoustic testing chambers, source identification, standards of noise level and exposure limits, selection of microphones	06
5.	Vibration analysis Relevance, procedure, continuous and discrete systems, methods for continuous systems, Euler's beam theory, modal analysis, modal parameters, experimental modal analysis- impact hammer testing, shaker testing,	06
6.	Transportation Noise and Vibration Transportation Noise and Vibration Sources, Engine Noise and Vibration, Chassis Vibration, Exhaust and Intake Noise and Acoustical Design of Mufflers, Tire/Road Noise, Aerodynamic Sound Sources in Vehicle, Noise and Vibration in Transmission and Gearbox, Brake Noise, air borne and structure born noise, vibration absorbers.	06

References -

Text Books:

- C. Sujatha, Vibration and Acoustics, Tata McGraw Hill Education Private Limited, New Delhi
- A.G. Ambekar, Mechanical Vibrations and Noise Engineering, PHI learning private limited

Reference Books:

- Grover G. K., Mechanical Vibration, Nem Chand & Brothers, Roorkee
- Rao V. Dukkipatti and J.Srinivas, Mechanical Vibrations, Prentice Hall of India, New Delhi
- W. T. Thomson, Theory of Vibrations, CBS Publishers, New Delhi
- Pujara K, Vibration & noise for Engineering, Dhanpat Rai and Company.
- V.P. Singh, Mechanical Vibrations, Dhanpat Rai and Co. Pvt. Ltd., Delhi
- S. S. Rao, Mechanical Vibrations, New Age International (P) Ltd., New Delhi





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Class: Final Year B.Tech.	Semester-VII
Course Code: AT4351	Course Name: Automotive Air Conditioning

L	T	P	Credits
3	-	-	3

Course Description:

The Automotive Refrigeration and Air Conditioning course is designed to provide students with essential knowledge of thermal comfort systems in vehicles. It covers principles of refrigeration, air conditioning cycles, and system components like compressors, condensers, evaporators, and expansion valves. The course emphasizes energy efficiency, eco-friendly refrigerants, and compliance with modern environmental norms. Students learn to analyze system performance and apply diagnostic techniques for fault detection. With the growing demand for passenger comfort and fuel-efficient vehicles, this course prepares students for industry roles in HVAC design and maintenance. It bridges theoretical learning with practical applications relevant to automotive thermal systems.

Course Learning Outcomes:

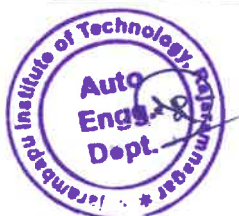
After successful completion of the course, students will be able to -

1. Explain basic refrigeration and air conditioning principles.
2. Identify components and layout of automotive A/C systems.
3. Analyse refrigeration cycles and system performance.
4. Diagnose common faults in automotive A/C systems.
5. Apply knowledge to design and improve vehicle climate control systems.

Prerequisite: Engineering Physics, Engineering Chemistry, Basics of Mechanical Engineering, Applied Thermodynamics, Heat Transfer

Course Content

Unit	Description	Hrs
5.	Introduction to Refrigeration and Air conditioning Basic air conditioning system - Location of air conditioning components in a car - Schematic layout of a refrigeration system, Air Refrigeration System and its applications, Refrigerants for automotive applications, Automobile air conditioning, Air conditioning for passengers, isolated vehicles, transport vehicles, Applied Psychrometry, Psychrometric processes using chart.	06
6.	Air Conditioning System Classification and layouts, Central / unitary air conditioning systems Components like compressors, evaporators, condensers, expansion devices, fan blowers, heating systems, Automotive heaters, manually controlled air conditioner, Heater system - Ford automatically controlled air conditioner and heater systems, Automatic temperature control.	06





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7.	Load Estimation Load Analysis, Outside & inside design consideration, Factors forming the load on air conditioning systems, Cooling & heating load calculations, Load calculations for automobiles, Equivalent Temperature Difference Method, Cooling Load Temperature Difference, and Radiance Method, Effect of air conditioning load on engine performance, solar heat gain, study of various sources of the internal and external heat gains, heat losses, etc.	06
8.	Air Distribution Air Distribution Systems Fundamentals of air flow in ducts, pressure drop calculations, design ducts by velocity reduction method, equal friction method and static regain method, duct materials and properties, insulating materials, types of grills, diffusers, ventilation, noise level etc. Layout of duct systems for automobiles and their impact on load calculations, Air Routine.	06
9.	Air Conditioning Equipment and Control Chillers, condensing units, Cooling coils, bypass factors, Air Conditioning Controls, humidifiers, dehumidifiers, various types of filters, air washers, thermostat, humidistat, control dampers, Pressure cutouts and relays cycling and sequence controls, modern control of purity, odour and bacteria, Air filtration- Study of different types of filters, Automatic temperature control, Controlling flow, Control of air handling systems.	06
10.	Troubleshooting and Service Causes of air conditioner failure - Trouble shooting of air controlling system - Air conditioner maintenance and service - Servicing heater system. Removing and replacing components – leak testing - Compressor service.	06

Text Books:

- Tom Birch, Automotive Heating and Air Conditioning, Pearson Education Inc., 2003.
- Boyce H. Duggins, Jack Erjavec., Automotive Heating and Air-Conditioning, Delmer publisher, 2001.
- William H Crouse and Donald L Anglin, Automotive air conditioning, McGraw - Hill Inc., 1990

Reference Books:

- Duggins, Automotive Air Conditioning, Thomson Asia, 2002
- Paul Weiser, Automotive Air Conditioning, Reston Publishing Co Inc., 1990.
- MacDonald. K.L, Automotive Air Conditioning, Theodore Audel series, 1978.
- Goings. L.F., Automotive Air Conditioning, American Technical services, 1974.
- James D. Halderman, Automotive Heating, Ventilation, and Air Conditioning Systems, Pearson Education Inc., 2004.





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Class:- Final Year B.Tech.	Semester: VII
Course Code: AT465	Course: Motor Insurance Practices

L	T	P	Credits
3	-	-	3

Course Description:

Motor vehicle accidents are still a leading cause of death, even if the trend has somewhat declined over the past 20 years. Motor insurance gives protection to the vehicle owner against - damages to his/her vehicle and pays for any Third-Party Liability determined as per law against the owner of the vehicle. Third Party Insurance is a statutory requirement. The owner of the vehicle is legally liable for any injury or damage to third party life or property caused by or arising out of the use of the vehicle in a public place. This course covers all the procedures of motor insurance and accident claims along with applications of IT and fraud management and internal audit. With rising opportunities in the motor insurance sector, the students will be well placed to contribute to the industry effectively.

Course Learning Outcomes:

After completion of this course student will be able to

1. Discuss applications of insurance principles in vehicle insurance.
2. Describe various forms in motor vehicle insurance.
3. Discuss MACT in detail.
4. Analyze fraud management and internal audit in relation with motor vehicle insurance

Prerequisite: ---

Course Content

Unit No.	Description	Hrs
1.	Principles of Insurance and Motor Insurance: History of Insurance, Business of Insurance – Transfer of Risk, Classification of Insurance – Life & General Insurance, Market Role of Specialist (e.g. Surveyor) History of Motor Insurance – Law and Practice of Motor Insurance in India – Applicability of Principles of Insurance – Total Loss (TL) / Constructive Total Loss (CTL) / Theft Claims – Legal Aspects of Insurance – Act No. 59 of 1988 (The Motor Vehicles Act, 1988) The Motor Vehicles (Amendment) Bill, 2008 – Part B: Key Issues and Analysis.	06
2.	Types of motor vehicles, documents and policies: Types of Motor Vehicles – Meaning and classification of motor vehicles – Motor insurance documents – Proposal form – Proposal form for 'Liability Only Policy' – Certificate of Insurance – Cover Note – Policy forms – Endorsement – Renewal notice – E-insurance to come into existence from next year – Types of Motor Policies – Coverage for motor policies – Coverage for Private Car – Coverage for Two Wheeler – Coverage for Commercial Vehicles – Motor trade policies – Motor Trade Internal Risks Policy – New technologies – In-car Technologies – New technology in auto field	06





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3.	Motor Insurance Claims: Motor Insurance Claims, Doctrine of cause of Accident, Motor Insurance Claims Procedures, Claim Documents, Types of Losses, Various Causes of Accident, Salvage/Scrap Disposal, Accident Repairing Cost, Compensation for Third Party Injury or Property Damage, The Consensus vs. Scientific Approach, Science of Damage Estimation and the Technology Support – Surveyor and His role in Loss Minimisation – Role of Surveyor – Steps in Motor Survey – Guidelines on Automobile Survey – Role of Motor Surveyor in Loss Minimisation – Role of Road Safety in Insurance – Concerns of Community – Road Safety Promotion by Insurance – Causes of Accident – Role of Fleet Operators – Underwriting in Motor Insurance, Transport Development Council – Roadside Assistance – Exclusions in Road Side Assistance – Frauds in Motor OD Claims – Seamless Claims Management – Frauds in motor insurance – Way to Mitigate Frauds	06
4.	Marketing in Motor Insurance: Market practice of Motor Insurance in India – Caveats for filing add-on covers – Guidelines applicable in India – India Motor Tariff 2002 – Amendments after discontinuance of tariff – Tariff system after detariffing – International practice in motor insurance rating – Underwriting in motor insurance – Principles and practice of premium computation – Introduction – Indian Motor Insurance market – Model wise Risk assessment – Motor Underwriting. Motor Third Party Pool – Dysfunctional Motor Market – Motor Third Party Pool – Review of Pool – Knock for Knock Agreement – International Issues in Insurance Markets – International Translation of Driver's License – Some Market Practices	06
5.	IT Applications in Motor Insurance: Importance of Analytics and IT Intervention – IT Intervention and Competition – IT Intervention and Data Analytics – Need for and Importance of Statistics – TAC as Data Depository – TAC as National Repository for Statistical Data	06
6.	Fraud Management and Internal Audit: Frauds in TP Claims – Frauds in Motor Insurance – Types of Fraud – Underwriting Frauds – Methods of Detection of underwriting fraud – Frauds Committed with Internal Support – Preventive Management of Fraud Cases – Issues to be Audited	06

References -

Text Books:

1. Handbook on Motor Insurance – IRDA
2. Automobile Insurance – Actuarial Model: Lemaire Jean, Springer

Reference Books:

1. Motor Vehicle Act, 1988 together with Central Motor Vehicle Rules, 1989, Eastern Book Company, Lucknow.
2. Lemaire Jean, Automobile Insurance – Actuarial Model, Springer
3. Georges Dionne HEC, Montreal, Automobile Insurance: Road Safety, New Drivers, Risks, Insurance Fraud and Regulation, Springer
4. P S Palande, R S Shah, M L Lunawat, Insurance in India: Changing Policies and Emerging Opportunities, SAGE Publications
5. IRDA website <https://www.irdai.gov.in>





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Class: Final Year B.Tech.	Semester-VII	L	T	P	Credits
Course Code: AT4071	Course Name: Automotive Aerodynamics	3	-	-	3

Course Description:

The main objective of this course is to introduce the concept and principle of fluid mechanics, definitions, aerodynamics of car, different shapes of car, lift and drag analysis, wind tunnel testing etc. This study provides the students with basic principles of aerodynamics for the design of vehicle body with main goals to reduce vehicle drag, minimizing noise emission and undesired lift forces and other causes of aerodynamic instability at high speeds.

Course Learning Outcomes:

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

1. Apply basic principles of aerodynamics for the design of vehicle body.
2. Calculating lift and drag of automotive models
3. Describe the physics of fluid flow over vehicle body and its optimization techniques.
4. Explain the use of wind tunnels in testing the vehicles.
5. Apply computational fluid dynamics (CFD) tool for aerodynamics study.

Prerequisite: Fluid Mechanics and Machinery

Course Content

Unit	Description	Hrs
1.	Introduction Scope – historical development trends – Fundamentals of fluid mechanics – Flow phenomenon related to vehicles – External & Internal flow problems – Resistance to vehicle motion – Performance – Fuel consumption and performance – Potential of vehicle aerodynamics.	06
2.	Aerodynamic drag of cars Cars as a bluff body, Flow field around car, Aerodynamic drag and its types, various forces and moments & its effects on performance, analysis of aerodynamic drag, drag coefficient of cars, strategies for aerodynamic development for low drag profiles.	06
3.	Stability, safety & comfort The origin of forces and moments on a vehicle, side wind problems, methods to calculate forces and moments, vehicle dynamics Under side winds, the effects of forces and moments, Characteristics of forces and moments, Dirt accumulation on the vehicle, wind noise, drag reduction in commercial vehicles. Wind noise, Air flow around individual components, High performance vehicles, Design alternatives, High efficiency radiator arrangement.	06





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4.	Shape optimization of car Front end modification, front and rear wind shield angle, Boat tailing, Hatch back, fast back and square back, air flow patter around individual component, Dust flow patterns at the rear, Effects of gap configuration, effect of fasteners.	06
5.	Wind Tunnels for automotive Aerodynamics Introduction - Principle of wind tunnel technology, Limitation of simulation, measuring equipment and transducers, Pressure measurement, velocity measurements, Flow visualization techniques, Road testing methods.	06
6.	Computational Fluid Dynamics (CFD) Introduction to governing, Solution methodology, desertification technique, Post processing of results, BC solution methods, CFD preprocessing, and post processing techniques, Diff plots.	06

References:

Text Books:

- Wolf – Heinrich Hucho, Aerodynamics of Road Vehicles, SAE.
- Joseph Katz, Automotive Aerodynamics, John Wiley & Sons, 2016.
- Thomas Christian Schütz, Aerodynamics of Road Vehicles: From Fluid Mechanics to Vehicle Engineering, SAE.

Reference Books:

- Pope. A., Wind Tunnel Testing, John Wiley & Sons, New York.
- McCallen, Browand, Ross, The Aerodynamics of Heavy Vehicles, Springer.
- Ino Sovran, Vehicle Aerodynamics, SAE.





Class: Final Year B.Tech.	Semester: VII	L	T	P	Credits
Course Code: AT4171	Course Name: Computational Fluid Dynamics	3	-	-	3

Course Description:

The Computational Fluid Dynamics is combination of physics, numerical mathematics, and, to some extent, computer sciences employed to simulate fluid flows and heat transfer. Now a days CFD is playing one important role in design, optimization and research in automobile engineering because of its ability to simulate the systems where controlled experiments are difficult or impossible to perform.

This course is base for developing the algorithm for CFD codes which can be used for fluid flow and heat transfer analysis. In this subject more focus is on creating the background for developing FDM and FVM algorithms for steady and unsteady fluid flow and heat transfer.

Course learning outcomes-

After completion of this course student shall be able to

1. Describe the physical significance of the governing equations for fluid dynamics and heat transfer.
2. Develop finite difference implicit & explicit algorithms for fluid flow and heat transfer problems.
3. Develop finite volume algorithms for fluid dynamics & heat transfer problems.
4. Select appropriate grid generation methods for CFD analysis.
5. Select appropriate solution method for CFD equations.

Prerequisite:

Prerequisite for this course is the knowledge of undergraduate level fluid mechanics and heat transfer. Also it requires knowledge of vector algebra and numerical methods.

Course Content

Unit No	Description	Hrs
1.	Conservation laws of fluid dynamics and heat transfer. Models of fluid flow, substantial derivative, divergence of velocity, conservative and nonconservative forms of continuity, momentum (Navier Stokes equation) and energy equations. Integral and differential analysis.	06
2.	Aspects of discretization Mathematical behavior of partial differential equations, Elliptic hyperbolic and parabolic equations. Finite difference approximation, difference equations. Implicit and explicit approximation, Crank Nicolson method.	05
3.	Grid transformation Need of transformation, General transformation equation, metrics and Jacobian. Form of governing equations particularly suited for CFD. Stretched	06





	grids, boundary fitted coordinate system. Elliptic and adaptive grids. Unstructured mesh for finite volume method.	
4.	CFD techniques Lax Wandroff technique, MacCormac's technique-viscous flows, conservation form and space marching solution, Relaxation techniques with inviscid flow, over relaxation and under relaxation. Alternating direction implicit technique, pressure correction technique. Incompressible N-S equation. Staggered grid. Simple algorithm, computer graphics.	07
5.	Finite volume method FVM. For Steady state diffusion, convection diffusion problems, tridigonal matrix algorithm. Implementation of boundary conditions. Finite volume method for two-dimensional diffusion problems, Properties of discretization schemes.	
6.	Solution techniques for CFD equations Criteria for unique solution, infinite number of solutions and no solution, Elimination, Iteration and Gradient Search method, Assessment of number of computations, L-U decomposition technique, Thomas algorithm, Norm of a vector, Norm of a matrix, Error analysis, Generalized analysis of the iterative methods, Sufficient condition for convergence, Rate of convergence, Scarborough criteria, Multigrid method, Line by line TDMA, Gradient search methods: Steepest descent method and Conjugate gradient method.	06

References -

Text books:

- J. D. Anderson, Computational Fluid Dynamics: The Basics with Applications, McGraw Hill.

Reference Books:

- K. Muralidhar and T. Sundararajan, Computational Fluid Flow and Heat Transfer, Second Edition, Narosa Publishing House.
- K. A. Hoffmann, S. T. Chiang, Computational Fluid Dynamics for Engineers - Volume 1, Engineering Education System.
- O. Zikanov, Essential Computational Fluid Dynamics, Wiley India.
- J. Tu, G. H. Yeoh and C. Liu, Computational Fluid Dynamics: A Practical Approach, Butterworth Heinemann (Indian Edition).
- S. V. Patankar, Numerical Heat Transfer and Fluid Flow, Taylor and Francis (Indian Edition).
- H. K. Versteeg, W. Malalasekera, An Introduction to Computational Fluid Dynamics: The Finite Volume Method, Pearson Education (Indian Edition).





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Class: Final Year B.Tech.	Semester: VII	L	T	P	Credits
Course Code: AT4151	Course: Industrial Engineering	3	-	-	3

Course Description:

This course introduces the students with tools and techniques of industrial engineering. This course contributes to develop managerial skills required by the industry. Also, the course helps to make the students perform in industry for effective planning, controlling, and implementing projects. The course contents exposure to the important industrial engineering concepts such as method study, work measurement, plant layout, material handling, production planning and control, inventory control and project management techniques.

Course Outcomes:

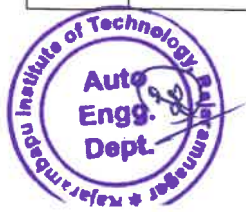
After successful completion of the course, students will be able to,

1. Apply industrial engineering tools to improve productivity
2. Decide plant layout and suitable material handling system.
3. Apply work study techniques to improve plant efficiency
4. Use the EOQ models for inventory control in the industrial operations
5. Apply the techniques for project management of deterministic and probabilistic projects
6. Plan production activities using tools like Production Planning and Control Techniques

Prerequisite: Engineering Mathematics

Course Content:

Unit No.	Description	Hrs.
1	Introduction to Industrial Engineering (IE) and Industry 4.0 Definition, scope, Applications, Types of industries, Tools and techniques of industrial engineering, Types of production systems, Industrial engineering in the modern world, Introduction to Industry 4.0 and 5.0 Productivity: Definition of productivity, factors affecting productivity, Measurement of productivity, productivity improvement techniques, Lean Manufacturing, Six Sigma overview	06
2	Plant Layout and Smart Material Handling Plant layout: -Site selection, principles and objectives, types of plant layout Material handling: - Objective, elements, functions, principles, types of material handling equipment, AGVs, AMRs, IoT-based material tracking, Unit load concept, MHE economics.	06
3	Method Study Definition, objective and scope of Work study, Definition, objective and scope of method study, steps in method study, activity recording and exam aids. Charts to record moments in shop operation – process charts, flow process charts, travel chart and multiple activity charts.	06
4	Time Study	06





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	Definition, time study equipment, selection of job, steps in time study. Breaking jobs into elements, recording information. Rating & standard Rating, standard performance, scale of rating, factors affecting rate of working, allowances and standard time determination. Work sampling, Predetermined Motion Time Standards (PMTS) – Method Time Measurement (MTM), Cycle time calculation in automation systems	
5	Production Planning and Control (PPC) in Digital Factories Function and activities of PPC, Process selection and machine selection, Make or buy decisions, Macro and micro process planning, MES and ERP integration, Capacity planning, loading, sequencing	06
6	Inventory Control and Network Techniques Inventory: Definition, Types, EOQ Models: Basic Definitions, Determination of EOQ for different Models Network Techniques: PERT and CPM, Basic Definitions, Network Diagram, Finding Critical Activity and Critical Path for Deterministic and Probabilistic Projects	06

References -

Text Books:

1. Khanna O.P., Industrial Engineering and Management, Dhanpat Rai Publications(P) ltd, New Delhi.
2. Martand Telsang, Industrial Engineering and Production Management, S. Chand & Company Ltd., New Delhi
3. Dinesh Seth, Subhash Rastog, Global management solutions demystified, Cengage learning publications

Reference Books:

1. Gavrial Salvendy, Hand book of Industrial engineering, John Wiley and sons, New York.
2. M. I. Khan, Industrial engineering, New age international (P) ltd, New Delhi.
3. International labour office, Introduction to work study, Publisher International labour office.





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Class: Final Year B.Tech.	Semester: VII	L	T	P	Credits
Course Code: AT467	Course: Special Purpose Vehicles	3	-	-	3

Course Description:

The main objective of this course is to introduce the concept and principle of operation of special purpose vehicles such as loaders, bulldozers, excavators, backhoe loaders, scrappers, and motor graders, farm equipment, etc. At the end of the course, the students will have a better understanding of the application of the special types of vehicles in the excavation of earth.

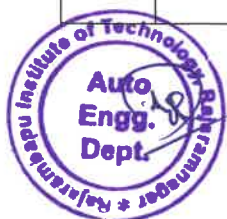
Course Outcomes:

After completion of this course student will be able to

1. Describe the construction & working of stratified charged/lean burn engines.
2. Describe the working of power trains in special propose vehicles and able to analyze the ride characteristics.
3. Describe the working of drive line in special propose vehicles and compared with commercial vehicles.
4. Explain the construction of farm equipment.
5. Apply the safety concepts for design of special proposes vehicles.

Prerequisite: Basics of Mechanical Engineering.

Content		
Unit No	Description	Hrs
1.	Earth Moving and Construtional Equipments Construction layout, capacity and applications of earthmovers for dumpers, front-end loaders, bulldozers, excavators, backhoe loaders, scrappers, and motor graders etc. criteria for selection of prime mover for dumpers and front end loaders based on vehicle performance characteristics.	06
2.	Powertrain Concepts Engine – converter match curves. Epicyclical type transmissions. Selection criteria for universal joints. Construtional details of steerable and drive axles of dumper.	06
3.	Vehicle Systems and Features Brake system and actuation – OCDB and dry disc caliper brakes. Body hoist and bucket operational hydraulics. Hydro-pneumatic suspension cylinders. Power steering system. Safety features, safe warning system for dumper. Design aspects on dumper body and loader. Articulated vehicles, Firefighting equipment.	06
4.	Earth Moving Machines Construction and operation aspects of Bull dozers, Scrapers, Dumpers, Loaders, Mobile cranes, Road rollers, Elevators and Elevating graders.	06





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5.	Special Purpose Vehicles for Industrial Applications General description, specification and functions, fork lift trucks, Scissors lift trucks - applications in industry, advantages and disadvantages. Constructional features, capacity and stability of jib cranes. Vibratory compactors. Stackers bore well machines, concrete mixtures.	06
6.	Farm Tractors Tractors: General description, specification and functions, light, medium and heavy wheeled tractors, crawler tracks mounted / wheeled-bull dozers, tilt dozers and angle dozers, front end loaders, factors affecting efficiency of output of tractors, simple problems, merits and demerits.	06

References –

Text Books:

1. Sharma, S.C., Construction Equipment and its Management.
2. Nakra C.P., Farm Machines and Equipments, Dhanparai Publishing company Pvt. Ltd.
3. Wong J Y, Theory of Ground Vehicles, John Wiley and Sons, New York.

Reference Books:

1. Satyanarayana. B., Construction Planning and Equipment, Standard Publishers and Distributors, New Delhi.
2. Pipenger, Industrial Hydraulics, Mcgraw Hill, Tokoyo.
3. Astakhov, Truck Cranes, MIR Publishers, Moscow.
4. Bart H., Vanderveen, Tanks and Transport Vehicles, Frederic Warne and Co. Ltd., London.
5. K. Abrosimov, A. Bromberg and F. Katayer, Road Making Machineries, MIR Publisher, Moscow.





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Class: - Final Year B.Tech.	Semester-VII
Course Code: AT469	Course Name: Finite Element Methods Lab.

L	T	P	Credits
-	-	2	1

Course Description:

In recent years, the use of computer simulation packages as a design and development tool has grown rapidly and it becomes integral part of research and development department. This laboratory course is designed to prepare the student to understand and apply the skills and knowledge of finite element methods to resolve the issues arising while using, customization and development of simulation software. The practicals include development of codes in softwares like SCILAB for the simulation of static and thermal analysis. It is also extended for higher order elements.

Course Learning Outcomes:

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

1. Explain user interface of the software.
2. Develop appropriate functions required for simulation.
3. Apply proper constraints and boundary conditions.
4. Analyze structural and thermal problems using linear and higher order elements.
5. Apply different post processing techniques to interpret the results.
6. Optimize the codes to simulate the engineering problems.

Prerequisite:

Mechanics of material, Heat transfer, Matrix algebra

Course Content

Expt. No.	Description	Hrs
1.	Introduction to user interface of software.	02
2.	Hands on to different functions and commands of software.	02
3.	Analysis of spring assembly.	02
4.	One dimensional static structural analysis.(linear elements)	02
5.	One dimensional thermal analysis.(linear elements)	02
6.	Two dimensional structural analysis (linear elements)	02
7.	Two dimensional thermal analysis. (linear elements)	02
8.	One dimensional static structural analysis.(quadratic elements)	02
9.	One dimensional thermal analysis.(quadratic elements)	02



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10.	Analysis of truss structure	02
11.	Beam analysis.	02

References -

Text books:

3. Young W Hwon, Hyochoong Bang, Finite Elements Method using MATLAB, CRC,
4. Amar Khennane Introduction to Finite Element Analysis Using MATLAB® and Abaqus CRC,

Reference Books:

- Robert D Cook, Concepts and applications of finite element analysis, JohnWiley & Sons,
- David V Hutton, Fundamentals of Finite element analysis, Tata McGraw Hill
- Frank L. Stasa, Applied finite Element Analysis for Engineers, CBS International Edition.
- J. N. Reddy, Finite Element Method, McGraw -Hill International Edition.
- Chandrupatla T. R., Finite Elements in engineering, PHI.





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Class:- Final Year B.Tech.	Semester-VII
Course Code: AT4451	Course Name: Automotive NVH Lab.

L	T	P	Credits
-	-	2	1

Course Description:

Control of noise and vibrations in an automobile is a must to satisfy the vehicle users by minimizing the annoyance due to excessive noise and vibration levels insider the vehicle. The pre-requisite for deciding the control strategies is collection of the data about the noise and vibration characteristics. This laboratory course aims at developing the skills necessary to measure, analyze and control the noise and vibration in automotive and mechanical systems. The course contents include basics of measurement systems, calibration of the transducers, use of microphones, accelerometers, strain gauges, measurement of noise and vibration level, determination of natural frequency and damping etc.

Course Learning Outcomes:

After completion of this course students will be able to

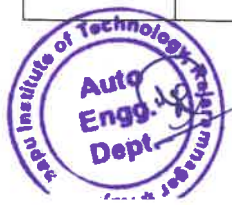
1. Demonstrate an awareness about basics of measurement, and elements of measurement system.
2. Calibrate the transducers such as accelerometers, microphones and strain gauges.
3. Measure vibration characteristics using data acquisition system or vibrometer.
4. Measure noise level using data acquisition system or sound level meter.
5. Design control strategies to reduce noise and vibration level in automotive and mechanical systems.

Pre-requisite:

Dynamics of Machines, Engineering Mathematics

Course Content

Expt. No.	Description	Hrs
1.	Calibration of transducers used for vibration measurement.	02
2.	Determination of frequency of undamped free vibration of an equivalent spring mass system.	02
3.	Determination of the natural frequency of undamped torsional vibration of a single rotor shaft system.	02
4.	Determination of damping of an automotive component using logarithmic decrement method.	02
5.	Determination of damping of an automotive component using half-power bandwidth method.	02
6.	Determination of the frequency of damped force vibration of a spring mass system.	02
7.	Determination of forced vibration characteristics for different levels of damping	02
8.	Determination of transmissibility ratio for the suspension system.	02





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9.	Calibration of a transducer used for noise level measurement.	02
10.	Measurement of sound pressure level inside the vehicle's passenger's compartment	02
11.	Measurement of amplitude of vibration inside the vehicle's passenger's compartment	02
12.	Visit to an industry to get acquainted with industrial practices for measurement and control of noise and vibration.	02

Note: Any 10 experiments from the list

References -

Text Books:

- C. Sujatha, Vibration and Acoustics, Tata McGraw Hill Education Private Limited, New Delhi
- A.G. Ambekar, Mechanical Vibrations and Noise Engineering, PHI learning private limited

Reference Books:

- Grover G. K., Mechanical Vibration, Nem Chand & Brothers, Roorkee
- Rao V. Dukkipatti and J.Srinivas, Mechanical Vibrations, Prentice Hall of India, New Delhi
- W. T. Thomson, Theory of Vibrations, CBS Publishers, New Delhi
- Pujara K, Vibration & noise for Engineering, Dhanpat Rai and Company.
- V.P. Singh, Mechanical Vibrations, Dhanpat Rai and Co. Pvt. Ltd., Delhi
- S. S. Rao, Mechanical Vibrations, New Age International (P) Ltd., New Delhi





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Class: Final Year B.Tech.	Semester-VII	L	T	P	Credits
Course Code: AT471	Course Name: Automotive Air-Conditioning Lab	-	-	2	1

Course Description:

The Automotive Refrigeration and Air Conditioning Lab is designed to provide students with hands-on experience in understanding and analyzing vehicle climate control systems. It bridges the gap between theoretical knowledge and real-world application, focusing on components like compressors, condensers, evaporators, and expansion devices. The course emphasizes eco-friendly practices by introducing modern refrigerants and addressing environmental regulations. Students learn to perform system diagnostics, evaluate performance metrics like COP, and troubleshoot common faults. This practical exposure enhances their readiness for careers in automotive HVAC design, testing, and maintenance. Overall, the lab aligns with industry demands for energy-efficient and sustainable vehicle thermal management systems.

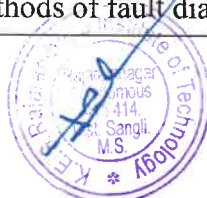
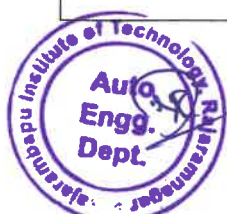
Course Learning Outcomes:

1. Explain components and working of transport refrigeration systems.
2. Analyze performance of heat pump, cascade, and multi-pressure systems.
3. Evaluate automotive A/C systems and control elements.
4. Diagnose faults in refrigeration and A/C setups.

Prerequisite: Heat Transfer, Applied Thermodynamics

Course Content

Experiment No	Description	Hrs
1.	Introduction to the Refrigeration and Air-conditioning Laboratory	02
2.	Demonstration of various methods of Transport Refrigeration Systems	02
3.	Demonstration on Car & Bus Air-conditioning Systems	02
4.	Demonstration of controls in Refrigeration	02
5.	Trial on Heat Pump	02
6.	Trial on Refrigeration Bench	02
7.	Trial on Air-conditioning System	02
8.	Trial on Cascade System	02
9.	Demonstration of Multi-Pressure Refrigeration System	02
10.	Trial on Ice Plant.	02
11.	Demonstration of various methods of fault diagnosis.	02





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12.	Industrial Visit to refrigeration plant for Practical Exposure	02
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References:

Text Books:

- Tom Birch, Automotive Heating and Air Conditioning, Pearson Education Inc., 2003.
- Boyce H. Dwiggins, Jack Erjavec., Automotive Heating and Air-Conditioning, Delmer publisher, 2001.
- William H Crouse and Donald L Anglin, Automotive air conditioning, McGraw - Hill Inc., 1990

Reference Books:

- Dwiggins, Automotive Air Conditioning, Thomson Asia, 2002
- Paul Weiser, Automotive Air Conditioning, Reston Publishing Co Inc., 1990.
- MacDonald. K.L, Automotive Air Conditioning, Theodore Audel series, 1978.
- Goings. L.F., Automotive Air Conditioning, American Technical services, 1974.
- James D. Halderman, "Automotive Heating, Ventilation, and Air Conditioning Systems", Pearson Education Inc., 2004.





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Class: Final Year B.Tech.	Semester-VII
Course Code: AT473	Course: Motor Insurance Practices Lab

L	T	P	Credits
-	-	2	1

Course Description:

This laboratory course is designed to prepare the student to understand and apply the skills and knowledge of motor insurance to settle the accident claims and procedures therein. The practical include carrying out motor accident survey, preparing report and settling the accident claims, along with the interviewing the surveyor for ascertaining the functions.

Course Learning Outcomes:

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

1. Comprehend the detailing of various forms to be used in insurance sector.
2. Carry out motor accident survey.
3. Prepare accident survey report.
4. Settle the claim of motor accident insurance.

Prerequisite: Automotive Systems

Course Content

Expt. No.	Description	Hrs
1.	Collecting various forms (from various companies) used in motor insurance business and studying it's applicability/use	02
2.	Physically carry out motor accident survey and prepare report (With the help of Surveyor)	04
3.	Prepare various types of the accident survey reports	04
4.	Conduct the interview of surveyor and loss assessor and ascertain his role in insurance business	04
5.	Prepare the claim settlement documents for a typical accident.	02
6.	Comparative study of various insurance companies	02
7.	Collecting information on latest developments in motor insurance sector through various sources like journals, newspapers, company websites etc. and prepare report.	02

References -

Text Books:

- Handbook on Motor Insurance – IRDA
- Automobile Insurance – Actuarial Model: Lemaire Jean, Springer

Reference Books:

- Motor Vehicle Act, 1988 together with Central Motor Vehicle Rules, Eastern Book Company, Lucknow.
- Lemaire Jean, Automobile Insurance – Actuarial Model, Springer





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- Georges Dionne HEC, Montreal, Automobile Insurance: Road Safety, New Drivers, Risks, Insurance Fraud and Regulation, Springer
- P S Palande, R S Shah, M L Lunawat, Insurance in India: Changing Policies and Emerging Opportunities, SAGE Publications
- IRDA website <https://www.irdai.gov.in>





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Class: -Final Year. B.Tech.	Semester-VII	L	T	P	Credits
Course Code: AT475	Course Name: Automotive System Design Lab.	-	-	2	1

Course Description:

In recent years, the use of computer simulation packages as a design and development tool has grown rapidly and it becomes integral part of research and development department. This laboratory course is designed to prepare the student to understand and apply the skills and knowledge of Auto system design to resolve the issues arises while development of vehicles. The practical's includes Design and modelling of vehicular systems.

Course Learning Outcomes:

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

1. Design automotive clutch assembly
2. Design automotive gear box assembly.
3. Draw / Sketch clutch and gear box details and assembly using suitable modeling software

Prerequisite:

Mechanics of material, Machine component design

Course Content

Expt. No.	Description	Hrs
1.	Details and Assembly drawing of existing clutch system	02
2.	Design of clutch system	02
3.	Details and Assembly drawing of designed clutch system	02
4.	Details and Assembly drawing of existing gear box	02
5.	Design of clutch gear box	02
6.	Details and Assembly drawing of designed gear box	02
7.	Design and drawing of break system	02
8.	Design and drawing of suspension system	02
9.	Design and drawing of Axles	02
10.	Design and drawing of Drive shaft	02





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References -

Text books:

- S. P. Patil Mechanical System Design Publisher: Jaico

Reference Books:

- Anup Goel Mechanical System Design Technical Publication.
- Ghutukade Daji Design of Mechanical Systems TechNeo Publication





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Class: - Final Year. B.Tech.	Semester-VII	L	T	P	Credits
Course Code: AT477	Course Name: Automotive Simulation Lab	-	-	2	1

Course Description:

The Automotive Simulation Lab introduces students to the modeling, simulation, and analysis of key automotive systems using MATLAB/Simulink and ANSYS. The course focuses on vehicle dynamics, powertrain systems, thermal management, and structural behavior under various driving and loading conditions. Students will develop simulation models for conventional and electric vehicles and perform finite element and computational fluid dynamics (CFD) analyses. Through hands-on experiments, learners gain practical insights into design optimization and system performance evaluation. This lab bridges theoretical concepts with real-world automotive engineering challenges.

Course Learning Outcomes:

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

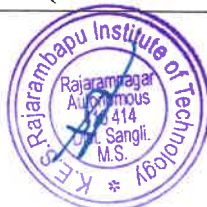
1. Develop and simulate automotive system models using MATLAB/Simulink for performance analysis.
2. Analyze structural and thermal behavior of automotive components using ANSYS tools.
3. Interpret simulation results to evaluate and improve vehicle performance and safety.

Prerequisite:

MATLAB/ANSYS

Course Content

Expt. No.	Description	Hrs
1.	Vehicle Longitudinal Dynamics Simulation (MATLAB/Simulink)	02
2.	Engine Performance Modeling (MATLAB/Simulink)	02
3.	Suspension System Simulation – Quarter Car Model (MATLAB/Simulink)	02
4.	Electric Vehicle Powertrain Simulation (MATLAB/Simulink)	02
5.	Vehicle Aerodynamics using CFD (ANSYS Fluent)	02
6.	Thermal Simulation of Automotive Disc Brake (ANSYS Thermal/Transient Thermal)	02
7.	Stress and Deformation Analysis of Suspension Arm (ANSYS Static Structural)	02
8.	Battery Thermal Management in EV (MATLAB + ANSYS Thermal Coupling)	02
9.	Crash Impact Simulation on Bumper Beam (ANSYS Explicit Dynamics)	02
10.	Vehicle Braking System Simulation (MATLAB/Simulink)	02





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References -

Text books:

- Kiencke, U., & Nielsen, L. *Automotive Control Systems: For Engine, Driveline, and Vehicle*. Springer, 2nd Edition, 2005.
- Tyagi, A. K. *MATLAB and Simulink for Engineers*. Oxford University Press, 2012.
- Moaveni, S. *Finite Element Analysis: Theory and Application with ANSYS*. Pearson Education, 4th Edition, 2014.
- Singh, K. *Automobile Engineering*, Vol. I & II. Standard Publishers Distributors, Revised Edition, 2011.





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Class: Final Year B.Tech.	Semester-VII	L	T	P	Credits
Course Code: AT479	Course Name: Automotive Diagnostic Lab.	-	-	2	1

Course Description:

Automobile engineering student will learn to do automotive fault diagnosis and apply remedial measures. Students will learn to design and plan maintenance activities such as preventive and scheduled maintenance. Students will be able to use modern tools and equipments for maintenance. Students will learn the use of testing components/systems for the maintenance of automobile. Student will get proficiency in maintenance of vehicle systems such as engine, clutch, gearbox, differential, braking system, steering, chassis, electrical system etc.

Course Learning Outcomes:

At the end of the course, students will be able to;

1. Identify the problems with their causes and remedies by dismantling the given clutch assembly and gear box assembly.
2. Measure backlash and run out of differential unit and assess the fault.
3. Service the transaxle and rear axle assembly, brake system, identify the faults and service the same.
4. Service the steering gear boxes, and measure the turning circle radius and check wheel balancing and set wheel alignment parameters of a given vehicle.
5. Align the head lamp of the given vehicle

Prerequisite: Internal combustion engines, Automotive Systems

Course Content

Experiment No	Description	Hrs
1.	Inspection and servicing of different types of clutches.	02
2.	Inspection and servicing of different types of gear boxes.	02
3.	Measurement of backlash and run out of differential unit.	02
4.	Servicing of transaxle and transfer case assembly.	02
5.	Servicing of different types of rear axle assembly.	02
6.	Servicing of steering gear boxes and verification of Ackerman steering geometry.	02
7.	Servicing and Troubleshooting of Brake system and Brake bleeding on a vehicle.	02
8.	Head light beam alignment	02





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9.	Electrical system diagnostics.	02
10.	Wheel balancing and wheel alignment	02
11.	Visit to dealership workshop	04
12.	Visit to engine components maintenance shop.	04

References -

Text Books:

- John Doke, — Fleet Management, McGraw Hill Co. 1984.
- James D Halderman, — Advanced Engine Performance Diagnosis, PHI, 1998.

Reference Books:

- Service Manuals from Different Vehicle Manufacturers.





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Class: Final Year B.Tech.	Semester: VII	L	T	P	Credits
Course Code: AT481	Course: Capstone Project Phase-II	-	-	6	3

Course Description:

This course gives opportunity for the students to offer engineering solutions to a relevant problem by working in a group. Apart from technical knowledge, he/she can explore interpersonal skills as well as ability to plan, execute and justify the tasks. This course brings the awareness about systematic and logical report writing and presentation of the technical efforts.

Course Outcomes:

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

1. Demonstrate the ability to develop creative and original solutions to engineering problems of significant complexity.
2. Work as an individual member of a team, with support from a supervisor, formulating solutions to day-to-day problems by integrating knowledge and experience gained during the course and beyond that.
3. Demonstrate the ability to produce a formal engineering report.
4. Describe experimental apparatus and/or models, and analysis procedures in a clear, complete and unambiguous manner making best use of latest information technology.
5. Communicate and present his / her ideas / work in front of peers and superiors.

Prerequisite: Capstone Project Phase-I

Course Content:

The candidate shall prepare a report of 100 – 150 pages. The report typed on A4 sized sheets and bound in the prescribed format shall be submitted after approval by the Guide and endorsement of the Head of Department. It will be assessed for term work by the evaluation committee appointed by the Controller of Examination.

Representative format of project report is as follows –

The dissertation work report shall be typed with 1.5 spacing on A4 bond paper. The total number of pages shall not be more than 150 and not less than 50. Figures, graphs, annexure etc. be added as per requirement. The report should be written in the following format.

1. Title sheet
2. Certificate
3. Acknowledgement
4. List of figures / photographs / graphs / tables
5. Abbreviations
6. Abstract / final synopsis
7. Contents
8. Text with usual scheme of chapters
9. Discussion of the results and conclusion
10. Bibliography (The source of illustrative matter be acknowledged clearly at appropriate place)





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Class:- Final Year B.Tech.	Semester-VIII
Course Code : OE4382	Course Name: Finance for Engineers (Online Course)

L	T	P	Credits
2	-	--	2

Course Description:

This course covers the basic concepts needed to understand the financial decision-making process. All types of organizations and also individuals develop and use financial accounting information in conducting their daily activities. Therefore, this course focuses upon financial accounting information. The course introduces the basic concepts and principles of accounting for preparing or analyzing the financial statements. The course also deals with the fundamentals of financial statements, how to measure a company's financial health using financial ratios and major topics in modern finance. With a deep understanding of the financial side of the business, you will be in a better position to make informed decisions and plan for the financial future.

Course Outcomes:

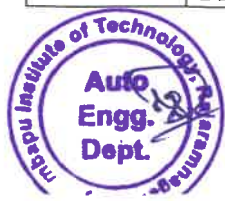
After successful completion of this course, students will be able to,

1. Discuss the fundamental aspects of accounting and finance.
2. Apply rules of accounting while recording transactions.
3. Prepare financial statements and analyze financial position of the firm by applying various techniques.
4. Describe the various long term sources of finance available for the business organization.

Prerequisite: Basics of Mathematics

Course Contents

Unit No	Description	Hrs
1.	Need for Financial accounting: Definition & Meaning of Financial Accounting, Need for Accounting, Internal & External Users of Accounting Information, Accounting Principles, Accounting equation	6
2.	Accounting Mechanics, Process and System: Rules of Accounting, Preparation of Journal, Ledger, Subsidiary Books, Trial balance.	8
3.	Preparation of Financial Statement: Components of Horizontal financial statement - Trading, Profit & loss account and Balance sheet, adjustment entries.	6
4.	Analysing Health of a Firm: Key finance terms, Techniques of Analysing Health of a Firm, Classification of Ratios – Liquidity, Leverage, Activity, Profitability	6
5.	Preparation of Cash Flow Statement: Meaning, sources and uses of cash and its usefulness, Preparation of Cash Flow Statement	6
6.	Long Term Financing: Long Term Financing: Shares, Debentures, Loan capital, foreign capital, FDI, Euro issues & external borrowings, Venture capital financing.	4





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References -

Reference Books:

- Paul Kimmel, J. Weygandt, D. Kieso, Financial Accounting, WILEY INDIA.
- S.N. Maheshwari & S.K. Maheshwari, Problems & Solutions in Advanced Accountancy, Vikas Publishing House Pvt. Ltd., New Delhi.
- M.C. Shukla, T.C. Grewal & S. C. Gupta, Advanced Accounts, S. Chand.
- Financial Management, M. Y. Khan & P. K. Jain, Tata McGraw-Hill Publishing Company Limited, New Delhi.
- Financial Management, Dr. Prasanna Chandra, Tata McGraw-Hill Publishing Company Limited.





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Class:- Final Year B.Tech.	Semester-VIII
Course Code: OE4362	Course Name: Engineering Management & Economics (Online Course)

L	T	P	Credits
2	-	--	2

Course Description:

Engineering management is the application of the practice of management to the practice of engineering. Engineering Management is a specialized form of management that is required to successfully lead engineering or technical personnel and projects. This course consists of two modules i.e. Engineering Management and Engineering Economics. First module deals with managerial skillsets that are required to coach, mentor and motivate technical professionals to the practice of engineering.

Engineering economics is a fundamental skill that all successful engineering firms employ in order to retain competitive advantage and market share. Second module focuses on decision making with reference to economics.

Course Outcomes:

After successful completion of this course, students will be able to,

1. Develop administrative, organizational and planning skills to execute engineering project.
2. Develop bar chart/mile stone chart for the project.
3. Analyze profit/cost data and carry out economic analysis to take optimal decision.
4. Calculate depreciation as per various methods.

Prerequisite: Basics of Mathematics

Course Content

Unit No	Description	Hrs
1.	Managerial skills Theories of Management Principles of Management (by Henry Fayol), Functions of Management, Planning, Organizing, Staffing, Directing, Co-Ordination, Communication, Motivation and Controlling	04
2.	Organizational skills Levels of management, Organizations-elements, types and characteristics of organization, Management by Objectives (MBO)	04
3.	Planning Tools Methods of scientific management- Critical Path Method (CPM), Programme Evaluation & Review Techniques (PERT), Network Crashing, Bar Chart, Mile-Stone chart	04
4.	Methods of Economic Analysis Economic equivalence, Methods of comparison of alternatives- Present Worth Method, Rate of Return method, Benefit-Cost ratio method, Net Present Value method	04
5.	Make or Buy Decision Approaches of make or buy decision-Simple cost analysis, Economic analysis, break-even analysis, Payback analysis	04





6.	Depreciation Methods of Depreciation- Straight line method, Declining balance depreciation, Sum of years digits method, sinking fund method, service output method	04
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References -

Text Books:

- Gilbert Daniel R, Freeman R. Edward and Stoner James A. F., Management, Pearson Education.
- Harold Kerzner, Project Management- A system approach to planning, scheduling and controlling, John Wiley & Sons Inc.
- Punmia B. C. and Khandelwal K. K., Project Planning, Scheduling and controlling with PERT and CPM, Laxmi Publications Pvt. Ltd.
- Paneerselvam R., Engineering Economics, Prentice Hall India Learning Private Limited.

Reference Books:

- Cannice Mark V, Koontz Harold and Weihrich Heinz, Management, McGraw Hill Education (I) Pvt. Ltd.
- Blank Leland and Tarquin Anthony, Basics of Engineering Economy, Tata McGraw-Hill.
- Mithani D. M., Managerial Economics- Theory & Applications, Himalaya Publishing House-New Delhi.

Note:- Being online course, lecture videos of each unit will be made available through college platform to the students. For each unit there will be separate assignment. Students need to submit all assignments within specified time.

Weightage: 25% weightage for unit wise assignments + 75% weightage for final exam.

Final exam will be held at college campus.





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Class:- Final Year B.Tech.	Semester-VIII
Course Code: IP4024	Course Name: Industry Internship & Project

L	T	P	Credits
-	-	-	12

Course Description:

Internship is designed to expand the depth and breadth of academic learning of students in their particular areas of study. It is an opportunity for students to receive experience in applying theories learned from the classroom to specific experiences with the community and work world. An internship can also heighten awareness of community issues, motivate students to create opportunities, embrace new ideas, and give direction to positive change. A successful internship can give valuable information in making decisions about the direction of future studies or employment. An internship is an opportunity not only to use and develop industry-related knowledge and skills, but also to enhance some of the skills that are transferable to any professional work setting. Students from Final year B.Tech are eligible to do this internship. Selected candidates by college will be permitted for internship of minimum 20 weeks in 8th semester. During this Internship, it is expected that students should identify the problems arising in the industry related to Engineering, and they have to give the solution to the company.

Course Outcomes:

1. Internship

After the successful completion of the IIP- II the student should be able to

1. Examine the functioning of the company on the terms of inputs, transformation process and the outputs (products and services)
2. Develop an attitude to adjust with the company culture, work norms, code of conduct.
3. Recognize and follow the safety norms, Code of conduct.
4. Demonstrate the ability to observe, analyse and document the details as per the industry practices.
5. Interpret the processes, systems and procedures and to relate to the theoretical concepts-studies.
6. Develop the leadership abilities, communication.
7. Demonstrate project management and finance sense

2. Project

After the successful completion of the project, the student should be able to;

1. Identify the project/problem in the domain of a program relevant for the company.
2. Compile the information to the pertaining to the problem identified.
3. Analyse the information using the statistical tools/ techniques.
4. develop the feasible solution for given problem.
5. Analyse the impact of the project on the performance of company/department.





Course Content

I. Internship :

During Internship, Students should follow guidelines given below.

1. After joining the industry students should learn all the departments and their workings. Furthermore, student should understand how each department of industry is interlinked with one another.
2. Student should correlate the theoretical aspects learned in academics with industry practices.
3. Students should gain a knowledge of new technologies which industry follows.
4. Students should follow the professional codes and ethics.
5. Students should follow all rules and regulations of industry. Special care should be taken regarding safety.

- **Work Diary:**

Work Diary will be provided to each student, which contains details regarding internship, do's and don'ts and evaluation scheme. Student is required to write the Diary regularly and get it signed by the industry guide periodically. During the visit of Mentor, assigned to the student should be able to go through the Diary to access the work done and write the remarks/ instruction. At the end of internship, student should submit the duly completed diary to the department.

- **Duration:**

The internship duration is of one complete semester (approximately 20 weeks) between 1st January to 30th May of the respective academic year. Biometric attendance on working days is compulsory.

II. Project :

Students should select technical problems occurring within the industry as a project in consult with industry & Institute mentors.

- **Evaluation**

Faculty Mentor will be assigned to each student by the Institute who will monitor the progress of internship and project and help the student to sort-out any issues/ problems arising. Mentor of student from college will visit the industry as per the schedule given below.

Sr.No.	Evaluation	Period
1.	At the beginning of the program for orienting Students to the company and finalize the project	During 2 nd Week
2.	Review-I (ISE-1)	During 10 th week
3.	Review-II (ISE-2)	During 15 th week
4.	Review-III (ESE)	During 20 th week

*Review-III is end semester examination (ESE), which will be conducted at institute.

*During ESE, students should submit, Project & internship report, Work diary, Internship & project completion certificate issued by industry etc. to respective departments.





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Class: - Final Year B.Tech.	Semester-VIII	L	T	P	Credits
Course Code: OE4382	Course Name: Finance for Engineers (Online Course)	2	-	--	2

Course Description:

This course covers the basic concepts needed to understand the financial decision-making process. All types of organizations and also individuals develop and use financial accounting information in conducting their daily activities. Therefore, this course focuses upon financial accounting information. The course introduces the basic concepts and principles of accounting for preparing or analyzing the financial statements. The course also deals with the fundamentals of financial statements, how to measure a company's financial health using financial ratios and major topics in modern finance. With a deep understanding of the financial side of the business, you will be in a better position to make informed decisions and plan for the financial future.

Course Outcomes:

After successful completion of this course, students will be able to,

1. Discuss the fundamental aspects of accounting and finance.
2. Apply rules of accounting while recording transactions.
3. Prepare financial statements and analyze financial position of the firm by applying various techniques.
4. Describe the various long-term sources of finance available for the business organization.

Prerequisite: Basics of Mathematics

Course Contents

Unit No	Description	Hrs
1.	Need for Financial accounting: Definition & Meaning of Financial Accounting, Need for Accounting, Internal & External Users of Accounting Information, Accounting Principles, Accounting equation	6
2.	Accounting Mechanics, Process and System: Rules of Accounting, Preparation of Journal, Ledger, Subsidiary Books, Trial balance.	8
3.	Preparation of Financial Statement: Components of Horizontal financial statement - Trading, Profit & loss account and Balance sheet, adjustment entries.	6
4.	Analysing Health of a Firm: Key finance terms, Techniques of Analysing Health of a Firm, Classification of Ratios – Liquidity, Leverage, Activity, Profitability	6
5.	Preparation of Cash Flow Statement: Meaning, sources and uses of cash and its usefulness, Preparation of Cash Flow Statement	6
6.	Long Term Financing: Long Term Financing: Shares, Debentures, Loan capital, foreign capital, FDI, Euro issues & external borrowings, Venture capital financing.	4





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References -

Reference Books:

- Paul Kimmel, J. Weygandt, D. Kieso, Financial Accounting, WILEY INDIA.
- S.N. Maheshwari & S.K. Maheshwari, Problems & Solutions in Advanced Accountancy, Vikas Publishing House Pvt. Ltd., New Delhi.
- M.C. Shukla, T.C. Grewal & S. C. Gupta, Advanced Accounts, S. Chand.
- Financial Management, M. Y. Khan & P. K. Jain, Tata McGraw-Hill Publishing Company Limited, New Delhi.
- Financial Management, Dr. Prasanna Chandra, Tata McGraw-Hill Publishing Company Limited.





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Class:- Final Year B. Tech.	Semester-VIII	L	T	P	Credits
Course Code: OE4362	Course Name: Engineering Management & Economics (Online Course)	2	-	--	2

Course Description:

Engineering management is the application of the practice of management to the practice of engineering. Engineering Management is a specialized form of management that is required to successfully lead engineering or technical personnel and projects. This course consists of two modules i.e. Engineering Management and Engineering Economics. First module deals with managerial skillsets that are required to coach, mentor and motivate technical professionals to the practice of engineering.

Engineering economics is a fundamental skill that all successful engineering firms employ in order to retain competitive advantage and market share. Second module focuses on decision making with reference to economics.

Course Outcomes:

After successful completion of this course, students will be able to,

1. Develop administrative, organizational and planning skills to execute engineering project.
2. Develop bar chart/mile stone chart for the project.
3. Analyze profit/cost data and carry out economic analysis to take optimal decision.
4. Calculate depreciation as per various methods.

Prerequisite: Basics of Mathematics

Course Content

Unit No	Description	Hrs
1.	Managerial skills Theories of Management Principles of Management (by Henry Fayol), Functions of Management, Planning, Organizing, Staffing, Directing, Co-Ordination, Communication, Motivation and Controlling	04
2.	Organizational skills Levels of management, Organizations-elements, types and characteristics of organization, Management by Objectives (MBO)	04
3.	Planning Tools Methods of scientific management- Critical Path Method (CPM), Programme Evaluation & Review Techniques (PERT), Network Crashing, Bar Chart, Mile-Stone chart	04
4.	Methods of Economic Analysis Economic equivalence, Methods of comparison of alternatives- Present Worth Method, Rate of Return method, Benefit-Cost ratio method, Net Present Value method	04





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5.	Make or Buy Decision Approaches of make or buy decision-Simple cost analysis, Economic analysis, break-even analysis, Payback analysis	04
6.	Depreciation Methods of Depreciation- Straight line method, Declining balance depreciation, Sum of years digits method, sinking fund method, service output method	04

References -

Text Books:

1. Gilbert Daniel R, Freeman R. Edward and Stoner James A. F., Management, Pearson Education.
2. Harold Kerzner, Project Management- A system approach to planning, scheduling and controlling, John Wiley & Sons Inc.
3. Punmia B. C. and Khandelwal K. K., Project Planning, Scheduling and controlling with PERT and CPM, Laxmi Publications Pvt. Ltd.
4. Paneerselvam R., Engineering Economics, Prentice Hall India Learning Private Limited.

Reference Books:

1. Cannice Mark V, Koontz Harold and Weihrich Heinz, Management, McGraw Hill Education (I) Pvt. Ltd.
2. Blank Leland and Tarquin Anthony, Basics of Engineering Economy, Tata McGraw-Hill.
3. Mithani D. M., Managerial Economics- Theory & Applications, Himalaya Publishing House-New Delhi.

- Note:- Being online course, lecture videos of each unit will be made available through college platform to the students. For each unit there will be separate assignment. Students need to submit all assignments within specified time.
- Weightage: 25% weightage for unit wise assignments + 75% weightage for final exam.
- Final exam will be held at college campus.





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Class:- Final Year B.Tech.	Semester-VIII
Course Code : RE4044	Course Name: Research Internship

L	T	P	Credits
-	-	-	12

Course Description:

Research experience for undergraduates is important not only for conducting research on a topic that has an impact on a current research activity, but also as a tool to enhance undergraduate education. For the engineering technology students, research experiences allow them to carry out in-depth study of engineering concepts, while emphasizing hands-on experiences and practical applications. Participating in research projects strengthens the student's resume, and fulfills the requirements of present-day employers, who demand sound engineering skills in their employees.

Course Outcomes:

After completion of this course, the student will be able to,

1. Investigate the technical literature.
2. Recognize and evaluate theories, practices, and/or research on a chosen topic by conducting a thorough literature review and submitting a written integrative, critical summary of the current literature.
3. Design a research problem and develop a methodology.
4. Develop and implement an advanced original research or creative project.
5. Develop the ability to explain the conceptual viability of the project and describe the major components involved.
6. Develop the ability to explain how the project will impact the relevant body of work.
7. Develop advanced discipline-relevant skills and competencies.
8. Construct an accurate record of research performed.
9. Write a research report and paper.

Course Content

Students should carefully discuss with their research advisor about time expectations to complete the research project.

Degree to which students meet expectations: The following is a minimum set of expectations for every student enrolled for this course for credit:

- i) perform a background literature search and review,
- ii.) Develop a project plan,
- iii.) Perform experimental work or applied experimental work,
- iv.) Write and present a research report.
- v) Write and submit research paper to any reputed journal/international conference.

- **To submit or publish the research paper in any reputed journal/international conference is a necessary criteria to become eligible for End semester Examination (ESE).**

Quality of the final report and oral presentation: The research advisor will provide clear expectations of the desired format, content, and deadlines of the final report. The research advisors will grade the final report.





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Attendance: In order to provide the measure of performance, the research advisor is expected to complete two mid-term evaluation with the student, accompanied by recommendations for improvement for the remainder of the term. The mid-term evaluation with the student should be accompanied by a one-on-one meeting between the research advisor and the student.

Absences and Make-up Work: Requirements for attendance is as per RR of the Institute

● **Evaluation**

Faculty guide will be assigned to each student by the Institute who will monitor the progress of research project and help the student to sort-out any issues/ problems arising. Schedule of evaluation will be as given below.

Sr.No.	Evaluation	Period
1.	Review-I (ISE-1)	During 10 th week
2.	Review-II (ISE-2)	During 15 th week
3.	Review-III (ESE)	During 20 th week

*Review-III is end semester examination (ESE).

*During ESE, students should submit research Project report, proof of submission of research paper to reputed journal/international conference to respective departments.

*If student is doing research project in outside organization (Research Lab/ institutes), he/she should submit project completion certificate given by outside organization.





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Class:- Final Year B.Tech.	Semester-VIII
Course Code : ED4104	Course Name : Project Management (Online Course)

L	T	P	Credits
-	-	--	2

Course Description:

To improve and update knowledge of new entrepreneurs in the areas of project preparation & appraisal techniques; decision-making process in the sector of industrial, infrastructure & sustainable opportunities that would lead to improved viability, returns and effective investment decisions. Writing a business plan which can gain interest of the fund providers like venture capitalists and other sources of funding.

Course Outcomes:

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

1. Prepare business Plan for selected business.
2. Make risk analysis & market analysis of selected project.
3. Make risk analysis & market analysis of selected project
4. Make financial appraisal of selected project.

Prerequisite: General knowledge of economics & clear concept about own business model.

Course Content

Unit No	Description	Hrs
1.	Project appraisal Introduction -Project Development Cycle, Identifying data requirements and analyzing their suitability for preparation of feasibility studies, project formulation, screening for pre-feasibility studies, stages of feasibility report preparation, Project Analysis including Market Analysis, Technical Analysis & Financial Analysis, applying various techniques and integrating the data gathered into a full-fledged business plan.	06
2.	Project Analysis -Environmental Analysis, Risk Analysis, Infrastructure Development & Financing, Risk Management, Risk identification, Qualitative risk analysis, Quantitative risk analysis, Risk planning, Risk control, Evaluating the rewards & risks for sustainable opportunities. National Cost-Benefit Analysis, Financing Sustainable Opportunities.	06
3.	Business Plan: What is business plan, Entrepreneurial opportunities and Business Plan. Preparing business plan. (Practical Exercises on preparation of business plan) Components of Business Plan, Executive summary, other components. Project report contents.	06
4.	Commercial Appraisal: Economic feasibility and commercial viability, market analysis, Market Research, Industry Analysis, Competitor analysis, defining the target market, market segmentation, market positioning, building a marketing plan, market strategy.	06





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5.	Technical Appraisal: Operation and Production Plan: Types of production systems, Product design and analysis, New product development, location and layout decisions, project layout, plant and technology choices, product specification and customer needs, production planning and control, Commercializing Technologies	06
6.	Financial Appraisal: pro forma income statements, financial projections, working capital requirement, funds flow and Cash flow statements; Ratio Analysis. Project Management Techniques: Identifying organizational structures Estimating costs and budgeting Using critical path project management tools (WBS, Gantt chart, Project Network Diagram) Establishing the critical path Tracking project milestones Using the program evaluation and review technique (PERT tool) Using process improvement tools (Fishbone, SIPOC) Managing time Controlling quality	06

References -

Text Books:

- Dwivedi, A.K.: Industrial Project and Entrepreneurship Development, Vikas Publishing House

Reference Books:

- Bangs Jr., D.H., *The Business Planning Guide*, Dearborn Publishing Co.
- Katz, J.A. and Green, R.P., *Entrepreneurial Small Business*, McGraw Hill
- Mullins, J. and Komisar R., *Getting to Plan B*, Harvard Business Press
- O'Donnell, M., *The Business Plan: Step by Step*, UND Center for Innovation.
- Scarborough, N.M. and Zimmerer, T.W., *Effective Small Business Management*, Pearson
- Pickle, H.B. and Abrahamson, R.L., *Small Business Management*, Wiley
- Desai, V., *Dynamics of Entrepreneurial Development & Management*, Himalaya Publishing
- Kao, J., *Creativity & Entrepreneurship*, Prentice Hall
- Singh, Narendra, *Project Management & Control*, Himalaya Publications





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Class:- Final Year B. Tech.	Semester-VIII	L	T	P	Credits
Course Code : ED4044	Course Name : Commercial Aspects of the Project (Online Course)	-	-	-	2

Course Description:

To familiarize students with accounting, mechanics of preparation of financial statements, understanding corporate financial statements, their analysis and interpretation. The objectives of the course are to build the skills, frameworks and knowledge in entrepreneurial finance. Students will study the financing of small and medium sized businesses & Financial management from the perspective of both the entrepreneur and investors. This course will also give overall understanding of marketing management which will help them in developing their own marketing decisions & in understanding the importance of market survey techniques. It will help them in conducting suitable market survey for their own selected products.

Course Outcomes:

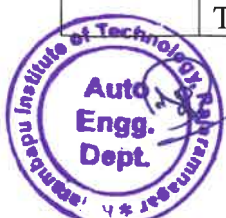
After successful completion of the course, students will be able to,

1. Interpret basic Financial Terminologies.
2. Prepare & analyze financial statements.
3. Prepare financial Plan for venture.
4. Apply basic principles of marketing for various products.
5. Prepare market survey.
6. Apply knowledge of marketing management for selected business.

Prerequisite: General knowledge of economics & clear concept about own business model

Course Content

Unit No	Description	Hrs
1.	Accounting Terminologies: meaning, nature, functions, types of accounting; basics of financial statements, generally accepted accounting concepts, principles and conventions; double entry system. Accounting Records: Fundamentals of record keeping, the accounting process, transactional analysis, the Adjusting and Closing process. Accounting systems. Computer-based accounting systems. Accounting cycle.	06
2.	Financial Statements: Balance sheet: assets, liabilities. Income statement: concept of income, concept of expenses, concept of gain and losses. Components of the income statement. Other concepts of income. Cash flow statements: purpose, components, and categories. Preparation of cash flow statements: concept, activities. Accounting and pricing.	06
3.	The concept of Financial Management – Definition, nature, objectives, functions and scope of financial management, Preparation of financial plan – its objectives, essential features, consideration in formulating financial plan, Capitalization: over, under and fair capitalization. Concept of risk and returns, Time value of money.	06





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4.	Nature & Scope of Marketing - Evolution; core marketing concepts, selling concept, marketing concept, Holistic marketing concept, portfolio approach-BCG matrix. Marketing Research- Concept & practice, Steps in Marketing Research, Assessment of demand & supply, Preparation of survey questionnaire.	06
5.	Marketing Environment and STP: Demographic, economic, political, legal, socio cultural, technological environment (Indian context); environmental scanning to discover marketing opportunities, Segmentation, Targeting and Positioning , difference between segmentation, targeting and positioning, customer value proposition.	06
6.	Marketing Mix: Product, Price, Promotion and Place. Product Decisions: Concept of Product, Levels of Product, Product Mix Decisions, Product Line Decisions, Individual Product Decisions, Branding, Product Life-cycle - Stages. Pricing Decisions: Meaning, Factors influencing Pricing Decisions, Methods of Pricing Place Decisions: Meaning, Channels of Distribution Promotion Decisions: Elements of Promotion Mix, Advertising, Publicity, Sales Promotion, Personal Selling, Direct Marketing and Public Relations, Digital Marketing	06

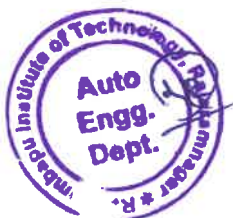
References -

Text Books:

- Maheshwari, S.N. and Maheshwari, S.K., Financial Accounting, Vikas Publishing House
- Leach C.J. and Melicher, R.W. Entrepreneurial Finance, Thomson.
- For B2C = Kotler, P., Keller, K.L., Koshy, A. and Jha, M.: Marketing Management, Pearson
- For B2B = Sarin, S. Strategic Brand Management for B2B Markets, Sage.

Reference Books:

1. Ghosh, T.P., Financial Accounting for Managers, Tax-mann Allied Services^[1]
2. Gupta, A., Financial Accounting for Management, Prentice Hall^[1]
3. Jain, S.P. and Narang, K.L., Advanced Accountancy, Kalyani Publishers.
4. Smith, J.K., Smith, R.L. and Bliss, R.T., Entrepreneurial Finance, Stanford University Press
5. Smith, J.K. and Smith, R.L., Entrepreneurial Finance, Wiley.
6. Rogers, S., Entrepreneurial Finance, McGraw Hill.
7. Chandra, P., Financial Management, McGraw Hill.
8. Kotler P. & Armstrong, G., Principles of Marketing, Pearson





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Class:- Final Year B. Tech.	Semester-VIII	L	T	P	Credits
Course Code : ED4064	Course Name : Entrepreneurship Development Program (EDP)	-	-	-	1

Course Description:

Student will attend short term intensive EDP program organized either in house or by any authorized agency approved by CIIED.

Course Outcomes:

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

1. Apply knowledge of engineering, economics, marketing and finance for formulation of business plan, starting & managing new business.

Prerequisite: General knowledge of business & clear concept about own business model.

Course Content:

1. 1 Student will undergo training programs organized by CIIED.
Programs on marketing, Finance management, project report preparation by professional agencies. Students are required to apply this knowledge for preparing final project report.
2. Student will complete online certification course- **Entrepreneurial & Employability Skill Development Program** by Singapore polytechnic in association with Jugad Funda & Shivaji University, Kolhapur or any other approved agencies.

Evaluation- ISE 50 marks by mentor for-

1. Completion of online certification course- **Entrepreneurial & Employability Skill Development Program** by Singapore polytechnic in association with Jugad Funda & Shivaji University, Kolhapur or any approved agencies.
2. Active participation in programs by completing various activities/assignments in program.





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Class:- Final Year B.Tech.	Semester-VIII	L	T	P	Credits
Course Code : ED4084	Course Name: Entrepreneurship Internship	-	-	-	11

Course Description:

Student will prepare technically feasible and economically viable detailed project report including market survey.

Course Outcomes:

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

1. Apply knowledge of engineering, economics, marketing and finance for preparation of project report.
2. Make commercial, technical and financial appraisal of project.

Course Content

Student will start working on collection of data required for business plan. During semester he may require to visit various support organizations, similar industries, suppliers of raw materials, machinery, special service providers. He has to conduct market survey. For this student can go out of campus with prior permission of mentor. Mentor should maintain this record. Students are required to work independently by taking guidance from mentor/Head CIIED/faculty on expert panel of CIIED.

Product prototype & execution of business operation is must & it should be validated by Departmental ED committee.

Continuous efforts taken by student should be observed by mentor for ISE evaluation. At the end of semester detailed project report will be presented before Expert committee for ISE evaluation of 100 marks.

Then student will appear for ESE. Project report evaluation & assessment will be done by a panel of experts appointed by COE.

Evaluation	Weightage	Particulars	converted Marks
ISE	10%	Preliminary project report	10
	20%	Market Survey	20
	20%	Completion of Legal Aspects	20
	50%	Final Report	50
ESE	100%	ESE -Final Report	100

