Dr. Babasaheb Ambedkar Marathwada University

Chhatrapati Sambhajinagar- 431001

B.VOC. Degree Program

(Three Year)

Course Structure

(Revised)

(AS PER NEP-2020)

Subject (Major): Automobile

Effective from 2024-25

PREFACE

As we stand on the threshold of a new era in education, the dawn of the National Education Policy 2020 illuminates our path toward a holistic, inclusive, and progressive educational landscape. The Bachelor of Vocation (B. VOC.) curriculum outlined herein reflects the ethos and aspirations of this transformative policy, aiming to equip learners with the knowledge, skills, and values necessary to thrive in the dynamic world of the 21st century.

At its core, the National Education Policy 2020 envisions an educational framework that is learner-centric, multidisciplinary, and geared towards fostering creativity, critical thinking, and innovation. It emphasizes the integration of knowledge across disciplines, breaking down traditional silos to encourage holistic understanding and application of concepts. The Bachelor of Vocation (B. VOC.) curriculum embodies these principles by offering a diverse array of courses spanning various scientific domains, while also incorporating interdisciplinary studies to nurture well-rounded graduates capable of addressing complex challenges with agility and insight.

Furthermore, the curriculum is designed to promote experiential learning, research, and hands-on exploration, recognizing the importance of practical engagement in deepening understanding and cultivating real-world skills. Through laboratory work, field experiences, internships, and project-based learning opportunities, students will have the chance to apply theoretical knowledge in practical settings, develop problem-solving abilities, and cultivate a spirit of inquiry and discovery.

Integral to the National Education Policy 2020 is the commitment to inclusivity, equity, and access to quality education for all. The Bachelor of Vocation (B. VOC.) curriculum reflects this commitment by embracing diversity in perspectives, backgrounds, and experiences, and by fostering an inclusive learning environment where every student feels valued, supported, and empowered to succeed.

Moreover, the curriculum emphasizes the cultivation of ethical values, social responsibility, and global citizenship, instilling in students a sense of accountability towards society and the environment. By integrating courses on ethics, sustainability, and social sciences, the Bachelor of Vocation (B. VOC.) program aims to produce graduates who are not only proficient in their respective fields but also compassionate, ethical leaders committed to making a positive impact on the world.

As we embark on this journey of educational transformation guided by the National Education Policy 2020, the Bachelor of Vocation (B. VOC.) curriculum stands as a testament to our collective vision of a more equitable, inclusive, and enlightened society. It is our hope that through rigorous academics, innovative pedagogy, and unwavering dedication to excellence, we can inspire the next generation of scientists, scholars, and change-makers to realize their full potential and contribute meaningfully to the advancement of knowledge and the betterment of humanity.

The need for expert human resources in **Automobile Sector** is critical for both manufacturing and service industries due to several key factors:

The automobile industry is undergoing a transformative phase characterized by rapid advancements in technology and a shift towards sustainability. With the advent of electric vehicles, autonomous driving, and increased emphasis on environmental responsibility, the need for a skilled workforce has never been more critical. The necessity of skill-based human resources in the automobile industry, focusing on the benefits of investing in specialized training and the impact on industry growth and innovation are summarized below.

Technological Advancements and Industry Transformation

The automobile industry is at the forefront of technological innovation. Developments in electric vehicles (EVs), hybrid technology, autonomous driving systems, and connected car technologies are revolutionizing the sector. These advancements require a workforce that is not only familiar with traditional automotive engineering but also proficient in software development, data analysis, and new manufacturing techniques.

Sustainability and Environmental Responsibility

As the global emphasis on sustainability intensifies, the automobile industry is compelled to reduce its carbon footprint. This shift necessitates the development of new materials, energy-efficient production processes, and eco-friendly vehicle designs. A skilled workforce is essential to drive these innovations and ensure compliance with environmental regulations.

Economic Competitiveness and Productivity

In a highly competitive global market, the ability to innovate and improve productivity is crucial for maintaining a competitive edge. Skill-based training programs equip employees with the latest knowledge and techniques, enhancing their ability to contribute to process improvements, cost reductions, and overall efficiency. This not only boosts the industry's competitiveness but also its capacity for economic growth.

Industry-Specific Skills and Training

The complexity of modern automotive systems requires specialized skills. Training programs focusing on areas such as advanced manufacturing, robotics, artificial intelligence, and cybersecurity are vital. These programs ensure that the workforce can effectively manage and develop the sophisticated systems that underpin contemporary vehicles.

Collaboration with Educational Institutions and Industry Partners

Collaborative efforts between automobile manufacturers, educational institutions, and industry partners are essential for developing relevant training programs. By aligning educational curricula with industry needs, these partnerships can produce graduates who are ready to meet the demands of the modern automotive workplace.

The necessity of skill-based human resources in the automobile industry cannot be overstated. As the industry navigates technological advancements and strives for sustainability, a well-

trained and adaptable workforce is crucial for continued innovation and competitiveness. Investing in skill-based training programs and fostering collaborations with educational institutions will ensure that the automobile industry remains at the cutting edge of technological progress and environmental responsibility. By prioritizing skill development, the industry can secure a prosperous future, drive economic growth, and lead the way in global automotive advancements.

Structure of Bachelor of Vocation (B.VOC)

(Three Year))

Subject (Major) : Automobile

B.VOC. First Year: 1st Semester

Course Type	Course Code	Course Name	Teaching Scheme (Hrs / Week)		Credits Assigned		Total Credits
			Theory	Practical	Theory	Practical	
Major (Core) M1 Mandatory	DSC-1	Automotive Systems	2		2		2+2 = 4
	DSC-2	Practical based on DSC-1		4		2	
Major (Core) M2 Mandatory	DSC-3	Basic Electrical Systems	2		2		2+2 = 4
	DSC-4	Practical based on DSC-1		4		2	
Major (Core) M3 Mandatory	DSC-5	Workshop Technology	2		2		2+2 = 4
	DSC-6	Practical based on DSC-1		4		2	
Generic / Open Elective (GE/OE) (Choose any one from pool of courses) **It should be chosen compulsorily from the faculty other than that of Major**	GE/OE-1	To be chosen from other faculty	2		2		2
SEC (Skill Enhancement Courses) (Choose any one from pool of courses)	SEC-1	1) Engineering Drawing 2) Basic Computer Course	1		1		2
	SEC-2	Practicals based on SEC-1		2		1	
AEC, VEC, IKS	AEC-1	English (Common for all the faculty)	2		2		2+2 =4
	IKS-1	Choose any one from pool of Courses	2		2		
OJT/ FP/CEP/CC/RP	CC-1	Health and Wellness (Common for all the faculty)		4		2	2
			13	**18**	**13**	**09**	**22**

B.VOC. First Year: 2nd Semester

Course Type	Course Code	Course Name	Teaching Scheme (Hrs / Week)		Credits Assigned		Total Credits
			Theory	Practical	Theory	Practical	
Major (Core) M1 Mandatory	DSC-7	Thermodynamics and Heat Transfer	2		2		2+2 = 4
	DSC-8	Practical based on DSC-3		4		2	
Major (Core) M2 Mandatory	DSC-9	Automotive Materials	2		2		2+2 = 4
	DSC-10	Practical based on DSC-3		4		2	
Major (Core) M3 Mandatory	DSC-11	Basic Electronic Systems	2		2		2+2 = 4
	DSC-12	Practical based on DSC-3		4		2	
Generic / Open Elective (GE/OE) (Choose any one from pool of courses) **It should be chosen compulsorily from the faculty other than that of Major**	GE/OE-2	To be chosen from other faculty	2		2		2
VSC (Vocational Skill Courses) (Choose any one from pool of courses)	VSC-1	1)Computer Aided Drawing 2)Mechanics of Machines	1		1		2
	VSC-2	Practicals based on VSC-1		2		1	
AEC, VEC, IKS	AEC-2	English (Common for all the faculty)	2		2		2+2 =4
	VEC-1	Constitution of India (Common for all the faculty)	2		2		
OJT/ FP/CEP/CC/RP	CC-2	Yoga Education / Sports and Fitness (Common for all the faculty)		4		2	2
			13	**18**	**13**	**09**	**22**
Exit Option : Award of UG Certificate in 3 Majors with 44 credits and an additional 4 credits of core NSQF course / Internship OR continue with Major and Minor							

GE/OE-1 : This is a 2 credit theory course to be designed for other faculty

GE/OE-2 : This is a 2 credit theory course to be designed for other faculty

Students will have to choose any three subjects as a **Major 1, Major 2, Major 3,** from Basket 1 under the Faculty of Science and Technology.

Students will be having three subject options of equal credits (instead of Major and / or minor verticals) in the first year. Students will have to select / declare choice of one subject **as a major subject** in the beginning of second year **out of three major options M1, M2 and M3 (which were opted in the first year).**

Detailed Illustration of Courses included in 1st and 2nd semester:

1) **Major** (Core) subject are mandatory.

   DSC-1 : This is a 2 credit theory course corresponding to Major (core) subject
   DSC-2 : This is a 2 credit practical course based on DSC-1
   DSC-3 : This is a 2 credit theory course corresponding to Major (core) subject
   DSC-4 : This is a 2 credit practical course based on DSC-3
   DSC-5 : This is a 2 credit theory course corresponding to Major (core) subject
   DSC-7 : This is a 2 credit theory course corresponding to Major (core) subject
   DSC-6 : This is a 2 credit practical course based on DSC-5
   DSC-8 : This is a 2 credit practical course based on DSC-7
   DSC-9 : This is a 2 credit theory course corresponding to Major (core) subject
   DSC-11 : This is a 2 credit theory course corresponding to Major (core) subject
   DSC-10 : This is a 2 credit practical course based on DSC-9
   DSC-12 : This is a 2 credit practical course based on DSC-11

2) **Generic / Open Elective (GE/OE)**: (Needs to be chosen (any one) from pool of courses available at respective college). **These courses should be chosen compulsorily from faculty other than that of Major.**

   GE/OE -1 : This is a 2 credit theory course should be chosen compulsorily from faculty other than that of Major.
   GE/OE -2 : This is a 2 credit theory course should be chosen compulsorily from faculty other than that of Major.

3) **SEC** (Skill Enhancement Courses) : Choose any one from pool of courses. These courses needs to be designed to enhance the technical skills of the students in specific area.

   SEC-1 : This is a 1 credit theory course to enhance the technical skills of the students in specific area.
   SEC-2 : This is a 1 credit practical course based on SEC-1.

4) **VSC** (Vocational Skill Courses) : Choose any one from pool of courses. These courses should be based on Hands on Training corresponding to Major (core) subject.

   VSC-1 : This is a 1 credit theory course based Hands on Training corresponding to Major (core) subject.

VSC-2 : This is a 1 credit practical course based on VSC-1

5) **AEC** (Ability Enhancement courses): The focus of these courses should be based on linguistic and communication skills.

   AEC-1 : English
   This is a 2 credit theory course based on linguistic proficiency. It will be common for all the faculty.

   AEC-2 : English
   This is a 2 credit theory course based on linguistic proficiency. It will be common for all the faculty.

6) **IKS** (Indian Knowledge System) : The courses related to traditional and ancient culture of India will be included in this section. The respective college will have to choose one of the courses from the pool of courses designed by the University.

   IKS-1 : To be chosen from the pool of courses designed by the University
   This is a 2 credit theory course based on Indian Knowledge System. It will be common for all the faculty

7) **VEC** (Value Education Courses): The courses such as understanding India, Environmental Science / Education, Digital and Technological solutions etc will be part of Value Education Courses.

   VEC-1 : Constitution of India
   This is a 2 credit theory course based on value education. It will be common for all the faculty

8) **CC** (Curricular Courses): The courses such as Health and wellness, Yoga education, Sports and Fitness, Cultural activities, NSS/NCC, Preforming Arts.

   CC-1 : Health and Wellness
   This is a 2 credit practical course based on Co-curricular activities. It will be common for all the faculty

   CC-2 : Yoga education / Sports and Fitness
   This is a 2 credit practical course based on Co-curricular activities. It will be common for all the faculty

B.VOC. Second Year: 3rd Semester

Students will have to select / declare choice of **one major subject** and **one minor subject** from three major options M1, M2 and M3 (which were opted in the first year)

Course Type	Course Code	Course Name	Teaching Scheme (Hrs / Week)		Credits Assigned		Total Credits
			Theory	Practical	Theory	Practical	
Major (Core) Mandatory	DSC-13	Automobile Transmission	2		2		2+2+2+2 = 08
	DSC-14	Hydraulics and Pneumatics	2		2		
	DSC-15	Practical based on DSC-5		4		2	
	DSC-16	Practical based on DSC-6		4		2	
Minor (Choose any two from pool of courses) **It is from different discipline of the same faculty**	Mn-1	Programmable Logic Control	2		2		2+2 = 04
	Mn-2	Python Programming	2		2		
Generic / Open Elective (GE/OE) (Choose any one from pool of courses) **It should be chosen compulsorily from the faculty other than that of Major**	GE/OE-3	To be chosen from other faculty	2		2		02
VSC (Vocational Skill Courses) (Choose any one from pool of courses)	VSC-3	1) Manufacturing Processes 2) Electric Motors	1		1		1+1 =02
	VSC-4	Practical based on VSC-3		2		1	
AEC, VEC, IKS	AEC-3	Modern Indian Language (MIL-1) (Common for all the faculty)	2		2		02
	VEC-2	Environmental Studies	2		2	2	2+2= 04
OJT/ FP/CEP/CC/RP	CC-3	Cultural Activity / NSS,NCC (Common for all the faculty)		4		2	
			15	**14**	**15**	**07**	**22**

Minor Courses for other Discipline

Mn-1 : This is a 2 credit theory course to be designed for other discipline

Mn-2 : This is a 2 credit theory course to be designed for other discipline

Generic /Open Elective Courses for other faculty

GE/OE-3 : This is a 2 credit theory course to be designed for other faculty

B.VOC. Second Year: 4th Semester

Course Type	Course Code	Course Name	Teaching Scheme (Hrs / Week)		Credits Assigned		Total Credits
			Theory	Practical	Theory	Practical	
Major (Core) Mandatory	DSC-17	Electric & Hybrid Vehicles	2		2		2+2+2+2 = 08
	DSC-18	Automotive HVAC	2		2		
	DSC-19	Practical based on DSC-9		4		2	
	DSC-20	Practical based on DSC-10		4		2	
Minor (Choose any two from pool of courses) **It is from different discipline of the same faculty**	Mn-3	Internet of Things	2		2		2+2 = 04
	Mn-4	Robotics	2		2		
Generic / Open Elective (GE/OE) (Choose any one from pool of courses) **It should be chosen compulsorily from the faculty other than that of Major**	GE/OE-4	To be chosen from other faculty	2		2		02
SEC (Skill Enhancement Courses) (Choose any one from pool of courses)	SEC-3	1) Computer Aided Manufacturing 2) Automobile Sensors	1		1		1+1 =02
	SEC-4	Practicals based on SEC-3		2		1	
AEC, VEC, IKS	AEC-4	Modern Indian Language (MIL-2) (Common for all the faculty)	2		2		02
OJT/ FP/CEP/CC/RP	FP-1	Field Project		4		2	2+2= 04
	CC-4	(Fine/ Applied/ Visual/ Performing Arts) (Common for all the faculty)		4		2	
			13	**18**	**13**	**09**	**22**
Exit Option : Award of UG Diploma in major and minor with 88 credits and an additional 4 credits NSQF course (related to major / minor) / Internship during summer vacation OR Continue with Major and Minor							

Minor Courses for other Discipline

Mn-3 : This is a 2 credit theory course to be designed for other discipline

Mn-4 : This is a 2 credit theory course to be designed for other discipline

Generic /Open Elective Courses for other faculty

GE/OE-4 : This is a 2 credit theory course to be designed for other faculty

Detailed Illustration of Courses included in 3rd and 4th semester:

1) **Major** (Core) subject are mandatory.
   DSC-13 : This is a 2 credit theory course corresponding to Major (core) subject
   DSC-14 : This is a 2 credit theory course corresponding to Major (core) subject
   DSC-15 : This is a 2 credit practical course based on DSC-13
   DSC-16 : This is a 2 credit practical course based on DSC-14
   DSC-17: This is a 2 credit theory course corresponding to Major (core) subject
   DSC-18: This is a 2 credit theory course corresponding to Major (core) subject
   DSC-19 : This is a 2 credit practical course based on DSC-17
   DSC-20: This is a 2 credit practical course based on DSC-18

2) **Minor : It is from different discipline of the same faculty**

   Mn1 : This is a 2 credit theory from different discipline of the same faculty
   Mn2 : This is a 2 credit theory from different discipline of the same faculty
   Mn3 : This is a 2 credit theory from different discipline of the same faculty
   Mn4 : This is a 2 credit theory from different discipline of the same faculty

3) **Generic / Open Elective (GE/OE)** : (Needs to be chosen (any one) from pool of courses available at respective college). **These courses should be chosen compulsorily from faculty other than that of Major.**

   GE/OE -3 : This is a 2 credit theory course should be chosen compulsorily from faculty other than that of Major.
   GE/OE -4 : This is a 2 credit theory course should be chosen compulsorily from faculty other than that of Major.

4) **VSC** (Vocational Skill Courses) : Choose any one from pool of courses. These courses should be based on Hands on Training corresponding to Major (core) subject.

   VSC-3 : This is a 1 credit theory course based Hands on Training corresponding to Major (core) subject.
   VSC-4 : This is a 1 credit practical course based on VSC-3

5) **SEC** (Skill Enhancement Courses) : Choose any one from pool of courses. These courses should be based on Hands on Training corresponding to Major (core) subject.

   SEC-3 : This is a 1 credit theory course based Hands on Training corresponding to Major (core) subject.
   SEC-4 : This is a 1 credit practical course based on SEC-3

6) **AEC** (Ability Enhancement courses): The focus of these courses should be based on linguistic and communication skills.

AEC-3 : MIL-1
This is a 2 credit theory course based on linguistic proficiency. It will be common for all the faculty.

AEC 4 : Modern Indian Language MIL-2
This is a 2 credit theory course based on linguistic proficiency. It will be common for all the faculty.

VEC-2: Environmental Studies

7) FP : Field Project : This is a 2 credit course, should be corresponding to Major (core) subject

8) **CC** (Curricular Courses): The courses such as Health and wellness, Yoga education, Sports and Fitness, Cultural activities, NSS/NCC, Preforming Arts. In the 3rd semester it will be either cultural activities OR NSS/NCC and will be common for all the faculty.

CC-3 : Cultural Activity / NSS, NCC
This is a 2 credit practical course based on Co-curricular activities. It will be common for all the faculty

CC-4 : Fine/ Applied/ Visual/ Performing Arts
This is a 2 credit practical course based on Co-curricular activities. It will be common for all the faculty

B.VOC. Third Year (UG Degree)

Course Type	Course Code	Course Name	Teaching Scheme (Hrs / Week)		Credits Assigned		Total Credits
			Theory	Practical	Theory	Practical	
Major (Core) Mandatory	DSC-13	Vehicle Testing	2		2		2+2+2+2= 08
	DSC-14	Design of Engine Components	2		2		
	DSC-15	Practical based on DSC-13		4		2	
	DSC-16	Practical based on DSC-14		4		2	
Discipline Specific Electives (DSE) (Choose any one from pool of courses)	DSE-1	1)Additive Manufacturing 2)Plastic Moulding	2		2		2+2=4
	DSE-2	Practical based on DSE-1		4		2	
Minor (Choose any two from pool of courses) **It is from different discipline of the same faculty**	Mn-5	To be chosen from other discipline of same faculty	2		2		2+2 = 04
	Mn-6	To be chosen from other discipline of same faculty	2		2		
VSC (Vocational Skill Courses) (Choose any one from pool of courses)	VSC-5	1. Metrology and Quality Control 2. Vehicle Dynamics	2		2		2+2 =04
	VSC-6	Practicals based on VSC-5		4		2	
OJT/ FP/CEP/CC/RP (Choose any one from pool of courses)	FP-2/CEP-2	Field Project / Community engagement and Service		4		2	02
			12	**20**	**12**	**10**	**22**
OR							
Industry Internship	INTERN -1	Industry Internship – 1	**12 Weeks Industry Internship**				**22**

Minor Courses for other Discipline

Mn-5 : This is a 2 credit theory course to be designed for other discipline

Mn-6 : This is a 2 credit theory course to be designed for other discipline

B.VOC. Third Year (UG Degree)
6th Semester

Course Type	Course Code	Course Name	Teaching Scheme (Hrs / Week)		Credits Assigned		Total Credits
			Theory	Practical	Theory	Practical	
Major (Core) Mandatory	DSC-17	Vehicle Body Engineering	2		2		2+2+2+2+2 = 10
	DSC-18	Fuels and Lubricants	2		2		
	DSC-19	Practical based on DSC-17		4		2	
	DSC-20	Practical based on DSC-18		4		2	
	DSC-21	IKS-2 (Indian Knowledge System related to Major)	2		2		
Discipline Specific Electives (DSE) (Choose any one from pool of courses)	DSE-3	1)Vibration and Noise 2)Automotive Product Life Cycle Management	2		2		2+2=4
	DSE-4	Practical based on DSE-3		4		2	
Minor (Choose any one from pool of courses) **It is from different discipline of the same faculty**	Mn-7	To be chosen from other discipline of same faculty	2		2		2+2 = 04
	Mn-8	To be chosen from other discipline of same faculty	2		2		
OJT/ FP/CEP/CC/RP (Choose any one from pool of courses)	OJT-1	On Job Training		8		4	04
			12	**20**	**12**	**10**	**22**
OR							
Industry Internship	INTERN -2	Industry Internship – 2	**12 Weeks Industry Internship**				**22**
Exit option : Award of UG degree in Major with 132 credits OR continue with Major and Minor							
OR							
Exit option : Award of Industry Embedded UG degree in Major with 132 credits OR continue with Major and Minor							

Minor Courses for other Discipline

Mn-7 : This is a 2 credit theory course to be designed for other discipline

Mn-8 : This is a 2 credit theory course to be designed for other discipline

Detailed Illustration of Courses included in 5th and 6th semester:

1) **Major** (Core) subject are mandatory.

   DSC-13 : This is a 2 credit theory course corresponding to Major (core) subject DSC-14 : This is a 2 credit theory course corresponding to Major (core) subject DSC-15 : This is a 2 credit practical course based on DSC-13
   DSC-16 : This is a 2 credit practical course based on DSC-14
   DSC-17 : This is a 2 credit theory course corresponding to Major (core) subject DSC-18 : This is a 2 credit theory course corresponding to Major (core) subject DSC-19 : This is a 2 credit practical course based on DSC-17
   DSC-20 : This is a 2 credit practical course based on DSC-18
   DSC-21 (IKS-2) : This is a 2 credit theory course corresponding to Indian Knowledge System related to Major

2) **Discipline Specific Electives (DSE) :** (Needs to be chosen any one from pool of courses available at respective college). **These courses should be chosen related to Major.**

   DSE-1 : This is a 2 credit discipline specific course (elective) related to Major
   DSE-2 : This is a 2 credit practical course based on DSE-1
   DSE-3 : This is a 2 credit discipline specific course (elective) related to Major
   DSE-4 : This is a 2 credit practical course based on DSE-3

3) **Minor : It is from different discipline of the same faculty**

   Mn5 : This is a 2 credit theory from different discipline of the same faculty Mn6 : This is a 2 credit theory from different discipline of the same faculty Mn7 : This is a 2 credit theory from different discipline of the same faculty Mn8 : This is a 2 credit theory from different discipline of the same faculty

9) **VSC** (Vocational Skill Courses) : Choose any one from pool of courses. These courses should be based on Hands on Training corresponding to Major (core) subject.

   VSC-5 : This is a 1 credit theory course based Hands on Training corresponding to Major (core) subject.
   VSC-6 : This is a 1 credit practical course based on VSC-5

10) **FP / CEP-2** : Field Project / Community engagement and service : This is a 2 credit course related to Field Project / community engagement and service

11) **OJT-1** : This is a 4 credit course related to On job Training

Program Educational Outcomes (PEO):

The Objective of the B.VOC Automobile program are to produce graduates who:

1. Have a strong foundation in Automobile systems and Automobile Troubleshooting and Diagnostics with an ability to solve important problems in modern technological society as valuable, productive technicians and supervisors.
2. Have a broad based background to practice B.VOC Automobile in the areas of Automobile Manufacturers, Service Industry, Auto Ancillary industry and Government sectors meeting the growth expectations of stakeholders.
3. Have an ability to pursue higher studies and succeed in academic and professional careers.
4. Have the ability to address professional demands individually and as a team member communicating effectively in technical environment using modern tools.
5. Recognize the need for and possess the ability to engage in lifelong learning.
6. Will be sensitive to consequences of their work both ethically and professionally for productive professional career.

Programme Outcomes (POs):

The objectives of B.Voc (Automobile) program are to produce graduates who -

PO 1: Basic knowledge: Apply knowledge of basic sciences, basic technical, and fundamental engineering/ technology to solve the broad-spectrum Automobile related problems.

PO 2. Discipline knowledge & Problem Analysis: Apply knowledge of a broad spectrum of technology that encompasses (but not limited to) electronics, mechatronics, electrical, robotics and control system to identify Automobile related problems.

PO 3. Design Development of solutions: Design / develop solutions for complex engineering or technological problems or challenges for Automobile related problems

PO 4. Conduct Investigation of complex problems: Use research-based knowledge and research method including design of experiments/systems, analysis and interpretation of data and synthesis of information to provide valid conclusion

PO 5. Environment and sustainability: Apply Automobile solutions for sustainable development practices in societal and environmental contexts.

PO 6. Ethics: Apply ethical principles for commitment to professional ethics, responsibilities and norms of the practice also in the field of Automobile.

PO 7. Communication: Communicate effectively in oral and written form.

Programme Specific Outcomes (PSOs):

After 3-4 years of completion of the program, students will be able to -

PSO 1: Apply knowledge of motor vehicles, their manufacturing and servicing & repair technology in solving complex problems in automotive field.

PSO 2: Design systems for motor vehicles, their manufacturing & servicing & repair sectors.

PSO 3 : Diagnose faults in motor vehicles and its systems.

Eligibility:

XII Science/Commerce/Arts or equivalent/ MCVC/ ITI (two years) with relevant/equivalent trade from any recognized Board/Institution are eligible for registration/ admission to first year (Semester I) of B.Voc Automobile Degree program.

Exit Options:

The programme allows exit of a student in an intermediate stage, on successful employment. Scopes will be there for further continuation of study. The other wise exit options will be as follows-

Exit Point	*Duration*	*Diploma / Degree to be Offered*
First exit	After 1 yr.	Diploma in Vocation (D. Voc.)
Second exit	After 2 yrs.	Advanced Diploma in Vocation (Adv. D. Voc.)
Third exit	After 3 yrs.	Bachelor in Vocation (B. Voc.)

Admission / Promotion Process:

In response to the advertisement for registration, interested students will have to register themselves. Admission should be done on the basis of performance of students at Common Entrance Test (CET). The CET will be conducted in the month of June every year.

A candidate who has sought admission to Semester – I shall be admitted to Semester – II automatically. A candidate who has passed 75% of the papers at First Year (First and Second Semesters together) examinations shall be allowed to take admissions in third semester. Similarly, a candidate who has passed 75% of the papers at the Second Year (Third and Fourth Semesters together) examinations shall be allowed to take admission to the Fifth semester. However, if a candidate has not passed the First and Second Semester examinations, he shall not be allowed to take admission to the Fifth Semester. Appearance in the First, Third and Fifth semester is compulsory to get promoted to next semester.

For obtaining B. Voc. Degree, a student will have to complete all semesters successfully within 06 years/12 semesters. It also offers multiple exit/entry. Students can exit after completion of one year and can enter into the system (subsequent year) with 5 years from the date of first time registration.

Dropout students will be allowed to register for respective semester as and when the concerned courses are offered by the department, **HOWEVER HE / SHE SHOULD NOT EXCEED MORE THAN TWICE THE DURATION OF THE COURSE FROM THE DATE OF FIRST REGISTRATION AT PARENT DEPARTMENT / COLLEGE**. The admission of the concern student will be automatically cancelled if he / she fails to complete the B. VOC. degree within a period of maximum six years / twelve semesters.

Choice Based Credit System (CBCS):

The choice-based credit system is going to be adopted. This provides flexibility to make the system more responsive to the changing needs of our students, the professionals and society. It gives greater freedom to students to determine their own pace of study. The credit-based system also facilitates the transfer of credits.

- Students will have to earn 44 credits for the award of one year Diploma in Vocation (D. Voc.)
- Students will have to earn 88 credits for the award of two year Advance Diploma in Vocation (Adv. D. Voc.)
- Students will have to earn 132 credits for the award of three year Bachelor Degree in Vocation (B. Voc.)

Credit-to-contact hour Mapping:

(a) One Credit would mean equivalent of 15 contact hours for theory lecture.

(b) For lab course/ workshops/internship/field work/project, the credit weightage for equivalent hours shall be 50% that for lectures /workshop.

(c) For self- learning, based on e-content or otherwise, the credit weightage for equivalent hours of study should be 50% or less of that for lectures/workshops.

Attendance:

Students must have 75 % of attendance in each course for appearing examination otherwise he / she will not be strictly allowed for appearing the examination of each course. Frequent absence from regular theory/Laboratory course may lead to disqualification from continuous assessment test (CAT) process in respective subject.

Departmental Committee:

The Departmental Committee (DC) of the Centre will monitor smooth functioning of the program.

Results Grievances / Redressal Committee

Grievances / Redressal committee should be constituted in the department to resolve all grievances relating to the evaluation. The committee shall consist of Head of the department, the concerned teacher of a particular course and senior faculty member of Department of Committee. The decision of Grievances / Redressal committee will have to be approved by Department committee.

Evaluation Methods:

Formative assessment is an efficient method to evaluate students' comprehension, learning needs, and academic progress. It offers immediate feedback, enhanced student engagement, personalized learning, improved learning outcomes, and encourages self-assessment. It reduces test anxiety, facilitates differentiation, enhances instructional practices, supports collaborative learning, fosters continuous improvement, encourages a growth mindset, and builds confidence. Formative

assessment also reduces test anxiety by lowering the stakes, ensuring all students receive appropriate challenges and support. It also supports a culture of continuous improvement and fosters a growth mindset among students.

This program will adapt Formative assessment/ Continuous Internal Assessments for each theory course in following format –

1. **Module-wise Tests – 10 Marks (*03 tests) = 30 marks**
2. **Assignment/Mini Project = 10 Marks**
3. **Seminar Presentation = 10 Marks**

1. Module-wise Tests 10 Marks (*03 tests) = 30 marks

Module-wise Tests will be conducted in each theory course immediately after completion of teaching with individual module. Such tests will be of 10 marks comprising of Part A and B.

- Part A will be consisting of 05 questions having 01 mark each (multiple choice questions / fill in the blanks/ answer in one sentence) as compulsory questions and it should cover entire module syllabus (05 Marks)
- Part B will contain 03 questions of 05 marks from module contents, from which students will have to attempt any one.

Every Module-wise Test will be followed by a remedial test. Any student, who has missed to appear for a test can appear for the remedial test. Or if any student wants to improve their performance of main test, will be allowed to appear for remedial test. For all students, who have appeared for main test as well as remedial test, the best performance will be considered for final marks memo preparation.

2. Assignment/Mini Project = 10 Marks

This will remain a group activity and concerned faculty will have to provide assignment/tasks that will lead to incubation of critical and creative thinking ability of students. Depending upon contents of a course, the faculty member may assign a mini project to a group of students as well. However assignment and project will not be given concurrently.

3. Seminar Presentation = 10 Marks

Individual student should deliver a seminar based on topics covered through course contents or topics related to course content. Evaluation of a seminar has to be carried out by course faculty member and an external faculty member.

A Semester End Examination (SEE) for a certain / all theory courses will be conducted only for students who will fall short in obtaining passing marks for respective course through the process of formative assessment. Following will be the pattern of SEE Question Paper –
The Question Paper will be of 50 marks consisting of Part A, Part B and Part C

- Part A will be consisting of 10 questions having 01 mark each (multiple choice questions / fill in the blanks/ answer in one sentence) as compulsory questions and it should cover entire module syllabus (10 Marks)
- Part B will contain 09 questions of 05 marks each from module contents, from which students will have to attempt any seven questions. Contents of each module should contribute towards framing of 03 questions. (35 Marks)
- Part C will contain 03 questions of 05 Marks each, from which students will have to attempt any one question. This question should critically look forward to evaluate critical applied thinking capability of a student. Contents of each module should contribute towards framing of 01 question. (05 Marks)

Semester end practical examination will be conducted at the end of each semester.

Earning Credits:

At the end of every semester, a letter grade will be awarded in each course for which a student had registered. A student‘s performance will be measured by the number of credits that he/she earned by the weighted Grade Point Average (GPA). The SGPA (Semester Grade Point Average) will be awarded after completion of respective semester and the CGPA (Cumulative Grade Point Average) will be awarded at the respective exit point.

Grading System:

The grading reflects a student-own proficiency in the course. A ten-point rating scale shall be used for the evaluation of the performance of the students to provide letter grade for each course and overall grade for the Bachelor Programme. Grade points are based on the total number of marks obtained by him / her in all heads of the examination of the course. The grade points and their equivalent range of marks are shown in Table-I

Table – I: Ten point grade and grade description

Marks Obtained (%)	Grade Point (GPA/CGPA)	Letter Grade	Description
90-100	9.00- 10	O	Outstanding
80-89	8.00-8.99	A^+	Excellent
70-79	7.00-7.99	A	Very Good
60-69	6.00-6.99	B^+	Good
55-59	5.50-5.99	B	Above Average
50-54	5.00-5.49	C	Average
40-49	4.00-4.99	P	Pass
Below 40	Below 4.0	F	Fail
Absent	Absent	Ab	Absent

- Non-appearance in any examination / assessment shall be treated as the students have secured zero marks in that subject examination / assessment.
- Minimum P grade (4.00 grade points) shall be the limit to clear / pass the **course / subject. A student with F grade will be considered as ―failed in the** concerned course and he / she has to clear the course by appearing in the next successive semester examinations. There will be no revaluation or recounting under this system.
- Every student shall be awarded grade points out of maximum 10 points in each subject (based on 10 point scale). Based on the grade points obtained in each subject, Semester
- Grade Point Average (SGPA) and then Cumulative Grade Point Average (CGPA) shall be computed. Results will be announced at the end of each semester and CGPA will be given at respective exit point.

Computation of SGPA (Semester Grade Point Average) and CGPA (Cumulative Grade Point Average)

Grade in each subject / course will be calculated based on the summation of marks obtained in all five modules.

The computation of SGPA and CGPA will be as below

- Semester Grade Point Average (SGPA) is the weighted average points obtained by the students in a semester and will be computed as follows:

$$SGPA = \frac{\text{Sum (Course Credits) X Number of Grade Points in concerned Course Gained by the Student}}{\text{Sum (Course Credits)}}$$

- The SGPA will be mentioned on the grade card at the end of every semester.
- The Cumulative Grade Point Average (CGPA) will be used to describe the overall performance of a student in all semester of the course and will be computed as under.

$$CGPA = \frac{\text{Sum (All six Semester SGPA)}}{\text{Total Number of Semester}}$$

- The SGPA and CGPA shall be rounded off to the second place of decimal.

Grade Card

Results will be declared by the Centre and the grade card (containing the grades obtained by the student along with SGPA) will be issued by the university after completion of every semester. The grade card will be consisting of following details.

- Title of the courses along with code opted by the student. Credits associated with the course.
- Grades and grade points secured by the student.
- Total credits earned by the student in a particular semester. Total credits earned by the students till that semester.
- SGPA of the student.
- CGPA of the student (at respective exit point).

Cumulative Grade Card

The grade card showing details grades secured by the student in each subject in all semesters along with overall CGPA will be issued by the University at respective exit point.

B.Voc Automobile

Semester I

DSC-1 : Automotive Systems

Total Credits : 02 Total Contact Hours : 30 Hrs
Maximum Marks : 50

Learning Objectives of the Course:

To introduce students with basic automobile concepts like

i. Four stroke engines,
ii. Engine lubrication system,
iii. Engine cooling system,
iv. Fuel injection system and ignition systems

Course Outcomes (COs) :

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

i) Explain the auto component manufacturer specifications related to the various components/aggregates in the vehicle
ii) Explain functioning of Basic Automobile systems components and aggregates of a vehicle

CO-PO Attainment Matrix for Course
(L = Low, M = Medium, H = High)

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7		PSO 1	PSO 2	PSO 3
CO 1	H										
CO 2	H										

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	**Engine Fundamentals and Terminologies:** Introduction, Engine cycles, Intake, Compression, Power, Exhaust strokes, Petrol and Diesel engines, principles, cylinder arrangement, valve arrangement, Nomenclature, Classification of Engines.	**10 Hrs**
II	**Engine coolant and lubrication system:** Introduction, Engine coolant, Radiators and coolant recovery systems, water pump, water pump drive belts, thermostat, cooling fans, cooling system operation, temperature indicators	**10 Hrs**
III	**Fuel Injection and Ignition systems:** Fuel Systems, Petrol fuel injection systems, Electronic control system, Air supply, Fuel supply, Gasoline direct injection, Diesel fuel injection systems, Common rail system, **Ignition system overview, Electronic Ignition,** Distributor less ignition system (DIS), Coil on plug (COP) direct ignition system, Spark plugs	**10 Hrs**

Text Books:

1. William H. Crouse. Donald L. Anglin, “Automotive Mechanics”: Tata McGraw Hill 10^{th}edition ISBN:9780070634350.
2. S.Shrinivasan, “Automotive Mechanics”: Tata McGraw Hill Second edition ISBN108187433221
3. Dr. Kripal Singh, “Automobile engineering Vol-I”: Standard Publisher distributers ISBN- 10: 8180141969

Website Links:

1.https://www.youtube.com/watch?v=hs7bABMtOMI&list=PLyqSpQzTE6M9G2SNxKfsVEjcM9MlJau4F&ab_channel=NPTEL-NOCIITM

NPTEL/SWAYAM Courses:

1. Fundamentals of Automotive System,

DSC-2: Practical Based on Basic Automotive System

Total Credits: 02 Total Contact Hours: 30 Hrs
Maximum Marks : 50

Course Outcomes (COs):

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

- **i)** Ensure that for routine maintenance and service the correct spare parts and appropriate grade of lubricant, coolants, oils and grease required have been obtained
- **ii)** Ensure all dismantled components (including mechanical aggregates are cleaned and conditioned prior to reassembly).

CO-PO Attainment Matrix for Course
(L = Low, M = Medium, H = High)

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7		PSO 1	PSO 2	PSO 3	PSO 4
CO 1		H										
CO 2		H										

List of Experiments

I. Engine oil and lubrication systems (Any 4 Job sheet)

II. Performance on engine oil and filter replacement of any automobile after replacement perform oil leak diagnosis,
III. Oil Pressure Indicators diagnosis,
IV. Resetting change oil warning messages,
V. Diagnosis of excessive oil consumption,
VI. Oil pressure testing
VII. Oil pump service, oil jet valves.

II. Engine coolant and Cooling system (Any 8 Job sheet)

i. Performance on cooling systems Maintenance
ii. Checking coolant level
iii. Hose inspection, Drive Belt inspection and tension testing
iv. Coolant testing
v. Coolant contamination
vi. Cooling system diagnosis
vii. Draining the cooling system
viii. Filling the cooling system
ix. Cooling system flushing
x. Diagnosis of improper operating temperatures, Thermostat testing, Pressure cap diagnosis and cooling system
xi. Leak diagnosis, cooling system service.

III Engine Ignition system (Any 2 Job sheet)

i. Demonstration of Battery Ignition System.
ii. Demonstration of Magneto Ignition System.
iii. Demonstration of coil on plug ignition system.

DSC-3 : Basic Electrical Systems

Total Credits : 02 Total Contact Hours : 30 Hrs
Maximum Marks : 50

Learning Objectives of the Course:
To introduce students with basic concepts of ohms law, automotive wiring, electrical testing equipments, and different types of electrical problems.

Course Outcomes (COs) :

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

1. Describe the different possible types of electrical problems.
2. Describe how each of the major types of electrical test equipment are connected and interpreted.
3. Explain how to use a DMM for diagnosing electrical and electronic systems.
4. Explain how to use an oscilloscope for diagnosing electrical and electronic systems.

CO-PO Attainment Matrix for Course
(L = Low, M = Medium, H = High)

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7		PSO 1	PSO 2	PSO 3
CO 1	H						L				
CO 2	H						L				
CO 3	H						L				
CO 4	H						L				

ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I Basic Theories	EMF, Current, Potential Difference, Power and Energy, M.M.F, magnetic force, permeability, hysteresis loop, reluctance, leakage factor and B-H curve, Analogy between electric and magnetic circuits, Electromagnetic induction, Faraday's laws of electromagnetic induction, Lenz's law, Dynamically induced emf, Statically induced emf.-(a) Self induced emf (b) Mutually induced emf; Equations of self and mutual inductance.	**10 Hrs**
II Electrical Components and Testing Devices	Basic Electrical Troubleshooting, Test Equipment, Multimeters, Lab Scopes and Oscilloscopes, Scan Tools, Static Strap, Memory Keepers, Service Information, Working as an Electrical Systems Technician, Circuit Protection Devices, Circuit Defects, Testing for Circuit Defects, Testing Circuit Protection Devices, Testing and	**10 Hrs**

	Replacing Electrical Components	
III **Wiring and Circuit Diagram**	Introduction, Automotive Wiring, Wiring Diagrams, Wire Repair, Replacing Fusible Links, Repairing Connector Terminals, Ground Straps, Reading Wiring Diagrams. Cables, color codes and terminal designations, harness design, printed circuits, fuses and circuit breakers, switches.	**10 Hrs**

Text Books:

1. Automotive Electrical Equipment: P L Kolhi: Tata McGraw Hill ISBN 10:0074602160.
2. Basic Automobile Engineering: C P Nakara: Dhanpatrai publication ISBN-10:9352160983.
3. Automotive Mechanics: S Shrinivasan: Tata McGraw Hill Second edition ISBN10 8187433221.
4. Automobile engineering Vol-I: Dr. Kripal Singh: Standard Publisher distributers ISBN- 10: 8180141969.

Website Links:

1. www.animations.physics.unsw.edu.au//jw/AC.html
2. www.alpharubicon.com/altenergy/understandingAC.html
3. www.electrical4u.com

DSC-4: Laboratory Course on Basic Electrical System

Total Credits : 02 Total Contact Hours : 60 Hrs
Maximum Marks : 50

Learning Objectives of the Course:
To gain practical understanding of fundamental electrical principles and laws, including measurement of electromotive force (e.m.f.), calculation of internal resistance, determination of equivalent resistance in series and parallel circuits, application of Kirchhoff's laws to analyze electrical circuits, calculation of equivalent capacitance, determination of time constant in an RC circuit, and analysis of electromagnetic induction phenomena.

Course Outcomes (COs) :

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

1. Determine various parameters used in electrical circuit.
2. Use of basic laws of electrical engineering
3. Make use of capacitor in different condition
4. Use principles of magnetism
5. Use principles of electromagnetism

CO-PO Attainment Matrix for Course
(L = Low, M = Medium, H = High)

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7		PSO 1	PSO 2	PSO 3
CO 1		H									
CO 2		H									
CO 3		H									
CO 4		H									

Practical No.	Practical Title
I	Measure of e.m.f. of d.c. source and to calculate its internal resistance by connecting it to an external load.
II	Determine the equivalent resistance of Series connection.
III	Determine equivalent resistance of parallel circuit
IV	Use Kirchoffs current law and Kirchoffs voltage law to determine current and voltage in electrical circuit.
V	Determine equivalent capacitance in series connected circuit
VI	Determine equivalent capacitance in parallel connected circuit
VII	Determine time constant of RC circuit
VIII	Using faraday law of electromagnetic induction analyze behaviour of statically induced e.m.f and dynamically induced e.m.f in a given circuit.

Text Books:

1.0 Automotive Electrical Equipment: P L Kolhi: Tata McGraw Hill ISBN 10:0074602160.

2.0 Basic Automobile Engineering: C P Nakara: Dhanpatrai publication ISBN-10:9352160983.

3.0 Automotive Mechanics: S Shrinivasan: Tata McGraw Hill Second edition ISBN10 8187433221.

4.0 Automobile engineering Vol-I: Dr. Kripal Singh: Standard Publisher distributers ISBN- 10: 8180141969.

Website Links:

1.0 www.animations.physics.unsw.edu.au//jw/AC.html

2.0 www.alpharubicon.com/altenergy/understandingAC.html

3.0 www.electrical4u.com

DSC-5 : Workshop Technology

Total Credits : 02 Total Contact Hours : 30 Hrs
Maximum Marks : 50

Learning Objectives of the Course:

To introduce students with basic automobile concepts like
i. Four stroke engines,
ii. Engine lubrication system,
iii. Engine cooling system,
iv. Fuel injection system and ignition systems

Course Outcomes (COs) :

After completion of the course, students will be able to -
i) Explain Manufacturing Machines used in automobile workshop.
ii) Recommend Machines and manufacturing process for different automotive components.

CO-PO Attainment Matrix for Course
(L = Low, M = Medium, H = High)

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7		PSO 1	PSO 2	PSO 3
CO 1	H										
CO 2	H										

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	**Forming and Metal Joining Methods:** Drop forging: open die & closed die forging, forging operations. Rolling: Principle of rolling, hot & cold rolling, Extrusion: Direct & indirect extrusion. Gas welding, carbon arc welding, shielded metal arc welding, TIG welding, MIG welding, plasma arc welding, resistance welding types spot, seam projection. Electron beam welding, laser beam welding, Soldering and Brazing	**10 Hrs**
II	**Casting Processes:** Pattern making: Basic steps in making casting, Pattern: types, materials and allowances, Moulding: Types of moulding sands, properties of sand, moulding methods, cores and core prints, elements of gating system, Casting: Furnaces: Construction and working of cupola furnace, Centrifugal casting, shell moulding, investment casting, Casting defects - Causes & remedies	**10 Hrs**
III	**Machining Operations:** Lathe Machine: Introduction, classification and basic parts of center lathe & their functions, Lathe operations like facing, plain turning, taper turning, thread cutting, chamfering, grooving, knurling. Cutting tool nomenclature & tool signature, Drilling Machine Introduction, classification, basic parts of radial drilling machine and their functions, twist drill nomenclature, drilling machine operations like drilling, reaming, boring, counter sinking, counter boring, spot facing. Cutting parameters.	**10 Hrs**

Text Books:

1. B. S. Raghuwanshi. “Workshop Technology” Vol-I & Vol-II: Dhanpat Rai& Co.
2. S. K. Hajra Choudhari. A. K. Hajra Choudhari, “Workshop Technology Vol-I and Vol-II”: Nirjhar Roy :Media Promoters and Publication Pvt.Ltd
3. W.A.J. Chapman, “Workshop Technology Vol-III”:

Website Links:

1. https://www.youtube.com/watch?v=jdFrBtHeJbs&list=PLtAjRFb9nXmzRwSuuYmUoIxIQOu5ccdM_&ab_channel=Fundamentalsofmanufacturingprocesses

NPTEL/SWAYAM Courses:

1. Fundamentals of manufacturing processes

DSC-6: Practical Based on Workshop Technology

Total Credits: 02 Total Contact Hours: 30 Hrs
Maximum Marks : 50

Course Outcomes (COs):

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

i) Use the basic machine tools like lathe and drilling.

ii) Produce and inspect the job as per specified dimensions.

iii) Select the specific manufacturing processes for the desired output.

CO-PO Attainment Matrix for Course
(L = Low, M = Medium, H = High)

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7		PSO 1	PSO 2	PSO 3
CO 1		H									
CO 2		H									
CO 3		H									

List of Experiments (Practical)

Casting Processes

i. Moulding practice for any one pattern

ii. Industrial visit to observe Casting process and report on the visit

Machining Operations

i. One turning job on lathe containing the operations like plain turning, step turning, Taper turning.

ii. One composite job containing the operations like lathe with axial & across drilling (like Nut- Bolt assembly or any other equivalent job).

Metal Joining Methods

i. Demonstration on various welding set up

ii. One simple job on Gas welding

iii. One simple job on Arc welding

iv. One job using Spot welding machine. (Min. 4 spots on 0.5-1mm thick metal strip.)

Forming Processes

i. Demonstration on forming process

ii. Suitable job based on Forming process

Note:

1] The workshop instructors should prepare specimen job in each shop as demonstration practice before the student (as per the drawing given).

2] Workshop diary should be maintained by each student duly signed by shop instructors.

VSC-1 : Engineering Drawing

Total Credits : 01 Total Contact Hours : 15 Hrs
Maximum Marks : 25

Learning Objectives of the Course:

To introduce students with concepts like
i. Orthographic projections,
ii. Job drawing in shop floor,

Course Outcomes (COs) :

After completion of the course, students will be able to -
i) Know the importance of drawing standards and drawing basics to prepare drawing vehicle
ii) Demonstrate ability to prepare projections of points, lines, planes.

CO-PO Attainment Matrix for Course
(L = Low, M = Medium, H = High)

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7		PSO 1	PSO 2	PSO 3
CO 1	H										
CO 2	H										

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	**Introduction to Drawing and Orthographic projections:** Drawing standard, Types and convention of lines and their applications, Letters and numbers (single stroke vertical), Dimensioning technique Introduction to Orthographic projections, Conversion of pictorial view into Orthographic Views (First Angle Projection Method Only) – elevation, plan and end view Selection of section plains and drawing sectional view (simple object)	**09 Hrs**
II	**Projections Lines and Planes:** Projection of lines parallel and perpendicular to one or both planes, projection of lines inclined to one or both planes. Projection of planes parallel and perpendicular to one or both planes, projection of planes inclined to one or both planes.	**06 Hrs**

Text Books:

1. N. D. Bhatt, "Engineering Drawing", Charotar Publishing House, Anand, India.
2. K. V. Nataraajan, A text book of Engineering Graphic, Dhanalakshmi Publishers, Chennai, 2006
3. N. H. Dubey, A text book of Engineering Drawing, Nandu Publishers,

Website Links:

1. https://www.youtube.com/results?search_query=engineering+graphics+NPTEL

NPTEL/SWAYAM Courses:

1. Engineering Drawing
2. Engineering Graphics

SEC-2: Practical Based on Engineering Drawing

Total Credits: 01 Total Contact Hours: 15 Hrs
Maximum Marks : 25

Course Outcomes (COs):

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

i) Draw the orthographic projections of regular solids.

ii) Draw the projection of planes and line.

CO-PO Attainment Matrix for Course
(L = Low, M = Medium, H = High)

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7		PSO 1	PSO 2	PSO 3
CO 1	H										
CO 2	H										

List of Experiments (Practical)

i. Drawing Sheet based on orthographic projections (3 problems)

ii. Drawing Sheet based on types of lines and their applications.

iii. Drawing Sheet based on projection of lines (3 problems)

iv. Drawing Sheet based on Projection of Planes (3 problems)

SEC -1 : Basic Computer Course

Total Credits : 01 Total Contact Hours : 15 Hrs
Maximum Marks : 25

Learning Objectives of the Course:
To provide students with a foundational understanding of computer hardware, operating systems, Internet fundamentals, and office productivity software, enabling them to perform basic computing tasks efficiently and effectively.

Course Outcomes (COs) :

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

1. Explain the basic components of a computer system
2. Proficient in using a GUI-based operating system.
3. Connect to the Internet, navigate web pages using web browsing software, and utilize search engines effectively.
4. Create, format, and manipulate text documents using word processing software. Students will also be skilled in using spreadsheet software for data manipulation, including cell manipulation, formulas, and functions. Additionally, they will learn to create and deliver small presentations using presentation software.

CO-PO Attainment Matrix for Course
(L = Low, M = Medium, H = High)

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7		PSO 1	PSO 2	PSO 3
CO 1	H						L				
CO 2	H						L				
CO 3	H						L				
CO 4	H						L				

ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I Computer Hardware	Knowing computer: What is Computer, Basic Applications of Computer; Components of Computer System, Central Processing Unit (CPU), VDU, Keyboard and Mouse, Other input/output Devices, Computer Memory, Concepts of Hardware and Software; Concept of Computing, Data and Information; Applications of IECT; Connecting keyboard, mouse, monitor and printer to CPU and checking power supply.	**5 Hrs**

II **Operating Systems and Applications**	Operating Computer using GUI Based Operating System: What is an Operating System; Basics of Popular Operating Systems; The User Interface, Using Mouse; Using right Button of the Mouse and Moving Icons on the screen, Use of Common Icons, Status Bar, Using Menu and Menu-selection, Running an Application, Viewing of File, Folders and Directories, Creating and Renaming of files and folders, Opening and closing of different Windows; Using help; Creating Short cuts, Basics of O.S Setup; Common utilities. Understanding Word Processing: Word Processing Basics; Opening and Closing of documents; Text creation and Manipulation; Formatting of text; Table handling; Spell check, language setting and thesaurus; Printing of word document. Using Spread Sheet: Basics of Spreadsheet; Manipulation of cells; Formulas and Functions; Editing of Spread Sheet, printing of Spread Sheet.	**5 Hrs**
III **Introduction to Internet**	Introduction to Internet, WWW and Web Browsers: Basic of Computer networks; LAN, WAN; Concept of Internet; Applications of Internet; connecting to internet; What is ISP; Knowing the Internet; Basics of internet connectivity related troubleshooting, World Wide Web; Web Browsing softwares, Search Engines; Understanding URL; Domain name; IP Address; Using e-governance website Communications and collaboration: Basics of electronic mail; Getting an email account; Sending and receiving emails; Accessing sent emails; Using Emails; Document collaboration; Instant Messaging; Netiquettes. Making Small Presentation: Basics of presentation software; Creating Presentation; Preparation and Presentation of Slides; Slide Show; Taking printouts of presentation / handouts.	**5 Hrs**

Text Books:

1. Michael Miller, "Computer Basics Absolute Beginner's Guide, Windows 10 Edition", Que Publishing, 2019.
2. Nancy C. Muir, "Computers For Seniors For Dummies", For Dummies, 2018.
3. James Bernstein, "Computers Made Easy: From Dummy To Geek", CreateSpace Independent Publishing Platform, 2016.
4. Paul McFedries, "Teach Yourself VISUALLY Computers", Visual, 2018.
5. Michael Miller, "Absolute Beginner's Guide to Computer Basics", Que Publishing, 2009.

SEC-2 : Laboratory Course on Basic Computer Systems

Total Credits : 02 Total Contact Hours : 60 Hrs
Maximum Marks : 50

Learning Objectives of the Course:
Gain practical proficiency in computer hardware assembly, operating systems, file management, software applications, internet connectivity, and digital communication tools.

Course Outcomes (COs) :

After completion of the course, students will be able to

1. Develop practical skills in assembling and troubleshooting computer hardware components, including connecting peripherals and checking power supply.
2. Gain proficiency in navigating through the user interface of a GUI-based operating system, using common icons, and utilizing the status bar effectively.
3. Acquire competency in file management, including creating, renaming, opening, and closing files and folders, and utilizing common utilities in the operating system.
4. Develop practical skills in using word processing, spreadsheet, internet, email, instant messaging, and presentation software for effective communication and collaboration in a digital environment.

CO-PO Attainment Matrix for Course
(L = Low, M = Medium, H = High)

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7		PSO 1	PSO 2	PSO 3
CO 1		H									
CO 2		H									
CO 3		H									
CO 4		H									

Practical No.	Practical Title
I	Assembling a Computer: Connecting keyboard, mouse, monitor, and printer to CPU and checking power supply.
II	Introduction to GUI Based Operating System: Navigating through the user interface, using common icons, and exploring the status bar.
III	File Management: Creating, renaming, opening, and closing files and folders.
IV	Using Common Utilities: Understanding and utilizing common utilities in the operating system.
V	Word Processing: Creating, formatting, and printing documents using word processing software.
VI	Spreadsheet Management: Creating, editing, and printing spreadsheets, including working with formulas and functions.

VII	Internet Connectivity: Connecting to the internet, understanding ISPs, and troubleshooting basic internet connectivity issues.	
VIII	Web Browsing: Using web browsers, understanding URLs, domain names, and IP addresses, and using search engines.	
IX	Email Communication: Setting up an email account, sending and receiving emails, and accessing sent emails.	
X	Document Collaboration: Collaborating on documents using email and other electronic means.	
XI	Instant Messaging: Using instant messaging for communication.	
XII	Presentation Creation: Creating a basic presentation, preparing and presenting slides, and taking printouts of presentations/handouts.	

Text Books:

1. Michael Miller, "Computer Basics Absolute Beginner's Guide, Windows 10 Edition", Que Publishing, 2019.
2. Nancy C. Muir, "Computers For Seniors For Dummies", For Dummies, 2018.
3. James Bernstein, "Computers Made Easy: From Dummy To Geek", CreateSpace Independent Publishing Platform, 2016.
4. Paul McFedries, "Teach Yourself VISUALLY Computers", Visual, 2018.
5. Michael Miller, "Absolute Beginner's Guide to Computer Basics", Que Publishing, 2009.

GE/OE-1**: Automotive Systems**

Total Credits : 02 Total Contact Hours : 30 Hrs
Maximum Marks : 50

Learning Objectives of the Course:

To introduce students with basic automobile concepts like

1. Four stroke engines,
2. Engine lubrication system,
3. Engine cooling system,
4. Fuel injection system and ignition systems

Course Outcomes (COs) :

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

1. Explain the auto component manufacturer specifications related to the various components/aggregates in the vehicle
2. Explain functioning of Basic Automobile systems components and aggregates of a vehicle

CO-PO Attainment Matrix for Course
(L = Low, M = Medium, H = High)

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7		PSO 1	PSO 2	PSO 3
CO 1	H										
CO 2	H										

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	**Engine Fundamentals and Terminologies:** Introduction, Engine cycles, Intake, Compression, Power, Exhaust strokes, Petrol and Diesel engines, principles, cylinder arrangement, valve arrangement, Nomenclature, Classification of Engines.	**10 Hrs**
II	**Engine coolant and lubrication system:** Introduction, Engine coolant, Radiators and coolant recovery systems, water pump, water pump drive belts, thermostat, cooling fans, cooling system operation, temperature indicators	**10 Hrs**
III	**Fuel Injection and Ignition systems:** Fuel Systems, Petrol fuel injection systems, Electronic control system, Air supply, Fuel supply, Gasoline direct injection, Diesel fuel injection systems, Common rail system, **Ignition system overview, Electronic Ignition,** Distributor less ignition system (DIS), Coil on plug (COP) direct ignition system, Spark plugs	**10 Hrs**

Text Books:

1. William H. Crouse. Donald L. Anglin, “Automotive Mechanics”: Tata McGraw Hill 10^{th}edition ISBN:9780070634350.
2. S.Shrinivasan, “Automotive Mechanics”: Tata McGraw Hill Second edition ISBN108187433221
3. Dr. Kripal Singh, “Automobile engineering Vol-I”: Standard Publisher distributers ISBN- 10: 8180141969

Website Links:

1.https://www.youtube.com/watch?v=hs7bABMtOMI&list=PLyqSpQzTE6M9G2SNxKfsVEjcM9MlJau4F&ab_channel=NPTEL-NOCIITM

NPTEL/SWAYAM Courses:

1. Fundamentals of Automotive System,

Semester II

DSC -7 : Thermodynamics and Heat Transfer

Total Credits : 02 Total Contact Hours : 30 Hrs
Maximum Marks : 50

Learning Objectives of the Course:
Understand the basic laws and concepts of thermodynamics, apply the first and second laws to analyze energy transfer, and comprehend fundamental heat transfer mechanisms and their practical applications in heat exchangers and evaporators.

Course Outcomes (COs) :

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

1. Define the basic laws and concepts of thermodynamics including system, surrounding, boundary, and universe.
2. Demonstrate the application of the first law for cyclic processes.
3. Identify and analyze various thermodynamic cycles including the air-standard analysis and vapor compression refrigeration cycle.
4. Define and analyze heat transfer mechanisms including conduction, convection, and radiation, and apply these concepts to understand heat exchangers and evaporators in practical applications.

CO-PO Attainment Matrix for Course
(L = Low, M = Medium, H = High)

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7		PSO 1	PSO 2	PSO 3
CO 1	H										
CO 2	H										
CO 3	H										
CO 4	H										

ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I **Basic Laws**	Definition and scope of Thermodynamics, Microscopic versus Macroscopic Viewpoint, Concepts and definitions, System, Surrounding, Boundary and Universe, Closed Systems, Open Systems, and Isolated Systems, Thermodynamic Properties: Intensive, Extensive and Specific Properties, Thermodynamics Equilibrium, State, Process and Path, Cyclic Process, Quasi-equilibrium Process, Reversible and Irreversible Process, Common Properties, Pressure, Specific Volume, Temperature, Zeroth Law Thermodynamics, Equality of Temperature, Energy and its meaning, Stored Energy and Transient Energy, Total Energy, Energy Transfer, Expression for displacement work Transfer, Power	**10 Hrs**

II **Laws of Thermodynamics**	First Law of thermodynamics for Control mass, and for Control mass undergoing cyclic process, First law of Thermodynamics for Control Volume, Control Volume Analysis: Steady State Analysis and Unsteady state analysis Necessity of formation of Second law, Entropy, Reversible and irreversible Processes, Carnot Cycle, Carnot Efficiency, Thermodynamic Cycles, Air Standard AnalysisVapor Compression Refrigeration Cycle,	**10 Hrs**
III **Fundamentals of Heat Transfer**	Basic Concepts and Modes of Heat Transfer, Conduction: One Dimensional, Convective Heat Transfer: One dimensional, Forced Convective Heat Transfer, Heat Transfer by Natural Convection, Radiation Heat Transfer, Heat Exchangers, Evaporators	**10 Hrs**

Text Books:

1. Michael J. Moran, Howard N. Shapiro, Daisie D. Boettner, Margaret B. Bailey, "Fundamentals of Engineering Thermodynamics", 9th Edition, Wiley, 2019, ISBN-10: 1119322838, ISBN-13: 978-1119322833
2. Yunus A. Çengel, Michael A. Boles, "Thermodynamics: An Engineering Approach", 9th Edition, McGraw-Hill Education, 2020, ISBN-10: 1260116110, ISBN-13: 978-1260116112
3. Yunus A. Çengel, Afshin J. Ghajar, "Heat and Mass Transfer: Fundamentals and Applications", 5th Edition, McGraw-Hill Education, 2014, ISBN-10: 0073398187, ISBN-13: 978-0073398181
4. Theodore L. Bergman, Adrienne S. Lavine, Frank P. Incropera, David P. DeWitt, "Fundamentals of Heat and Mass Transfer", 7th Edition, Wiley, 2011, ISBN-10: 0470501979, ISBN-13: 978-0470501979

DSC-08 : Laboratory Course on Thermodynamics and Heat Transfer

Total Credits : 02 Total Contact Hours : 60 Hrs
Maximum Marks : 50

Learning Objectives of the Course:
Understand principles of heat transfer and experimental techniques for thermal conductivity, thermoelectric voltage, cooling curves, Newton's Law of Cooling, Stefan-Boltzmann constant, thermal resistance, phase change, melting point, heat transfer by radiation, emissivity, and overall heat transfer coefficient.

Course Outcomes (COs) :

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

I. Understand the principles and techniques of heat transfer experiments, including measurement of thermal conductivity, thermal resistance, cooling curves, and phase change characteristics of materials.

II. Develop the skills to perform various heat transfer experiments and analyze the results to determine the coefficient of thermal conductivity, Stefan-Boltzmann constant, thermal resistance, melting point, and emissivity of materials.

II. Acquire proficiency in experimental methods to study heat transfer mechanisms such as conduction, convection, and radiation, and to verify fundamental laws and relationships like Newton's Law of Cooling and Stefan-Boltzmann Law.

IV. Apply theoretical knowledge to experimentally determine heat transfer parameters, analyze heat transfer phenomena, and calculate overall heat transfer coefficients and Nusselt numbers for different materials and experimental setups.

CO-PO Attainment Matrix for Course
(L = Low, M = Medium, H = High)

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7		PSO 1	PSO 2	PSO 3
CO 1		H									
CO 2		H									
CO 3		H									
CO 4		H									

Practical No.	Practical Title
I	To determine the coefficient of thermal conductivity of a bad conductor using Lee's disc apparatus.
II	To verify the relation between thermo emf of a thermocouple and temperature difference between two hot junctions.
III	To draw the cooling curve.
IV	The aim of the experiment is to verify Newton's Law of Cooling of different materials and different liquids.
V	Determination of Stefan- Boltzmann constant σ .

VI	To find the thermal conductivity of a material by the two slabs guarded hot plate method.
VII	To find the thermal resistance of the sample.
VIII	To study the phase change of a substance from liquid to solid by plotting the cooling curve.
IX	To determine the melting point of the given substance and to find out the transition time.
X	To compare heat transfer between different material surface and the black body surface by radiation.
XI	To find the emissivity of different material surface.
XII	To determine the overall heat transfer coefficient at the surface of a given vertical metal cylinder by the natural convection method.
XIII	To determine the value of Nusselt number.

Text Books:

1. Michael J. Moran, Howard N. Shapiro, Daisie D. Boettner, Margaret B. Bailey, "Fundamentals of Engineering Thermodynamics", 9th Edition, Wiley, 2019, ISBN-10: 1119322838, ISBN-13: 978-1119322833
2. Yunus A. Çengel, Michael A. Boles, "Thermodynamics: An Engineering Approach", 9th Edition, McGraw-Hill Education, 2020, ISBN-10: 1260116110, ISBN-13: 978-1260116112
3. Yunus A. Çengel, Afshin J. Ghajar, "Heat and Mass Transfer: Fundamentals and Applications", 5th Edition, McGraw-Hill Education, 2014, ISBN-10: 0073398187, ISBN-13: 978-0073398181
4. Theodore L. Bergman, Adrienne S. Lavine, Frank P. Incropera, David P. DeWitt, "Fundamentals of Heat and Mass Transfer", 7th Edition, Wiley, 2011, ISBN-10: 0470501979, ISBN-13: 978-0470501979

DSC- 9 : Automotive Materials

Total Credits : 02 Total Contact Hours : 30 Hrs
Maximum Marks : 50

Learning Objectives of the Course:

To introduce students with Engineering material concepts like

I. Creep, Fatigue
II. Mechanical properties of material,
III. Ferrous and Non-ferrous alloy,
IV. Shear force and Bending Moment Diagram

Course Outcomes (COs) :

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

i. Explain properties of engineering materials.
ii. Explain ferrous materials and their alloys.
iii. Draw Shear force and Bending moment diagram for beam.

CO-PO Attainment Matrix for Course
(L = Low, M = Medium, H = High)

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7		PSO 1	PSO 2	PSO 3
CO1	H		M								
CO2	H		M								
CO3	H		M								

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	**Classification and Properties of Material:** Introduction, Classification of Materials, Mechanical properties of metals – Strength, Elasticity, Stress, Strain, Plasticity, Malleability, Ductility, Toughness, Hardness, Brittleness, Resilience, Creep, Fatigue, Tensile test, Rockwell Hardness test, Brinell Hardness Test, Bend Test, Stress- Strain Curve for Mild steel	**10 Hrs**
II	**Ferrous and Non-Ferrous Metals:** Cast iron, Types of cast irons, properties, structures, compositions and applications, plain carbon steels, low alloy steels, Copper Alloys, Aluminium Alloys, Ceramics, Plastics, Heat treatment- Annealing, Quenching, Normalizing, Tempering	**10 Hrs**
III	**Design Fundamentals:** Selection of Material, Stress and strain due to axial force, Poisson's ratio– volumetric strain– shear stress–shear strain, Bending moment and Shear force Diagrams in beam, Flexure and Torsion in beams, Bending Stress	**10 Hrs**

Text Books:

1. V.D.Kodgire, S.V.Kodgire "Material Science and Metallurgy for Engineers.
2. V.B. Bhandari, "Design of Machine Elements": Tata McGraw Hill Fourth edition
3. Daniel Yesudian C., "Materials Science and Metallurgy", Scitech Publications (India), 2004

Website Links:

1. https://www.youtube.com/watch?v=3IQz9LAPuIA&ab_channel=NPTEL-NOCIITM

NPTEL/SWAYAM Courses:

1. Basics of Material Engineering

DSC- 10 : Practical Based on Automotive Materials

Total Credits: 02 Total Contact Hours: 30 Hrs
Maximum Marks : 50

Course Outcomes (COs):

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

I. Calculate the Hardness of material.

II. Identify the microstructure of steel.

CO-PO Attainment Matrix for Course
(L = Low, M = Medium, H = High)

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7		PSO 1	PSO 2	PSO 3
CO1			H								
CO2			H								

List of Experiments (Any 6)

i. Study of Measuring instruments: Dial gauge, bore gauge, vernier calliper, depth gauge

ii. Study of Universal Tensile Test machine to determine various mechanical properties.

iii. Study of Carbon fibre composites and light metal alloys.

i. Computation of Shear force and Bending moment diagram using graphical method

ii. Preparation and study of the Micro Structure of pure metals, Mild Steel, Low Carbon steel and High Carbon Steel.

iii. Study of the Microstructures of Non Ferrous Metals.

iv. Study of Hardness Test machine (Brinell and Rockwell)

v. Study of Microstructure of Heat treated steel.

DSC -11 : Basic Electronics Systems

Total Credits : 02 Total Contact Hours : 30 Hrs
Maximum Marks : 50

Learning Objectives of the Course:
Understand electronic components, signals, diodes, and bipolar junction transistors, analyze their characteristics and applications, and design electronic circuits involving diodes, filters, and transistor configurations.

Course Outcomes (COs) :

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

1.0 Explain the construction, working principle, and applications of PN junction diodes and Zener diodes.
2.0 Analyze the operation of rectifiers including half-wave, full-wave, and bridge rectifiers, and calculate performance parameters such as PIV, ripple factor, and efficiency.
3.0 Define and analyze the operating regions of a BJT (cut-off, saturation, and active) and calculate transistor parameters including CB gain, CE gain, input resistance, and output resistance.
4.0 Demonstrate the ability to design and analyze electronic circuits involving diodes, filters, and transistor configurations.

CO-PO Attainment Matrix for Course
(L = Low, M = Medium, H = High)

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7		PSO 1	PSO 2	PSO 3
CO 1	H						L				
CO 2	H						L				
CO 3	H						L				
CO 4	H						L				

ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I Electronic Components	Active and passive components, Resistor, capacitor, inductor, symbols, color codes, specifications, voltage and current sources, Signals; waveforms (sinusoidal, triangular and square), time and frequency domain representation, amplitude, frequency, phase, wavelength, Integrated circuits-analog and digital.	**10 Hrs**
II Diodes and Applications	PN junction diode: symbol, construction, working and applications, Zener diode; working, symbol, voltage regulator, Rectifiers: Half wave, Full wave and Bridge Rectifier, Performance parameters: PIV, ripple factor, efficiency. Filters: circuit diagram and working of ' L ', ' C ' and ' π ' filter, Light Emitting Diodes: symbol, construction, working principle	**10 Hrs**

	and applications.	
III **Bipolar Junction Transistor**	BJT: symbol, construction and working principle, Transistor as switch and amplifier, Input and Output characteristics: CE, and CC configurations, Operating regions: Cut-off, saturation and Active, Transistor parameters: CB gain, CE gain, input resistance. output resistance.	**10 Hrs**

Text Books:

1.0 "Electronic Devices and Circuit Theory" by Robert L. Boylestad and Louis Nashelsky, Publication: Pearson Education, ISBN-10: 0132549867

2.0 "Electronic Principles" by Albert Malvino and David J. Bates, Publication: Career Education, ISBN-10: 0073373885

3.0 "Basic Electronics: Solid State" by B.L. Theraja and S. Chand, Publication: S. Chand Publishing, ISBN-10: 8121925565

4.0 "Fundamentals of Electric Circuits" by Charles K. Alexander and Matthew N.O. Sadiku, Publication: McGraw-Hill Education, ISBN-10: 1259924183

5.0 "Introduction to Electric Circuits" by Richard C. Dorf and James A. Svoboda, Publication: Wiley, ISBN-10: 1119560475

DSC-12 : Laboratory Course on Basic Electronics System

Total Credits : 02 Total Contact Hours : 60 Hrs
Maximum Marks : 50

Learning Objectives of the Course:
To Gain practical understanding of electronic components and circuits including measurement techniques using a Cathode Ray Oscilloscope (CRO), testing diodes and transistors, analyzing rectifier and amplifier circuits, and exploring the applications of sensors and regulators in electronic circuits.

Course Outcomes (COs) :

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

1. Identify electronic components in electronic circuits.
2. Use diodes in different applications.
3. Interpret the working of junction transistor in the electronic circuits.
4. Interpret the working of unipolar devices in the electronic circuits.
5. Use sensors and transducers.

CO-PO Attainment Matrix for Course
(L = Low, M = Medium, H = High)

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7		PSO 1	PSO 2	PSO 3
CO 1		H									
CO 3		H									
CO 4		H									
CO 5		H									

Practical No.	Practical Title
I	Measure amplitude, time period and frequency of sine wave and square wave using CRO.
II	Identify active and passive electronic components in the given circuit.
III	Test the performance of the PN junction diode.
IV	Test the performance of the given Zener diode.
V	Test the performance of the given Zener voltage regulator.
VI	Convert AC signal into DC signal using Half wave rectifier.
VII	Convert AC signal into DC signal using Full wave rectifier.
VIII	Use filters to get regulated DC.

IX	Convert AC signal into DC signal through Bridge rectifier.	
X	Test the performance of the given Bridge rectifier using filter.	
XI	Test input/output characteristics of NPN Transistor in CE mode.	
XII	Test input/output characteristics of NPN Transistor in CB mode.	
XIII	Test input/output characteristics of NPN Transistor in CC mode.	
XIV	Determine gain and bandwidth of Single stage RC coupled amplifier.	
XV	Determine gain and bandwidth of 2 Stage RC coupled amplifier.	
XVI	Test the performance of the given JFET.	
XVII	Measure temperature of the given Liquid using thermocouple sensor.	
XVIII	Test the performance of the given circuit consisting of photoelectric sensor.	

Text Books:

1. "Electronic Devices and Circuit Theory" by Robert L. Boylestad and Louis Nashelsky, Publication: Pearson Education, ISBN-10: 0132549867
2. "Electronic Principles" by Albert Malvino and David J. Bates, Publication: Career Education, ISBN-10: 0073373885
3. "Basic Electronics: Solid State" by B.L. Theraja and S. Chand, Publication: S. Chand Publishing, ISBN-10: 8121925565
4. "Fundamentals of Electric Circuits" by Charles K. Alexander and Matthew N.O. Sadiku, Publication: McGraw-Hill Education, ISBN-10: 1259924183
5. "Introduction to Electric Circuits" by Richard C. Dorf and James A. Svoboda, Publication: Wiley, ISBN-10: 1119560475

VSC 1 : Mechanics of Machines

Total Credits : 01 Total Contact Hours : 15 Hrs
Maximum Marks : 25

Learning Objectives of the Course:
1. To provide basic concept of kinematics and kinetics of machine elements.
2. To study basics of power transmission.
3. To study the effect of friction.

Course Outcomes (COs) :

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

1.0 Analyze and Apply the knowledge of these machines, mechanisms and related terminologies in mechanical engineering science in maintaining sustainable environment and its impact on society

2.0 Select appropriate power transmission mechanisms

3.0 Analyze the effect of friction on machine elements

CO-PO Attainment Matrix for Course
(L = Low, M = Medium, H = High)

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7		PSO 1	PSO 2	PSO 3
CO 1	H										
CO 2	H										
CO 3	H										

ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I Basic Kinematics	Definition-Kinematic link or element-Types of links-Kinematic pair–Types-Types of constrained Motions-Kinematic chain- Definition of Machine, Structure and Mechanism, Difference between Machine and Structure ,Mechanism-Inversions-Types of Kinematic Chains-Four Bar Chain- Beam Engine-Coupling Rod of Locomotive-Single Slider Crank Chain- Pendulum Pump-Crank and Slotted Lever Quick Return Motion Mechanism-Double Slider Crank Chain-Elliptical trammel-Scotch yoke mechanism-Oldham's coupling.	**10 Hrs**
II Power Transmission	Belt Drives-types of flat belt drives-open, cross, idler pulley, compound, cone pulley and fast and loose pulley. Velocity Ratio, Slip and creep of belt, length of belt, Ratio of driving Tensions, Centrifugal Tension and Initial Tension-Power Transmitted by belts (Flat and VBelt) and ropes- Maximum power transmitted by belt (without proof)-Problems on belt drives-Introduction to Gears - Classification of Gears-Spur Gear Terminology-Problems on gears –(centre distance only) Introduction to Gear Trains-Types of Gear trains –Simple, Compound, Reverted and Epicyclic gear trains- Problems on	**10 Hrs**

	Gear Trains	
III **Friction**	Friction-Introduction-Types of Friction, Laws of solid friction, coefficient of friction, limiting angle of friction, angle of Repose -Friction in Journal Bearing-Power Transmission in the Journal bearing-Friction in Thrust Bearing-Pivot Bearing– Flat and Conical bearing-Collar Bearing –Problems on bearings (Assuming uniform pressure theory)- Friction in ClutchesSingle Disc Clutch- Multiple Disc Clutch- Problems on clutches (Assuming uniform wear theory)-Introduction to Brakes-Internal Expanding Brake (Mechanical & Hydraulic).	**10 Hrs**

Text Books:

1. 1. Rattan.S.S, "Theory of Machines", Tata McGraw -Hill Publishers, New Delhi, 2009.
2. Khurmi R S, Guptha J.K "Theory of machines ", 5 Edition, S.Chand and company Delhi ISBN 81-219-2524-X
3. Thomas Bevan, "Theory of Machines", CBS Publishers and Distributors, 3rd Edition, 2005.
4. Ramamurti,V., "Mechanism and Machine Theory", 2nd Edition, Narosa Publishing House,2005.
5. Ghosh.A and A.K.Mallick, "Theory of Mechanisms and Machines", Affiliated East- WestPrivate Limited, New Delhi, 1998.
6. Rao.J.S and Dukkipati R.V, "Mechanism and Machine Theory", Wiley-Eastern Limited,New Delhi, 1992.

VSC-2 : Laboratory Course on Mechanics of Machines

Total Credits : 01 Total Contact Hours : 30 Hrs
Maximum Marks : 25

Learning Objectives of the Course:
Lab deals experiments on the mechanics of machines components. These experiments aims at enhancing the knowledge of students on the different mechanisms, to build mathematical models and develop position, velocity and acceleration relations. After completing every experiment in the mechanics of machines lab the students can able to understand basic concepts on different mechanisms.

Course Outcomes (COs) :

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

1.0 Understand the principles of kinematic analysis and synthesis of planar mechanisms including Grashof and Non-Grashof four-bar linkages, slider-crank mechanisms, Scotch yoke mechanisms, and elliptical trammels.

2.0 Develop the ability to perform position, velocity, and acceleration analyses of various planar mechanisms, including Grashof and Non-Grashof four-bar linkages, slider-crank mechanisms, Scotch yoke mechanisms, and elliptical trammels.

3.0 Acquire proficiency in analyzing the positional, velocity, and acceleration characteristics of planar mechanisms, enabling the design and optimization of mechanical systems.

4.0 Apply theoretical knowledge to analyze the performance of different planar mechanisms under various operating conditions, facilitating the design and selection of mechanisms for specific engineering applications.

CO-PO Attainment Matrix for Course
(L = Low, M = Medium, H = High)

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7		PSO 1	PSO 2	PSO 3
CO 1		H									
CO 2		H									
CO 3		H									
CO 4		H									

Practical No.	Practical Title
I	Position analysis of Grashof four bar mechanism
II	Velocity analysis of Grashof four bar mechanism
III	Acceleration analysis of Grashof four bar mechanism
IV	Position analysis of NonGrashof four bar mechanism
V	Velocity analysis of NonGrashof four bar mechanism
VI	Acceleration analysis of NonGrashof four bar mechanism

VII	Position analysis of Slider crank mechanism
VIII	Velocity analysis of Slider crank mechanism
IX	Acceleration analysis of Slider crank mechanism
X	Position analysis of Slider crank mechanism with Offset
XI	Position analysis of Scotch Yoke Mechanism
XII	Velocity analysis of Scotch Yoke Mechanism
XIII	Acceleration analysis of Scotch Yoke Mechanism
XIV	Position analysis of Elliptical Trammel

Text Books:

1. 1. Rattan.S.S, "Theory of Machines", Tata McGraw -Hill Publishers, New Delhi, 2009.
2. Khurmi R S, Guptha J.K "Theory of machines ", 5 Edition, S.Chand and company Delhi ISBN 81-219-2524-X
3. Thomas Bevan, "Theory of Machines", CBS Publishers and Distributors, 3rd Edition, 2005.
4. Ramamurti,V., "Mechanism and Machine Theory", 2nd Edition, Narosa Publishing House,2005.
5. Ghosh.A and A.K.Mallick, "Theory of Mechanisms and Machines", Affiliated East- WestPrivate Limited, New Delhi, 1998.
6. Rao.J.S and Dukkipati R.V, "Mechanism and Machine Theory", Wiley-Eastern Limited,New Delhi, 1992.

VSC-1 : Computer Aided Drawing

Total Credits : 01 Total Contact Hours : 15 Hrs
Maximum Marks : 25

Learning Objectives of the Course:

To introduce students with computer graphics concepts like

1. Annotation, layering
2. Dimensioning, tolerancing
3. Customization of drawing,

Course Outcomes (COs):

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

i) Draw orthographic projection using CAD software.
ii) Model parts and assembly of components.

CO-PO Attainment Matrix for Course
(L = Low, M = Medium, H = High)

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7		PSO 1	PSO 2	PSO 3
CO1	H										
CO2	H										

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	**Overview of Computer Graphics:** Introduction, theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids];	**06 Hrs**
II	**Annotations, layering & other functions:** Covering applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Drawing annotation, Computer-aided design (CAD) software modeling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory, Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling;	**09 Hrs**

Text Books:

1. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education.
2. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing,

Scitech Publishers

Website Links:

2. https://www.youtube.com/watch?v=wY3rezjj9es&ab_channel=CADCAMTutorials

NPTEL/SWAYAM Courses:

VSC-2: Practical Based on Computer Aided Drawing

Total Credits: 01 Total Contact Hours: 15 Hrs
Maximum Marks : 25

Course Outcomes (COs):

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

i) Draw orthographic projection using CAD software.
ii) Model parts and assembly of components.

CO-PO Attainment Matrix for Course
(L = Low, M = Medium, H = High)

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7		PSO 1	PSO 2	PSO 3
CO1	H										
CO2	H										

List of Experiments

i. Introduction to CAD: Advantages, Applications, Drawing Environment
ii. AutoCAD – Basics: Layout and Sketching; Line, Curve, various commands
iii. 2 - D Figures Using AutoCAD
iv. Isometric Drawings Using AutoCAD

GE/OE-2: Automotive Materials

Total Credits : 02 Total Contact Hours : 30 Hrs
Maximum Marks : 50

Learning Objectives of the Course:

To introduce students with Engineering material concepts like

1. Creep, Fatigue
2. Mechanical properties of material,
3. Ferrous and Non-ferrous alloy,
4. Shear force and Bending Moment Diagram

Course Outcomes (COs) :

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

1. Explain properties of engineering materials.
2. Explain ferrous materials and their alloys.
3. Draw Shear force and Bending moment diagram for beam.

CO-PO Attainment Matrix for Course
(L = Low, M = Medium, H = High)

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7		PSO 1	PSO 2	PSO 3
CO1	H		M								
CO2	H		M								
CO3	H		M								

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	**Classification and Properties of Material:** Introduction, Classification of Materials, Mechanical properties of metals – Strength, Elasticity, Stress, Strain, Plasticity, Malleability, Ductility, Toughness, Hardness, Brittleness, Resilience, Creep, Fatigue, Tensile test, Rockwell Hardness test, Brinell Hardness Test, Bend Test, Stress- Strain Curve for Mild steel	**10 Hrs**
II	**Ferrous and Non-Ferrous Metals:** Cast iron, Types of cast irons, properties, structures, compositions and applications, plain carbon steels, low alloy steels, Copper Alloys, Aluminium Alloys, Ceramics, Plastics, Heat treatment- Annealing, Quenching, Normalizing, Tempering	**10 Hrs**
III	**Design Fundamentals:** Selection of Material, Stress and strain due to axial force, Poisson's ratio– volumetric strain– shear stress–shear strain, Bending moment and Shear force Diagrams in beam, Flexure and Torsion in beams, Bending Stress	**10 Hrs**

Text Books:

I. V.D.Kodgire, S.V.Kodgire "Material Science and Metallurgy for Engineers.
II. V.B. Bhandari, "Design of Machine Elements": Tata McGraw Hill Fourth edition
III. Daniel Yesudian C., "Materials Science and Metallurgy", Scitech Publications (India), 2004

Website Links:

1. https://www.youtube.com/watch?v=3IQz9LAPuIA&ab_channel=NPTEL-NOCIITM

NPTEL/SWAYAM Courses:

1. Basics of Material Engineering