DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,
CHHATRAPATI SAMBHAJINAGAR.

CIRCULAR NO.SU/ Sci & Tech./B.Voc/NEP/12/2024.

It is hereby inform to all concerned that, the Revised syllabi prepared by the Ad-hoc Board and recommended by the Dean, Faculty of Science & Technology **Academic Council at its meeting held on 05 June, 2024 has accepted the following New syllabi of Bachelor of Vocation under the Faculty of Science & Technology as per National Education Policy -2020 run at the University Department, Dr. Babasaheb Ambedkar Marathwada University as appended herewith.**

Sr.No	Subject Name	Semester
1.	B.Voc in Industrial Automation (Industry Embedded) (New)	I & II
2.	B.Voc in Automobile (Industry Embedded) (New)	I & II

This is effective from the Academic Year 2024-25 onwards under the Faculty of Science & Technology.

All concerned are requested to note the contents of the circular and bring notice to the students, teachers and staff for their information and necessary action.

University campus,
Chhatrapati Sambhajinagar-431 004.
Ref. No.SU/B.voc./syllabus./2024-25/5014-22
Date: 03.08.2024

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Deputy Registrar,
Academic Section.
(Syllabus)

Copy forwarded with compliments to :-

1] **The Director,Deen Dayal Upadhyay Kaushal Kendra, Dr. Babasaheb Ambedkar Marathwada University.**
2] **The Director,** University Network & Information Centre, UNIC, with **a request to upload the curriculum along with this Circular on University Website.**

Copy to :-

1] **The Director, Board of Examinations & Evaluation,** Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.
2] The Section Officer, [B.Voc Unit] Examination Branch, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.
3] The Programmer, [Computer Unit-1] Examination Branch, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.
4] The Programmer, [Computer Unit-2] Examination Branch, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.
5] The In-charge, [E-Suvidha Kendra], Rajarshi Shahu Maharaj Pariksha Bhavan, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.
6] The Public Relation Officer, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.
7] The Record Keeper, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

Dr. Babasaheb Ambedkar Marathwada University

Chhatrapati Sambhajinagar- 431001

Deen Dayal Upadhyay KAUSHAL Kendra

Three Year (Industry Embedded)
B.VOC. Degree Program

In collaboration with Industries

Course Structure

(Revised)

(AS PER NEP-2020)

B.Voc Automobile (Industry Embedded)
(Pattern 2024)

Effective from 2024-25

PREFACE

The National Education Policy (NEP) 2020 has introduced significant reforms aimed at transforming the education landscape in India. Here's how NEP 2020 intersects with skill education:

1. **Multidisciplinary Education**: NEP 2020 emphasizes multidisciplinary education, encouraging students to pursue a broad range of subjects and skills. This approach promotes flexibility and enables students to develop diverse skill sets tailored to their interests and career goals.
2. **Holistic Development**: The policy advocates for holistic development, which includes not only academic learning but also social, emotional, and vocational skills. This holistic approach ensures that students are well-rounded individuals equipped to navigate various aspects of life and work.
3. **Vocational Education and Internships**: NEP 2020 places a strong emphasis on vocational education, integrating it into mainstream curriculum from an early age. The policy encourages hands-on learning experiences, internships, and apprenticeships to provide practical skills and real-world exposure to students.
4. **Focus on Critical Thinking and Problem-Solving**: NEP 2020 prioritizes the development of critical thinking, creativity, and problem-solving skills. These skills are essential for innovation and adaptability in a rapidly changing world and are integrated across all levels of education.
5. **Flexible Learning Pathways**: The policy promotes flexible learning pathways, allowing students to choose their own educational trajectories based on their interests, aptitudes, and aspirations. This flexibility enables students to explore diverse skill areas and tailor their education to suit their individual needs.
6. **Teacher Training and Professional Development**: NEP 2020 recognizes the importance of teacher training and professional development in enhancing the quality of education. The policy emphasizes continuous learning for teachers, equipping them with the knowledge and skills necessary to effectively nurture students' talents and abilities.
7. **Digital Education and Technology Integration**: The policy advocates for the integration of digital technology in education to enhance access, equity, and quality. Digital platforms and tools are leveraged to facilitate interactive learning experiences, skill development, and personalized instruction.

By aligning with the principles and objectives of NEP 2020, skill education in India is poised to undergo a transformative shift, fostering innovation, equity, inclusivity, and excellence in education. These contexts have remained as mainframe while developing this curriculum.

The University has adapted Outcome-based education (OBE) since 2017. OBE is widely adopted in educational systems globally due to student centric advantages. OBE provides clear and measurable learning objectives that help students focus and stay motivated. It emphasizes real-world skills, bridging the gap between academia and the workforce. Customized learning paths are possible, accommodating different learning styles and promoting inclusivity. OBE focuses on mastery and competency rather than seat time, encouraging deeper learning and retention of knowledge. Continuous improvement is encouraged through ongoing assessment and feedback. OBE promotes accountability and transparency, allowing stakeholders to monitor progress and evaluate educational programs. It equips students with skills needed for the globalized economy, fostering critical thinking and collaboration. Lifelong learning skills like self-directed learning and adaptability are developed, creating a culture of continuous improvement. Overall, OBE offers a holistic approach to education, emphasizing relevant skills, competencies, and attitudes crucial for success in today's ever-changing world.

The authorities of Dr. Babasaheb Ambedkar Marathwada University, CHHATRAPATI SAMBHAJINAGAR (M.S.), remaining aligned to accreditation standards of National Assessment and Accreditation Council, decided to opt for National Education and Policy and Outcomes Based Education (OBE). As the part of the decision, different meetings, workshops and presentations were held at the campus of university.

This document is the outcome such meetings and workshops held at university level and department level. The detailed document is designed and the existing curriculum of the department has been meticulously analysed from the standpoint of the immediate and long-time requirements of manufacturing and process industries, and transformed in to the framework of NEP with OBE. This is the first step towards the implementation of NEP with OBE in the university departments and affiliated colleges. The document will serve all stakeholders in the effective implementation of the curriculum. The OBE is continuous process for quality enhancement and it will go a long way in order to enhance the competencies and employability of the graduates/Post-graduates of the university departments and affiliated colleges.

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 Lab Course 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 Lab Course 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.

In light of aforesaid, Dr. Babasaheb Ambedkar Marathwada University hereby proposes to offer a three years industry embedded Bachelor of Vocation program (B. VOC.) in Automobile. The curriculum design of this program is undertaken with following considerations –

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.

The future of education is moving towards vocational education from the conventional education system prevalent in India. This is evident from the New Education Policy announced by the Government that is going to radically change the education system. The vocational education system is already successfully functioning in various countries across the globe. Students from the lower strata of the society who are deprived of higher education due to their financial constraints can benefit hugely from the program. Also, students who had to drop out after completion of their 12th or equivalent educational qualification can enroll into the program.

B.Voc Automobile (Industry Embedded) program is an outcome of critical brainstorming towards catering the needs of the working professionals who are working in the Industries and want to pursue their higher education. The collaboration between Dr. BAMU and large spectrum of industries underscore their shared commitment to promoting innovation, excellence, and employability in higher education. Together, they aim to nurture a generation of skilled professionals equipped to drive positive change and contribute meaningfully to the workforce and society at large.

This Program will bridge the gap between academia and industry. ***This B.Voc Automobile (Industry Embedded) Program will be a 3 Year degree program. This program will be in blended mode.*** *Theory will be taught by the University Faculty Members in online mode and assignments will be collected collaboratively by faculty members and Industry personnel.* ***Practical's will be thought at Industry premises by Industry Experts.*** *Evaluation of Theory will be done in online mode as per pattern designed in the department by university and the practical evaluation will be done by the Industry experts and evaluations sheets will be sent to the university as per stipulated period.University Academic calender and Exam timetable will be strictly followed by the Industries for theory and practical related activities.*

Structure of Bachelor of Vocation B.Voc Automobile (Industry Embedded)

(Three Year Degree Program))

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	AU(IE)/DSC/T/100	Automotive Systems	2		2		2+2 = 4
	AU(IE)/DSC/P/126	Practical based on AU(IE)/DSC/T/100		4		2	
Major (Core) M2 Mandatory	AU(IE)/DSC/T/101	Basic Electrical Systems	2		2		2+2 = 4
	AU(IE)/DSC/P/127	Practical based on AU(IE)/DSC/T/101		4		2	
Major (Core) M3 Mandatory	AU(IE)/DSC/T/102	Workshop Technology	2		2		2+2 = 4
	AU(IE)/DSC/P/128	Practical based on AU(IE)/DSC/T/102		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**	AU(IE)/GE/OE/T/100	To be chosen from other faculty	2		2		2
SEC (Skill Enhancement Courses) (Choose any one from pool of courses)	AU(IE)/SEC/T/100	Engineering Drawing	1		1		2
	AU(IE)/SEC/T-101	Basic Computer Course					
	AU(IE)/SEC/P/126	Practicals based on AU(IE)/SEC/T/100		2		1	
	AU(IE)/SEC/P/127	Practicals based on AU(IE)/SEC/T/101					
AEC, VEC, IKS	AU(IE)/AEC/T/100	English (Common for all the faculty)	2		2		2+2 =4
	AU(IE)/AEC/T/101	Choose any one from pool of Courses	2		2		
OJT/ FP/CEP/CC/RP	AU(IE)/CC-I/P/126	Health and Wellness (Common for all the faculty)		4		2	2
			13	**18**	**13**	**09**	**22**

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	AU(IE)/DSC/T/150	Thermodynamics and Heat Transfer	2		2		2+2 = 4
	AU(IE)/DSC/P/176	Practical based on AU(IE)/DSC/T/150		4		2	
Major (Core) M2 Mandatory	AU(IE)/DSC/T/151	Automotive Materials	2		2		2+2 = 4
	AU(IE)/DSC/P/177	Practical based on AU(IE)/DSC/T/151		4		2	
Major (Core) M3 Mandatory	AU(IE)/DSC/T/152	Basic Electronic Systems	2		2		2+2 = 4
	AU(IE)/DSC/P/178	Practical based on AU(IE)/DSC/T/152		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**	AU(IE)/GE/OE/T/150	To be chosen from other faculty	2		2		2
VSC (Vocational Skill Courses) (Choose any one from pool of courses)	AU(IE)/SEC/T/150	Computer Aided Drawing	1		1		2
	AU(IE)/SEC/T-151	Mechanics of Machines					
	AU(IE)/SEC/P/176	Practicals based on AU(IE)/SEC/T/150		2		1	
	AU(IE)/SEC/P/177	Practicals based on AU(IE)/SEC/T-151					
AEC, VEC, IKS	AU(IE)/AEC/T/150	Modern Indian Language (MIL-1) (Common for all the faculty)	2		2		2+2 =4
	AU(IE)/AEC/T/151	Constitution of India (Common for all the faculty)	2		2		
OJT/ FP/CEP/CC/RP	AU(IE)/CC-1/P/176	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							

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:

Working Professionals with 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.

Teaching

Following academic calendar of University, Theory will be taught by the University Faculty Members in online mode and practicals will be taught at the Industry premises by Industry experts. Assignments will be collected collaboratively by University faculty members and Industry experts. Evaluation of Theory will be done in online mode by the University as per pattern designed by the University and the practical evaluation will be done by the Industry experts and evaluation sheets will be sent to the University within stipulated period. Academic calendar and Exam timetables of University will be followed by the Industries.

Attendance:

Students must have 75 % of attendance in industries for practical and 75 % of attendance (Online mode) in each theory 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 and one Industry Expert from Industry. 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 Online Tests – 10 Marks (*03 tests) = 30 marks**
2. **Assignment/Mini Project = 10 Marks**
3. **Online Seminar Presentation = 10 Marks**

1. Module-wise Online 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. Online 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 in University premises. 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 and evaluation will be conducted by the Industry experts in Industry premises at the end of each semester following University Timetable. Final marks of practicals will be communicated to the University.

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.

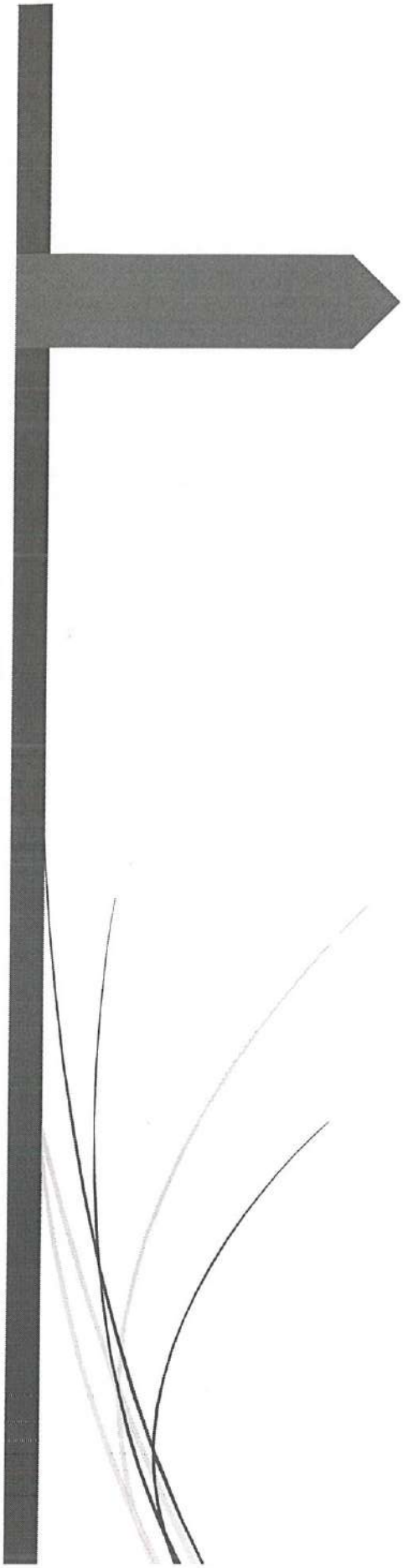
Grade Card

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

Course Type	Course Code	Course Name	Teaching Scheme (Hrs / Week)		Credits Assigned		Total Credits
			Theory	Practical	Theory	Practical	
Major (Core) M1 Mandatory	AU(IE)/DSC/T/100	Automotive Systems	2		2		2+2 = 4
	AU(IE)/DSC/P/126	Practical based on AU(IE)/DSC/T/100		4		2	
Major (Core) M2 Mandatory	AU(IE)/DSC/T/101	Basic Electrical Systems	2		2		2+2 = 4
	AU(IE)/DSC/P/127	Practical based on AU(IE)/DSC/T/101		4		2	
Major (Core) M3 Mandatory	AU(IE)/DSC/T/102	Workshop Technology	2		2		2+2 = 4
	AU(IE)/DSC/P/128	Practical based on AU(IE)/DSC/T/102		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**	AU(IE)/GE/OE/T/100	To be chosen from other faculty	2		2		2
SEC (Skill Enhancement Courses) (Choose any one from pool of courses)	AU(IE)/SEC/T/100	Engineering Drawing	1		1		2
	AU(IE)/SEC/T-101	Basic Computer Course					
	AU(IE)/SEC/P/126	Practicals based on AU(IE)/SEC/T/100		2		1	
	AU(IE)/SEC/P/127	Practicals based on AU(IE)/SEC/T/101					
AEC, VEC, IKS	AU(IE)/AEC/T/100	English (Common for all the faculty)	2		2		2+2 =4
	AU(IE)/AEC/T/101	Choose any one from pool of Courses	2		2		
OJT/ FP/CEP/CC/RP	AU(IE)/CC-1/P/126	Health and Wellness (Common for all the faculty)		4		2	2
			13	**18**	**13**	**09**	**22**

AU(IE)/DSC/T/100: 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,

AU(IE)/DSC/P/126: Practical Based on Basic Automotive System

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

The List of Practical's for above course will be provide after commencement of program in consultation with Industry Experts.

AU(IE)/DSC/T/101: 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 Replacing Electrical Components	**10 Hrs**

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

AU(IE)/DSC/P/127: Laboratory Course on Basic Electrical System

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

The List of Practical's for above course will be provide after commencement of program in consultation with Industry Experts.

AU(IE)/DSC/T/102 : 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

AU(IE)/DSC/P/128: Practical Based on Workshop Technology

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

The List of Practical's for above course will be provide after commencement of program in consultation with Industry Experts.

AU(IE)/SEC/T/100 : 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

AU(IE)/SEC/P/126: Practical Based on Engineering Drawing

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

The List of Practical's for above course will be provide after commencement of program in consultation with Industry Experts.

AU(IE)/SEC/T-101 : Basic Computer Course

Total Credits : 01
Maximum Marks : 25

Total Contact Hours : 15 Hrs

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	**5 Hrs**

	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.	
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.

AU(IE)/SEC/P/127: Laboratory Course on Basic Computer Systems

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

The List of Practical's for above course will be provide after commencement of program in consultation with Industry Experts.

AU(IE)/GE/OE/T/100: 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:

4. William H. Crouse. Donald L. Anglin, "Automotive Mechanics": Tata McGraw Hill 10^{th}edition ISBN:9780070634350.
5. S.Shrinivasan, "Automotive Mechanics": Tata McGraw Hill Second edition ISBN108187433221

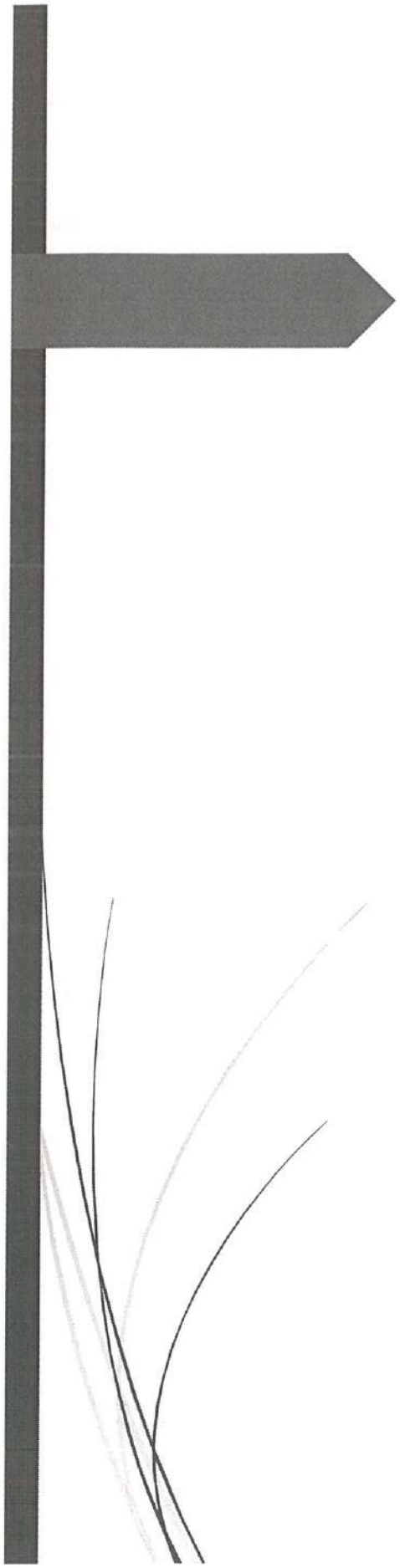
6. Dr. Kripal Singh, "Automobile engineering Vol-I": Standard Publisher distributers ISBN- 10: 8180141969

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 2

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	AU(IE)/DSC/T/150	Thermodynamics and Heat Transfer	2		2		2+2 = 4
	AU(IE)/DSC/P/176	Practical based on AU(IE)/DSC/T/150		4		2	
Major (Core) M2 Mandatory	AU(IE)/DSC/T/151	Automotive Materials	2		2		2+2 = 4
	AU(IE)/DSC/P/177	Practical based on AU(IE)/DSC/T/151		4		2	
Major (Core) M3 Mandatory	AU(IE)/DSC/T/152	Basic Electronic Systems	2		2		2+2 = 4
	AU(IE)/DSC/P/178	Practical based on AU(IE)/DSC/T/152		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**	AU(IE)/GE/OE/T/150	To be chosen from other faculty	2		2		2
VSC (Vocational Skill Courses) (Choose any one from pool of courses)	AU(IE)/SEC/T/150	Computer Aided Drawing	1		1		2
	AU(IE)/SEC/T-151	Mechanics of Machines					
	AU(IE)/SEC/P/176	Practicals based on AU(IE)/SEC/T/150		2		1	
	AU(IE)/SEC/P/177	Practicals based on AU(IE)/SEC/T-151					
AEC, VEC, IKS	AU(IE)/AEC/T/150	Modern Indian Language (MIL-1) (Common for all the faculty)	2		2		2+2 =4
	AU(IE)/AEC/T/151	Constitution of India (Common for all the faculty)	2		2		
OJT/ FP/CEP/CC/RP	AU(IE)/CC-I/P/176	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							

AU(IE)/DSC/T/150: 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 -

5. Define the basic laws and concepts of thermodynamics including system, surrounding, boundary, and universe.
6. Demonstrate the application of the first law for cyclic processes.
7. Identify and analyze various thermodynamic cycles including the air-standard analysis and vapor compression refrigeration cycle.
8. 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:

I. 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

II. Yunus A. Çengel, Michael A. Boles, "Thermodynamics: An Engineering Approach", 9th Edition, McGraw-Hill Education, 2020, ISBN-10: 1260116110, ISBN-13: 978-1260116112

III. 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

IV. 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

AU(IE)/DSC/P/176: Laboratory Course on Thermodynamics and Heat Transfer

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

The List of Practical's for above course will be provide after commencement of program in consultation with Industry Experts.

AU(IE)/DSC/T/151: 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

AU(IE)/DSC/P/177: Practical Based on Automotive Materials

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

The List of Practical's for above course will be provide after commencement of program in consultation with Industry Experts.

AU(IE)/DSC/T/152: 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 and applications.	**10 Hrs**

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

AU(IE)/DSC/P/178 : Laboratory Course on Basic Electronics System

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

The List of Practical's for above course will be provide after commencement of program in consultation with Industry Experts.

AU(IE)/SEC/T/151: Mechanics of Machines

Total Credits : 01
Maximum Marks : 25

Total Contact Hours : 15 Hrs

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 Gear Trains	**10 Hrs**

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.

AU(IE)/SEC/P/177: Laboratory Course on Mechanics of Machines

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

The List of Practical's for above course will be provide after commencement of program in consultation with Industry Experts.

AU(IE)/SEC/T/150 : 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:

AU(IE)/SEC/P/176: Practical Based on Computer Aided Drawing

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

The List of Practical's for above course will be provide after commencement of program in consultation with Industry Experts.

AU(IE)/GE/OE/T/150 Basic Electronics Systems

Total Credits : 02
Maximum Marks : 50

Total Contact Hours : 30 Hrs

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 Componcnts	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 and applications.	**10 Hrs**

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