VIDYASAGARUNIVERSITY

Midnapore, West Bengal

PROPOSED CURRICULUM&SYLLABUS (DRAFT) OF

BACHELOR OF SCIENCE (HONOURS)

MAJOR IN AUTOMOBILE MAINTENANCE

4-YEAR UNDERGRADUATE PROGRAMME

(w.e.f. Academic Year 2023-2024)

Based on

Curriculum & Credit Framework for Undergraduate Programmes

(CCFUP), 2023& NEP, 2020

VIDYASAGAR UNIVERSITY
BACHELOR OF SCIENCE (HONOURS) MAJOR IN AUTOMOBILE MAINTENANCE
(under CCFUP, 2023)

Level	YR.	SEM	Course Type	Course Code	Course Title	Credit	L-T-P	Marks		
								CA	ESE	TOTAL
B.Sc. (Hons.)	1st	I	**SEMESTER-I**							
			Major-1	AUTHMJ101	**T: Principles of Automobiles and IC Engine** **P: Practical**	4	3-0-1	15	60	75
			SEC	AUTSEC01	**P: Assembling Simple Electronics Circuits**	3	0-0-3	10	40	50
			AEC	AEC01	Communicative English -1 (***common for all programmes***)	2	2-0-0	10	40	50
			MDC	MDC01	Multidisciplinary Course -1 (***to be chosen from the list***)	3	3-0-0	10	40	50
			VAC	VAC01	ENVS (***common for all programmes***)	4	2-0-2	50	50	100
			Minor-1 (Disc.-I)	MI01	***To be decided*** ***(To be taken from other Discipline)***	4	3-0-1	15	60	75
					Semester-I Total	20				400
		II	**SEMESTER-II**							
			Major-2	AUTHMJ102	**T: Strength of Material** **P: Practical**	4	3-0-1	15	60	75
			SEC	AUTSEC02	**P: Electro Magnetism and Digital Electronics**	3	0-0-3	10	40	50
			AEC	AEC02	MIL-1 (***common for all programmes***)	2	2-0-0	10	40	50
			MDC	MDC02	Multi Disciplinary Course-02 (***to be chosen from the list***)	3	3-0-0	10	40	50
			VAC	VAC02	Value Added Course-02 (***to be chosen from the list***)	4	4-0-0	10	40	50
			Minor-2 (Disc.-II)	MI02	***To be decided*** ***(To be taken from other Discipline)***	4	3-0-1	15	60	75
			Summer Intern.	CS	Community Service	4	0-0-4	-	-	50
					Semester-II Total	24				400
					TOTAL of YEAR-1	44				800

MJ = Major, MI = Minor Course, SEC = Skill Enhancement Course, AEC = Ability Enhancement Course, MDC = Multidisciplinary Course, VAC = Value Added Course; CA= Continuous Assessment, ESE= End Semester Examination, T = Theory, P= Practical, L-T-P = Lecture-Tutorial-Practical, MIL = Modern Indian Language, ENVS = Environmental Studies

MAJOR (MJ)

MJ-1: Principles of Automobiles and IC Engine **Credits 04 (Full Marks: 75)**

MJ-1T: Principles of Automobiles and IC Engine **Credits 03**

Course contents:

Unit-I:

- Basic concept of thermodynamics, 1st and 2nd laws, reversible, irreversible process and adiabatic, Isothermal Process.
- Thermodynamic Cycle: Carnot, Otto, Diesel, Dual cycles and their air standard efficiency, Numerical Problems.
- Classification of I.C Engines, S.I. and C.I Engines, 2 Stroke, 4-Stroke engines and their working Principle.
- Engine specifications-Bore, Stroke-length, MEP, I.H.P, B.H.P, S.F.C, mechanical and thermal efficiencies.

Unit-II:

- Valve timing diagram-2-stroke and 4 stroke engine.
- Fuel used in I.C Engines, Properties of Fuel, Petrol and Diesel, Fuel additives and- fuel rating (Octane and cetane numbers)
- Combustion Process in I.C engines Auto ignition and chemical reaction, pre-ignition MAN and open combustion chambers, effect of knocking, calorific value of fuels, requirement of oxygen for complete combustion.

Unit-III:

- Layout of an automobile: Main Components and assemblies.
- Constructional features and functions of 2& 4 wheelers, Cylinder block, Crankcase, Cylinder head, Oil Pump, Gasket, Crank Shaft, Main Bearing, Vibration dampers, Exhaust system, Inlet and exhaust manifolds, fly-wheel, Piston, Piston rings, Piston Pin, Connecting rod, Cams and Camshaft, Valve and Valve mechanism.
- S.I Engines: Combustion process, types of fuel feed system, various components of fuel system, fuel tank, fuel filters and screens, fuel losses, fuel gauges, fuel pumps, air cleaners, carburetor and its working its working, trouble shooting, servicing adjustments and M.P.F.I system.

Unit-IV:

- C.I engines: Combustion and combustion chambers, fuel injection system, fuel tanks, fuel feed pumps, fuel injectors, nozzles and their types, details of nozzles and fuel injector unit, CRDI system.
- Cooling System: Importance, types, various components and accessories with troubles shooting.
- Lubrication system: Importance, lubricants and their properties, their selections, lubrication system and their working, filters, lubrications in other parts of an automobiles, trouble shooting.

MJ-1P: Practical **Credits 01**

Course Outline:

Unit-I: Workshop safety and Health: First aid and Fire safety, Machinery used in Trade Types of work done by the students in the shop floor. Importance of maintenance and cleanliness of Workshop, Practice operation of different workshop equipments,

Unit-II: Workshop hand tools: all marking aids, steel rule ,steel tap , all divider, punches, Scraper, wire brush, Emery paper, Chisel, scriber all spanner ,box spanner , ring spanner, open end spanner, adjustable spanner , torque wrange , types of screw driver, Allen key, bench vice, types of Combination pliers, Telescope gauges, Dial bore gauges, Dial indicators, straightedge, feeler gauge, thread pitch gauge, vacuum gauge, tire pressure gauge. Outside and depth micrometer, Micrometer adjustments, Vernier calipers,

Electrical safety precaution ,Electrical hand tools, Electrical measuring instrument practice (Volt Metre, Ammeter, Ohm metre, AVO Metre), Wire cutting and joint practice (Basic wire joints, soldering, Lug joint), Wire checking, use of terminal block, Magnetic effect of current, Practice using relay.

Basic idea and details of fitting shop, First aid, 5S concept, fire, Measuring instruments,
Gauge Measurement, Cutting tool's Operation, Heat Treatment, Drill and Grinding Machine Operation

Unit-III: 2-stroke and 4 stroke (C.I & S.I engine):
Valve, Valve seat, Rocker arm, Push rod, Cam shaft, Crank shaft, Piston, piston ring, Connecting rod, Oil pump, fuel pump, Distributor, Oil filter, Fuel filter, Starter motor, alternator, Dynamo, Solex carburettor, inlet manifold, exhaust manifold, water pump, fly-wheel, vibration damper, spark plug, heater plug, injector, F.I.P pump.

Unit-IV:
Cooling system: Radiator cleaning, thermostat valve, testing fan valve adjust, water pump service, pressure cap testing, over hauling viscous fan.
Lubrication system: Oil pump over-hauling and refitting, Replacing oil filter, Drawing engine oil, Repairs oil galleries.

MJ-2: Strength of Material **Credits 04(Full Marks: 75)**

MJ-2T: Strength of Material **Credits 03**

Course contents:

Unit-I: Stress, strain, their types, Numerical problems on principle of stresses,

Unit-II: Centre of Gravity: Introductions, Centroid, methods of Gravity by Geometrical considerations, centre of gravity by moments, centre of Gravity of Plain figure, Solid Body, Symmetrical section, unsymmetrical section,

Unit-III: Moment of Innertia (M.I): Definition, Determination of second moment of areas like rectangle, triangle, circle, radios of gyration, M.I of structural section such as angle, tee, I-Beam, channel, poller M.I of simple area.

Unit-IV: Shear Force and Bending Moment Diagram: Definition , Type Of Beam and load, B.M and S.F diagrams for simple cases of cantilever with point load, U.D.L and U.V.L, simple supported beam with point load, U.D.L and U.V.L,

Unit-V: Bending stress and beam: Stress due to bending , moment of resistance , netural axis, section modulus, Determination of bending stress in beam of composite sections

Unit-VI: Torsion: Definition, Shearing stress, angle of twist, stress due to torsion, power transmitted by shaft, solids and hollow shaft.

Unit-VII: Riveted Joints: Used of rived joints, various forms of riveted joints , classifications of riveted joints on the basis of assuagement of rived, pitch of rivets, single shear and double shear possible ways of failure of a riveted joint, strength of the rivet joints, efficiency of rivet joints,

Unit-VIII: Circular bending equation of flexure method of determining, deflection of beam in cantilever, simple supported beam, with point load and U.D.L. Determination of slope

MJ-2P: Practical **Credits 01**

Course Outline:

Unit-I: Valve timing: C.I. & S.I. valve timing adjustment of 2-stroke & 4-stroke.

Unit-II: Firing order set (Multi cylinder S.I. & C.I. 4-stroke) petrol- tappet timing, gear timing, chain timing, ignition timing. Diesel- tappet timing, gear timing, fuel timing.

Unit-III: Adjustment - Check the side clearance of piston rings in the piston groove & lands for wear. Check piston skirt and crown for damage and scuffing, clean oil holes, C.B point, fan belt adjustment, valve tappet. Valve grinding , Measure cylinder bore for taper & ovality, clean oil gallery passage and oil pipe line, Bore - descale water passages.

Unit-IV:
Fuel system (Petrol engine):
Over hauling fuel pump, carburetor, fuel fitter and air cleaner, practice in engine tune up in a vehicle.
Fuel system (Diesel engine):
Fuel feed pump over hauling, F.I.P pump single & multi cylinder over hauling, over hauling injector, testing the injector, Fuel bleeding, cleaning the injector. adjusting idle speed of the engine fitted with mechanical governor checking high speed operation of the engine.

MINOR (MI)

TO BE DECIDED (SELECTED FROM OTHER DECIPLINES)

SKILL ENHANCEMENT COURSE (SEC)

SEC-1P: **Assembling Simple Electronics Circuits (Practical)** **Credits: 03**

Course Outline:

Unit- 1: Semiconductor and Diode:
P-type and N-type semiconductor, Junction of P-type & N type i.e. PN junction, Barrier voltage , depletion region ,Junction Capacitance, Forward biased & reversed biased junction, Diode symbol ,circuit diagram for characteristics (forward & reversed),Characteristics of PN junction diode, Specifications:- Forward voltage drop , Reversed saturation current, maximum forward current , power dissipation, Package view of diodes of different power ratings (to be shown during practical hours) Zener diode: Construction, Symbol, Circuit diagram for characteristics of zener diode (Forward & Reverse), Zener & Avalanche Breakdown, Zener diode specifications – zener voltage, power dissipation, break over current, dynamic resistance & maximum reverse current.

Unit- 2: Rectifiers, Filters and Power Supply
Need of rectifier , definition ,Types of rectifier – Half wave rectifier, Full wave rectifier,(Bridge & centre tapped) Circuit operation Input/output waveforms for voltage & current, Average (dc) value of current & voltage (no derivation), Ripple , ripple factor , ripple frequency , PIV of diode used , efficiency of rectifier.(no derivation only definition), Comparison of three types of rectifier, Need of filters, Types of filters- A] shunt capacitor, B] Series inductor, C] LC filter , D] - filter --- only circuit operation (no mathematical derivation),limitations & advantages 2.5 Voltage regulator- Simple voltage regulator circuit using zener, familirisation with IC regulator circuit (like 78XX , 79XX series etc.), IC 723 adjustable power supply, concept of Switch mode power supply (SMPS) block diagram only.

Unit-3: Transistors, Switching and Optoelectronics Devices
Bipolar Junction Transistor (BJT): Symbol of NPN & PNP types, Construction, Different types of package, Operation of NPN and PNP transistor – current flow, relation between different currents, Transistor configurations – CB, CE, CC circuit diagram for input & output characteristics of each configuration, Input & output characteristics, Comparison between three configuration, Transistor parameters – input & output resistance and relation between them. Transistor specification – VCE Sat, IC Max, VCEO, ICEO, VCE Breakdown, Power dissipation. Field effect Transistor (FET): Symbol, Construction of JFET, Working principle and V-I characteristics of JFET, pinch- off voltage, drain résistance, trans conductance, amplification factor and their relationship, Enhancement and depletion type MOSFET. TRIAC, DIAC, Silicon control rectifier (SCR):-Symbol, working, application (elementary ideas only) Comparison between Transistor and SCR. Elementary ideas of LED, LCD, photodiode, phototransistor and solar cell and their applications only.

Unit- 4: Transistor Biasing
Need of biasing, concept of DC load line and AC load line, selection of Q point and Stabilization, Types of biasing circuits (no mathematical derivation) – a) Fixed biased circuit, b) Collector-to-base biased circuit, c) Voltage divider bias circuit

Unit – 5: Small Signal Transistor Amplifiers
Concept of amplification- Small signal amplifier using BJT, Determination of current, voltage & power gain, Input & output resistance. Single stage CE amplifier with voltage divider bias. Its explanation. Frequency response of single stage CE Amplifier, Bel and Decibel unit. Bandwidth & its significance.

Cascade Amplifiers (Multistage Amplifier), Need of Multistage Amplifiers, Gain of amplifier. Types of amplifier coupling – RC, transformer & direct coupling. Two stage amplifier circuit diagram, working (briefly), frequency response, merits & demerits & applications of each.

SEC-2P: **Electro Magnetism and Digital Electronics (Practical)** **Credits: 03**

Course Outline:

Unit-1: Steady electric current: Current density, equation of continuity, condition for the steady current, Kirchhoff's laws and analysis of multi loop circuits.

Unit-2: Magneto statics: Force on a moving charge, Lorentz force and definition of B, force on a straight current carrying conductor in a uniform magnetic field, torque on a current loop. Bio- Savart law, Ampere's circuital law, determination of magnetic fields (B) due to a straight current carrying conductor, a circular coil, a solenoid, magnetic field due to a small current loop, concept of magnetic dipole as a tiny current loop.

Unit-3: Magnetic fields in matter- magnetization (M), relation between B, H, and M, magnetic susceptibility and permeability, diamagnetic, paramagnetic and ferromagnetic materials, Curie's law, hysteresis in ferromagnetic material.

Unit-4: Electromagnetic induction and Maxwell's Equations: Faraday's law (both the integral and the differential forms), self and mutual inductances, transformers, energy stored in a coil of self inductance L, displacement current, Maxwell's equations.

Unit-5: Transients in DC: Growth and decay of current in LR circuit, charging and discharging of capacitor in CR circuit, time constants.

Unit-6: Alternating current: LR and CR circuits, complex number and their applications in AC circuits, impedance and reactance, series and parallel resonances, Q– factor, power dissipation in AC circuit, power factor.