VIDYASAGAR UNIVERSITY

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.)	2nd	III	**SEMESTER-III**							
			Major-3	AUTHMJ03	T: Theory of Machine	4	3-1-0	15	60	75
			Major-4	AUTHMJ04	T: Suspension system, Steering system, Ignition system and Auto Air conditioning; P: Practical	4	3-0-1	15	60	75
			SEC	AUTSEC03	P: Body repair and maintenance	3	0-0-3	10	40	50
			AEC	AEC03	Communicative English -2 (***common for all programmes***)	2	2-0-0	10	40	50
			MDC	MDC03	Multidisciplinary Course -3 (***to be chosen from the list***)	3	3-0-0	10	40	50
			Minor-3 (Disc.-I)	MIN03	*To be decided* *(To be taken from other Discipline)*	4	3-0-1	15	60	75
					Semester-III Total	20				375
		IV	**SEMESTER-IV**							
			Major-5	AUTHMJ05	T: Transmission system P: Practical	4	3-0-1	15	60	75
			Major-6	AUTHMJ06	T: Manufacturing process and machine tools- 1 P: Practical	4	3-0-1	15	60	75
			Major-7	AUTHMJ07	T: Chassis, Frame &Body, Brake & Braking System, Wheel & Tyres; P: Practical	4	3-0-1	15	60	75
			AEC	AEC04	MIL-2 (***common for all programmes***)	2	2-0-0	10	40	50
			Minor-4 (Disc.-II)	MIN04	*To be decided* *(To be taken from other Discipline)*	4	3-0-1	15	60	75
			Summer Intern.	INT	**Internship/ Apprenticeship - activities to be decided by the Colleges following the guidelines to be given later**	4	0-0-4	-	-	50
					Semester-IV Total	22				400
					TOTAL of YEAR-2	42				775

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

MAJOR (MJ)

MJ-3: Theory of Machine **Credits 04 (Full Marks: 75)**

MJ-3T: Theory of Machine (Theory) **Credits 04**

Course contents:

Unit-I: Friction: Introduction, types of friction, coefficient of friction, limiting friction, laws of solid friction and kinetic friction, screw jack.

Unit-II: Belt, Rope and Chain Drive: Introduction, Belt drive, types of belts, Materials used, Velocity ratio, Slip, Length of belt, Comparison, flat and v-belt, Rope drive & Chain Drive.

Unit-III: Gear and Gear Trains: Fundamental laws of gearing, spur, bevel and worm gears, gear train, Interference, epicyclic gear trains.

Unit-IV: Cam: Types, displacement diagrams.

Unit-V: Flywheels: Turning moment diagrams, fluctuations of energy and speed.

Unit-VI: Governors: Types, Principles, working, Characteristics and performance.

MJ-4: Suspension system, Steering system, Ignition system and Auto Air conditioning

Credits 04(Full Marks: 75)

MJ-4T: Theory **Credits 03**

Course contents:

Unit-I: **Suspension system-** Objectives, principles of working, types of suspension system, independent and rigid axle suspension system, damper, electronically controlled air suspension (ECAS), Types of springs - Description and function of Coil springs, Leaf springs, Torsion bars, Rubber springs. Shock absorber types- Description and function of Hydraulic shock absorbers, Gas-pressurized shock absorbers, Load-adjustable shock absorbers, Manual adjustable-rate shock absorbers, Electronic adjustable-rate shock absorbers, Automatic load-adjustable shock absorbers, Torsion bar suspension, Rear suspension types & Components-Rigid axle leaf spring suspension, troubles in a suspension system.,

Unit-II: **Steering system -** Steering geometry, their effect, steering angle, steering mechanism, steering linkages, power steering, Electric power assisted steering, Basic electric power steering operation. Steering arms & components- Forward control vehicle steering, steering linkages, Basic hydraulic power steering operation, 4 wheel steering system, trouble shooting.

Unit-III: **Wheel alignment fundamentals -** Basic principles of wheel alignment, wheel base, wheel track, king pin inclination, Caster, Camber, Scrub radius, Toe-in & toe out, Toe-out on turns, Turning radius, Thrust angle & centrelines.

Unit-IV: **Ignition System:-** Battery, electrical, magneto and electronic ignition systems and their troubles.
Unit-V: Auto Air conditioning: Introduction, Air conditioning system, components, effect of Air conditioning of fuel economy, car Air conditioning system, Truck Air conditioning, trouble shooting.

MJ-4P: Practical **Credits 01**

Course Outline:

1. Suspension system: Practice on visual Inspection and Carryout Overhauling and Inspection of shackle, leaf spring, front & rear suspension. Practice on overhauling process and assembling of shock absorber and replacing shock absorber over hauling coil spring, Practice on overhauling process and assembling of air suspension and Replacing process this system. Trouble shooting for Suspension system defects.

2. Ignition system: Battery testing with hydrometer and multi meter, Spark plug cleaning, spark plug gap setting and spark plug testing with spark plug cleaning machine.

3. Checking ignition timing, Checking & changing a spark plug, Identification and testing of Hall Effect sensor, Optical sensor. Tracing and testing of sensor circuits.

4. Steering system: Practice on removing steering wheel, Inspect and overhaul steering boxes, adjusting steering gear backlash, Check & top up power steering fluid, Carryout Pressure testing a power steering system, Flushing a power steering system, Inspecting & adjusting an engine drive belt, Servicing a steering system, wheel bearings.

5. Wheel alignment: Practice on removing the drop arm, Check and adjust the turning angle, align the drop arm and steering wheel with the front wheel. Check and correct toe-in. Check and correct setting wheel alignment with alignment machine, Inspect and adjust toe-in, toe-out, camber angle, castor angle, kingpin inclination and wheel run out.

MJ-5: Transmission system **Credits 04(Full Marks: 75)**

MJ-5T: Transmission system (Theory) **Credits 03**

Course contents:

Unit-I: General principle, objectives and types (Manual, Semi-automatic, Automatic, Hydraulic transmission) Gear boxes, resistance to motion of a vehicle, power required for propulsion

Unit-II: Acceleration and hill climbing, necessity of gear box, function and types of gears, synchromesh gear box, Sliding mesh gear box, constant mesh gearbox, and epicycle gear box, free wheel drive, gear lubrication, transmission troubles.

Unit-III: Clutch System: Function, types, clutch linkage, clutch facing &friction material, Clutch principles, Single-plate clutches, Multi-plate clutches, Operating mechanisms common faults. Propeller Shaft: Types, fluid drives, Hotchkiss drive, universal & slip joint, Torque convertors.

Unit- IV: Final drive and rear axle: Types of final drives, differential gears and its principles of operation, rear axle and its types, Four-wheel drive differentials. All-wheel drive- four wheel final drives, only Front-wheel differentials
Front Axle: Types and their components, swivelling mechanism, front form of motor cycle.

MJ-5P: Practical **Credits 01**

Course Outline:

1. Gearbox: Over hauling a sliding mesh, constant mesh and synchromesh gear box, 4 wheel drive gear box. Dismantling cleaning and assembling of gearshift mechanism, changing oil in gear box. All gear box cleaning, inspecting parts replacing and worn out defective parts assembling for correct place identify the gearbox and noises from gear boxes recovery.

2. Clutch: Over hauling single plate, multi plate, diaphragm clutch and other clutch cleaning inspecting parts. Removing & fitting of pilot bearing, ring gear in fly wheel relining a clutch plate, checking condition of flywheel and pressure plate surface for reconditioning. Pressure plate adjusting the fingers checking run out of fly wheel and aligning clutch assembly with flywheel.

3. Practice on Remove the open type propeller shaft , slip joint ,universal joints from vehicle ,cleaning and replacing worn out parts, re-assembling & refitting to vehicle- and their alignment, including front wheel drive.

4. Overhauling & inspection of front and rear axle, differential assembly, front wheel differential assembly, 4 wheel differential assembly. Identify Automatic transmission components inspect automatic transmission fluid and change the transmission fluid & filter. Oil pressure control cable play adjustments, Inspection of shift lever switch, throttle position sensor, speed sensor and automatic transmission wiring.

MJ-6: Manufacturing process and machine tools- 1 Credits 04(Full Marks: 75)

MJ-6T: Manufacturing process and machine tools- 1 (Theory) Credits 03

Course contents:

Unit-I: Mechanical properties of metals, ferrous and non-ferrous metals used in engineering practice, Influence of carbon on iron and steel. Heat treatment of metals-different process-heat treatment equipment and materials.

Unit II: Ferrous metal, Non-ferrous metals and alloys Pig iron, Manufacture of pig iron, Description of blast Furness, Melting ore in blast Furness, composition of pig iron, classification of pig iron, manufacture of cast iron, types of cast iron, effect of allowing elements on cast iron, manufacture of steel, classification of steel, aluminum, copper, led, zinc, tin, Nickel, Cadmium, copper alloys, Lead alloys, tin alloys, aluminum alloys

Unit-III: Indian Timber and Pattern - Introduction of Indian timber, classification of timber, concept of patterns , patterns materials, pattern making tools, type of pattern, pattern allowance, cope and drag, core box, colour coding of pattern.

Unit-IV: Hand tools used in different shops, bench work and fitting shop, Hand tools used in fitting shops, chipping, filing, scraping, measuring tools and gauges, limit, fit, allowance and clearance, jug stand and fixtures.

Unit-V: Definition and concept of different types, welding, brazing, and soldering and their working principle and application..

Unit-VI: Machine shops- Elementary ideas, Classification, Specification, Working Principle and operation of different type machine Tools, like Lathe, Shaper, Grinder, Drill & Milling.

MJ-6P: Practical Credits 01

Course Outline:

1. Produce job using lathe machine, Drill machine and grinding machine -straight turning, tapper turning, shoulder turning, knurling, grilling and tapping, face grinding.
2. Identity of Cupola and Blast Furness.
3. Carpentry Work to be performed for the given job:- T- joint ,lap joint, corner joint, Dovetail joint, cross lap joint , Simple Pattern, loose piece pattern , Split pattern
4. Jobs Produce by using of Welding Machine like T-joint, Angle joint, Cross joint, Practice of Brazing and Soldering.

MJ-7: Chassis, Frame & Body, Brake & Braking System, Wheel & Tyres

Credits 04(Full Marks: 75)

MJ-7T: Theory **Credits 03**

Course contents:

Unit-I: Chassis, Frame and Body: Chassis layout and its main components, design features, types of chassis and frames, materials and dimensions for auto body work, method of manufacturing and space requirements. Wheel track and wheel base.

Unit-II: Brake and braking system: Principles of brakes, braking mechanisms, Brake type - principles, Air brakes, Exhaust brakes, Electric brakes, Parking brakes, brake troubles.

Braking system components -Park brake system, Master cylinder, Tandem master cylinder, Brake pedal, Brake lines, Brake fluid, Bleeding, Brake light switch

Drum brakes & components -Drum brake system, Drum brake operation, Brake linings & shoes, Wheel cylinders operation

Disc brakes & components -Disc brake system, Disc brake operation, Disc brake pads, Disc brake callipers, Brake friction materials

Antilock braking system & components-ABS brake system, Antilock braking system operation, Principles of ABS braking and all sensors, ABS with electronic control unit.

Unit-III: Wheels and tyres- Types of tyres and their specification, tubeless tyres, radial tyres, friction due to pavement and earth in relation to wear, care and maintenance of tyres and tubes, repair and retreading of tyres.

MJ-7P: Practical **Credits 01**

Outline:

1. Check & adjust tire pressure by use of air or by Nitrogen, Rotate the wheels in vehicle minor repairs to wheels and tyres, wheel balancing, Check for tyre wear patterns

2. Brake system: Over hauling master cylinder and tendam master cylinder, wheel cylinder, front and rear brake, hand brake, Electromagnetic retarder brake (EMR) and Engine exhaust brake, vacuum assisted brake assembly. Disc brake, Checking & adjusting brake fluid, Replacing brake fluid, Bleed hydraulic brakes & Disk brakes.

3. Air brakes:- adjuster and repair to tank, air compressor, air servo, single brake chamber unit, unloaded valve, release valve locating, air leaks in the brake lines and rectifying and general maintenance, servicing air tank, servicing brake valve

4. wheel brake adjuster- drum brake adjuster, Adjusting a parking brake, heavy vehicle adjusting brakes and balancing all four wheel brakes

MINOR (MI)

TO BE DECIDED
(SELECTED FROM OTHER DECIPLINES)

SKILL ENHANCEMENT COURSE (SEC)

SEC-3P: **Body repair and maintenance (Practical)** **Credits: 03**

Course Outline:

1. **Materials for body repairs and spray painting:** Body repair materials; types of body filler- plastic filler, fiber glass filler; types of body abrasives- sand papers, sanding disc; types of sealers- rubber sealers, seam sealers, under coating; Rivet pins – pop and solid rivets. Spray painting materials – types of paints – enamel paints and lacquers – undercoats – surface primer, putty/ body filler, sealers; top coats – lacquers and enamel paints.

2. **Body repair works:** Basic methods of straightening auto body, aligning the metal with power jack, pulling mechanism. Heat shrinking the metal to bring the metal back to its original shape. Major body repair- Metal panel repairs, plastic repairs

3. **Body painting works:** Surface preparation; types of paints – cellulose synthetic paint, enamel paint, acrylic, metallic paints; spray gun and accessories- pressure feed gun, siphon and gravity gun- air cap, fluid needle, air valve, trigger gun.

4. **Body maintenance:** Periodical cleaning of vehicle body, washing, waxing; Interior body cleaning by vacuum cleaning; Cleaning carpet, dashboard, seats; Body coatings.