



SWAMINARAYANUNIVERSITY

Program Name: Engineering Level: Degree

Course/ Subject Code: BE102402

Course/Subject Name: Automotive Manufacturing Processes and Technology

w.e.f. Academic Year:	2024-25
Semester:	4 th Semester/ 2 nd Year
Category of the Course:	Professional Core

Prerequisite:	Zeal to learn the subject
Rationale:	Manufacturing Processes and Technology related to Machining processes, Sheet metal working, Welding processes, Casting, and Powder Metallurgy for Automobile Engineering. All the manufacturing processes are included in this subject with the objectives to students familiar with processes its application and basic principles.

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+(PR/2)	Assessment Pattern and Marks				Total Marks
L	T	PR	C	Theory		Tutorial/Practical		
				(E)	(M)	(I)	(V)	
3	0	2	4	60	40	20	30	150

Course Content:

Unit No.	Content	No. of Hours	% of Weight age
1.	Machining: General principles of working and commonly performed operations in the following machines: Lathe, Shaper, Planer, Slotter, Milling, Drilling and Grinding machine. Principles and application of Capstan and Turret lathe. Basics of NC, CNC machines with Application and advantages. Super finishing Technology: Introduction and application: Lapping, Honing, Buffing, Barrel Tumbling, Burnishing, Powder coating, Polishing. General principles and applications of the following processes: Abrasive Jet machining, Water Jet Machining, Ultrasonic machining, electric discharge machining, electro chemical machining, Plasma arc machining, electron beam machining and laser beam machining.	14	20
2.	Casting: Steps involved in making a casting, Advantage of casting and its applications. Patterns and Pattern making, Types of patterns, Materials used for patterns, core and core making, casting design considerations. Casting processes, Sand, centrifugal, die, investment, lost foam, gravity, squeeze, and shell. Methods of Melting: Crucible melting and cupola operation	08	20



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3.	Forming and Shaping Processes: Stamping, forming and other cold working processes: Blanking and piercing, Bending and forming, Rolling, Drawing and its types, wire drawing and Tube drawing, coining, Hot and cold spinning, Types of presses and press tools. Basic extrusion processes and its characteristics. Forging processes: Principles of forging, tools and dies, Types of forging, Open, closed, drop forging, roll forging.	10	20
4.	Welding: Classification of welding processes. Principles and Application of Oxy- acetylene gas welding. A.C metal-arc welding, resistance welding, submerged arc welding, tungsten inert gas welding, metal inert gas welding, plasma arc welding, Thermit welding, electron beam welding, laser beam welding, defects in welding, soldering and brazing	08	20
5.	Plastic Technology: Introduction, Classification of Plastics, Ingredients of Moulding compounds, General Properties of Plastics, Plastic part manufacturing processes such as compression moulding, Transfer moulding, Injection moulding, Extrusion moulding, Blow moulding, Calendaring, Thermo forming, slush moulding, laminating.	05	20
Total		45	100

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10%	25%	30%	15%	10%	10%

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT level
1	Interpret basics of metal cutting processes and machining operations for different machine tools	U – Understand
2	Understand basics of foundry shop	U – Understand
3	Make use of basics of sheet metal forming and welding processes and Application	A – Apply
4	Identify basics of Plastic technology and application.	U – Understand



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Course/ Subject Code: BE102402

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Course Outcome to Program Outcome (CO-PO) Mapping

CO-PO Mapping				
PO \ CO	CO-1	CO-2	CO-3	CO-4
PO-1 Basic Engg Knowledge	3	2	3	2
PO-2 Problem Analysis	2	-	2	-
PO-3 Design/Development	2	2	3	2
PO-4 Investigations	-	-	-	-
PO-5 Modern Tool Usage	-	-	-	-
PO-6 Engineer & Society	-	-	-	-
PO-7 Environment & Sustainability	-	-	-	-
PO-8 Ethics	-	-	-	-
PO-9 Individual & Team Work	-	-	-	-
PO-10 Communication	1	-	1	-
CO-PSO Mapping				
PSO \ CO	CO-1	CO-2	CO-3	CO-4
PSO1 (Automobile Manufacturing Skills)	3	2	3	2
PSO2 (Design and Analysis)	1	-	1	-

References/Suggested Learning Resources:

(a) Books:

1. Introduction to Manufacturing Processes** – Schey A. John, Tata McGraw Hill, Noida, 2012
2. Manufacturing Technology** – R. L. Timing, Volume 1 and 2, Pearson Education
3. Workshop Technology (Manufacturing Processes)** – S. K. Garg, University Science Press
4. Principles of Metal Casting** – Heine, Loper, and Rosenthal, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 2011
5. A Textbook of Production Engineering** – P. C. Sharma, S. Chand Publication
6. Foundry Engineering** – Banga T.R. and Agrawal R.L., Khanna Publishers, New Delhi, 2007
7. Processes and Materials of Manufacture** – Lindberg Roy A., Prentice-Hall India
8. Principles of Manufacturing Materials and Process** – J. S. Campbell



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(b) Open source software and website:

- NPTEL
- Syllabus contents videos

Suggested Course Practical List:

1. Job making on lathe
2. Job making on casting
3. Job making by using press tool
4. Job making on welding
5. Job making by using plastic moulding

List of Laboratory/Learning Resources Required:

- Lathe Milling, Shaper, Drilling machine,
- Unconventional Machine
- Mechanical Press
- Mini Foundry
- Welding machine

Suggested Project List:

1. Design and Fabrication of Mini Lathe Machine for Small Workshop Applications
2. Manufacturing of a Simple Automotive Component Using Sand Casting
3. Development of Sheet Metal Bending Tool and Making a Utility Product (e.g., mobile stand)
4. Fabrication of Mini Spot Welding Machine for Mild Steel Sheets
5. Plastic Injection Molding of a Household or Automotive Component (e.g., gear knob, keychain)
6. Study and Demonstration of Various Welding Techniques (MIG, TIG, Arc)
7. Design and Fabrication of a Hand-Operated Press Tool for Simple Blanking Operation
8. Machining of a Multi-Step Shaft on Lathe and Inspection Using Vernier/Micrometer
9. Comparative Study of Conventional and Non-Conventional Machining (AJM, EDM, WJM)
10. Design and Fabrication of Mould for a Thermoforming Process



सर्व विद्या अधिपतये

SWAMINARAYAN UNIVERSITY

Program Name: Engineering

Level: UG

Course / Subject Code : BE101402

Course / Subject Name : Fluid Mechanics and Hydraulics Machines

w. e. f. Academic Year:	2024-25
Semester:	4th/ 2ND Year
Category of the Course:	PC

Prerequisite:	Zeal to learn the subject
Rationale:	This course imparts fundamental knowledge regarding fluid, types, properties and basic governing equations in static and moving conditions. The course also provides the basic technical knowledge related to various fluid machines used in the practice.

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
L	T	PR	C	Theory		Tutorial / Practical		
				(E)	(M)	(I)	(V)	
4	0	2	5	60	40	20	30	150



SWAMINARAYAN UNIVERSITY

Program Name: Engineering

Level: UG

Course / Subject Code : BE101402

Course / Subject Name: Fluid Mechanics and Hydraulics Machines

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1	Fluids and Their Properties: Fluid classifications, hypothesis of continuum, shear stress in a moving fluid, molecular structure of material, density, viscosity, surface tension, capillary effect, vapor pressure, compressibility and the bulk modulus, pressure, Pascal's law of pressure at a point, variation of pressure vertically in a fluid under gravity, equality of pressure at the same level in a static fluid, general equation for the variation of pressure due to gravity from a point to point in a static fluid, pressure and head, hydrostatic paradox	8	6
2	Static Forces on Surface and Buoyancy: Fluid static, action of fluid pressure on surface, resultant force and center of pressure on a plane surface under uniform pressure and surface immersed in a liquid, pressure diagrams, forces on a curved surface due to hydrostatic pressure, buoyancy, equilibrium of floating bodies, stability of a submerged body and floating bodies, determination of the metacentric height, determination of the position of the metacenter relative to the center of buoyancy	8	12
3	Motion of Fluid Particles and Streams: Fluid flow, different types of flow, frames of reference, analyzing fluid flow, motion of a fluid particle, acceleration of a fluid particle, discharge and mean velocity, continuity of flow, continuity equations for 2-D and 3-D flow in Cartesian coordinates of system, rotational and irrotational flow, circulation and vorticity, streamlines and the stream functions, velocity potential and potential flow, relation between stream function and velocity potential, stream function and velocity potential for uniform flow, vortex flow	6	10
4	The Energy Equation and its Application: Momentum and fluid flow, Momentum equation for 2-D flow along a stream line, momentum correction factor, Euler's equation of motion along a stream line, mechanical energy of a flowing fluid, Bernoulli's theorem, kinetic energy correction factor, changes of pressure in tapering pipe, principle of venturimeter, orifice, rotameter, theory of notches and weirs	6	10
5	Dimensional Analysis and Similarities: Dimension reasoning, dimensional homogeneity, dimensional analysis using Rayleigh's method, Buckingham π -theorem, use of dimensionless numbers in experimental investigation, geometric similarity, dynamic similarity, kinematic similarity, model testing, model laws, undistorted and distorted models	4	8



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Course / Subject Code : BE101402

Course / Subject Name : Fluid Mechanics and Hydraulics Machines

6	Viscous and Turbulent Flow: Reynolds' experiment, flow of viscous fluid through circular pipe-Hagen Poiseuille formula, flow of viscous fluid between two parallel fixed plates, power absorbed in viscous flow through - journal, foot step and collar bearing, turbulent flow expression for coefficient of friction -Darcy Weishbach equation, moody diagram, resistance of smooth and rough pipes, shear stress and velocity distribution in turbulent flow through pipes	4	8
7	Flow through pipes: Major and minor energy losses, hydraulic gradient and total energy lines, pipes in series and parallel, equivalent pipes, water hammer in pipes	6	10
8	Impact of Jet and Hydraulic Turbines: Force exerted on stationary flat and curved plates held normal, force exerted on moving plate held normal and on a plate when vane is moving in direction of jet, jet striking on curved vane tangentially at one tip and leaving at other end, classification of hydraulic turbines, impulse and reaction turbines, construction, working and analysis of Pelton, Francis and Kaplan turbines, draft tube, governing of the hydraulic turbines, cavitations, performance characteristics	4	8
9	Centrifugal Pumps: Pump classification and selection criterion, velocity vector diagrams, pump losses and efficiencies, net positive suction head, pressure rise in impeller, characteristic curves, priming	10	18
10	Hydraulic Machines: Hydraulic press, hydraulic accumulator, hydraulic intensifier, hydraulic crane, hydraulic jack, hydraulic lift, hydraulic ram, fluid couplings, fluid torque converter and air lift pump	6	10
Total		60	100

Note: Topic No. 4 and 7 of the above syllabus must be covered in Practical Hours.

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	40	40	-	-	-

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT level
1	explain various fluid properties and behavior of fluid in static and dynamic mode.	Understand
2	make use of dimensional analysis and interpret types of fluid flow.	Apply

3	analyze theory of impact of jet and apply the same for hydraulic turbine.	Apply
4	evaluate performance of centrifugal pumps	Understand

Program Outcomes (POs)

PO No.	PO Description (Abbreviated)
PO1	Engineering knowledge
PO2	Problem analysis
PO3	Design/development of solutions
PO4	Conduct investigations of complex problems
PO5	Modern tool usage
PO12	Life-long learning

CO-PO Mapping Table:

CO \ PO	PO1	PO2	PO3	PO4	PO5
O1	3	2			
CO2	3	3		2	
CO3	2	3			
CO4	3	3	2	2	1

Program Specific Outcomes (PSOs):

PSO No.	PSO Statement
PSO1	Apply fundamental knowledge of mechanical engineering for solving real-world problems.
PSO2	Select and apply modern tools for analysis and design in thermal and fluid systems.

CO-PSO Mapping Table

CO \ PSO	PSO1	PSO2
CO1	3	-
CO2	3	2
CO3	3	2
CO4	2	3

References/Suggested Learning Resources:**(a) Books:**

1. Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, S. K. Kataria & Sons
2. Fluid Mechanics and Hydraulic Machines by R.K. Bansal, Laxmi Prakashan
3. Fluid Mechanics and Hydraulic Machines by R.K. Rajput, S.Chand & Co.
4. Theory and Applications of Fluid Mechanics by K. Subramanya, McGraw Education
5. Fluid Mechanics by Frank .M. White, McGraw Hill Education
6. Mechanics of Fluids by Shames, McGraw Hill Education

(b) Open Sources:

1. <https://nptel.ac.in>
2. www.vlab.co.in

Suggested Course Practical List:

1. Verification of Bernoulli's theorem
2. To determine metacentric height by metacentric height apparatus.
3. To measure the velocity of flow using orifice meter and venturi meter.
4. To determine the coefficient of discharge through open channel flow over a notch. 5
5. To determine the different types of flow patterns by Reynolds' experiment.
6. To determine the friction factor for the different pipes.
7. To determine the loss coefficients for different pipe fittings.
8. To verify Impulse-momentum principle for impact of jet on stationary vane.
9. Performance test on Pelton turbine.
10. Performance test on Kaplan turbine.
11. Performance test on Francis turbine.
12. Performance test on centrifugal pump



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Program Name: Engineering

Level: UG

Course / Subject Code : BE101402

Course / Subject Name : Fluid Mechanics and Hydraulics Machines

List of Laboratory/Learning Resources Required:

1. Reynolds' apparatus
2. metacentric height apparatus
3. impact of jet apparatus
4. test rigs of Pelton
5. Francis and Kaplan turbine
6. test rigs of centrifugal pump and hydraulic ram
- 7.

Suggested Project List:

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SWAMINARAYAN UNIVERSITY

Program Name: Engineering

Level: UG

Course / Subject Code : BE101403

Course / Subject Name : Fundamentals of Machine Design

w. e. f. Academic Year:	2024-25
Semester:	4 th / 2 ND Year
Category of the Course:	PC

Prerequisite:	Zeal to learn the subject
Rationale:	The course aims to impart basic skills of force and stress analysis for design of machine elements.

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
L	T	PR	C	Theory		Tutorial / Practical		
				(E)	(M)	(I)	(V)	
4	0	2	5	60	40	20	30	150



SWAMINARAYAN UNIVERSITY

Program Name: Engineering

Level: UG

Course / Subject Code : BE101403

Course / Subject Name : Fundamentals of Machine Design

Unit No.	Content	No. of Hours	% of Weightage
1.	Basics of stress and strain: <ul style="list-style-type: none"> 3 -D state of stress (Concept only) Normal/axial stresses: Tensile & compressive Stresses: Shear and complementary shear Strains: Linear, shear, lateral, thermal and volumetric. Hooke's law, Elastic Constants: Modulus of elasticity, Poisson's ratio, Modulus of rigidity and bulk modulus and relations between them with derivation. 	5	10
2.	Moment of inertia of planar cross -sections: <ul style="list-style-type: none"> Derivation of equation of moment of inertia of standard lamina using first principle, Parallel & perpendicular axes theorems, polar moment of inertia, 	5	10
3.	Flexural stresses: <ul style="list-style-type: none"> Theory of simple bending, Assumptions, derivation of equation of bending, neutral axis, determination of bending stresses, section modulus of rectangular & circular (solid & hollow), I,T, Angle, channel sections. 	4	10
4.	Torsion: <ul style="list-style-type: none"> Derivation of equation of torsion, Assumptions, application of theory of torsion equation to solid & hollow circular shaft, torsional rigidity. 	4	10
5.	Introduction to Machine Design: <ul style="list-style-type: none"> Design procedure, Selection of preferred sizes, Aesthetic and Ergonomic considerations in Design, Manufacturing considerations in Design, Mechanical Properties of Materials, Effect of Alloying elements and heat treatment on properties of steels, Materials Selection in Machine Design, Standardization. 	6	10
6.	Design Against Static Load: <ul style="list-style-type: none"> Concepts of stresses and Strain, Combinations of Axial, Shear, Torsional and Bending loads; Theories of Failures: Distortion energy (von Mises), Maximum-Shear stress, Maximum Principal stress, Selection and Use of theories of failures; Factor of safety, Contact stresses, Crushing and Bearing stress. Application Problems: Eccentric Loading; Cotter and Knuckle Joints; Design and analysis of levers: Cranked, Bell crank, Foot, Rocker arm. 	4	10



SWAMINARAYAN UNIVERSITY

Program Name: Engineering

Level: UG

Course / Subject Code : BE101403

Course / Subject Name: Fundamentals of Machine Design

7.	Beams and Columns: <ul style="list-style-type: none"> Different types of supports / end conditions, Revision of Stresses in beams: Effect of Section, Orientation, and type of loading; Deflection of beams for different loading conditions. Compressive axial loading of columns and struts, Slenderness ratio, Compressive stress and Buckling of members, Effect of end conditions; Euler's Formula, Applications, validity and limitations; Rankine's Formula, stresses in curved beam. 	4	10
8.	Shafts and Keys: <ul style="list-style-type: none"> Design of solid and hollow circular shaft subjected to torque and combined loading for rigidity and stiffness; Design of Keys and splines. 	5	10
9	Power Screws and Threaded Joints: <ul style="list-style-type: none"> Forms of thread, Single and Multiple threaded screw, Terminology of power screw, Torque requirement of lifting/lowering, Self-locking, Efficiency of threads, coefficient of friction, design of screw and nut. Basic types of screw fastening, Cap and Set screw, Bolt of Uniform strength, locking devices, Terminology of Screw thread, Bolted Joint: Simple and Eccentric loading, Torque requirement for bolt tightening. 	4	10
10	Design Against Fluctuating Loads: <ul style="list-style-type: none"> Stress Concentration, Endurance limit and Fatigue failure, Factors affecting endurance limit, S-N Diagram, Design for reversed stresses and cumulative damage, Fluctuating stresses: Soderberg, Gerber, Goodman and Modified Goodman criteria, Combined stresses. 	4	10
Total		45	100

Note: Topic No. 4 and 7 of the above syllabus must be covered in Practical Hours.

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	25	15	-	-	-

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT level
1	understand fundamentals of material selection, strength of materials and loading patterns of machine elements.	Understand
2	distinguish basic failure modes of machine elements.	Apply
3	analyse beams and columns for stresses and deflection	Apply
4	design and analyse machine components under static loading.	Understand

Program Outcomes (POs)

PO No.	PO Description (Abbreviated)
PO1	Engineering knowledge
PO2	Problem analysis
PO3	Design/development of solutions
PO4	Conduct investigations
PO5	Modern tool usage
PO6	Engineer and society
PO7	Environment and sustainability
PO8	Ethics
PO9	Individual and teamwork
PO10	Communication
PO11	Project management and finance
PO12	Life-long learning

CO-PO Mapping Table:

CO \ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	-	-	-
CO2	3	3	-	2	2
CO3	3	2	2	2	-
CO4	3	2	-	3	2

Program Specific Outcomes (PSOs):

PSO No.	PSO Description
PSO1	Apply mechanical engineering principles in the areas of thermal, design, and fluid systems.
PSO2	Use modern tools and techniques for analysis and modeling of mechanical systems.

CO-PSO Mapping Table

CO \ PSO	PSO1	PSO2
CO1	3	-
CO2	3	2
CO3	3	2
CO4	2	3

References/Suggested Learning Resources:

(a) Books:

1. Design of Machine Elements, V B Bhandari, 3/e, McGraw Hill.
2. A Textbook of Machine Design, P C Sharma and D K Aggarwal, S K Kataria & sons.
3. Shigley's Mechanical Engineering Design, R G Budnyas, J K Nisbett, McGraw Hill.
4. Fundamentals of Machine Component Design, R C Juvinall, 4/e, Wiley.
5. Machine Design: An Integrated Approach, R L Norton, Pearson
6. Strength of Materials, Part I & II, S Timoshenko, CBS publishers and distributors Pvt. Ltd.
7. Strength of Materials, Bansal R K, Laxmi publication.
8. Strength of Materials, Patnaik S, Hopkins D, Elsevier.
9. Engineering Mechanics, Bansal R K, Laxmi Publication.

(b) Open source software and website:

1. <http://nptel.ac.in>
2. <http://help.autodesk.com/view/fusion360/ENU/>

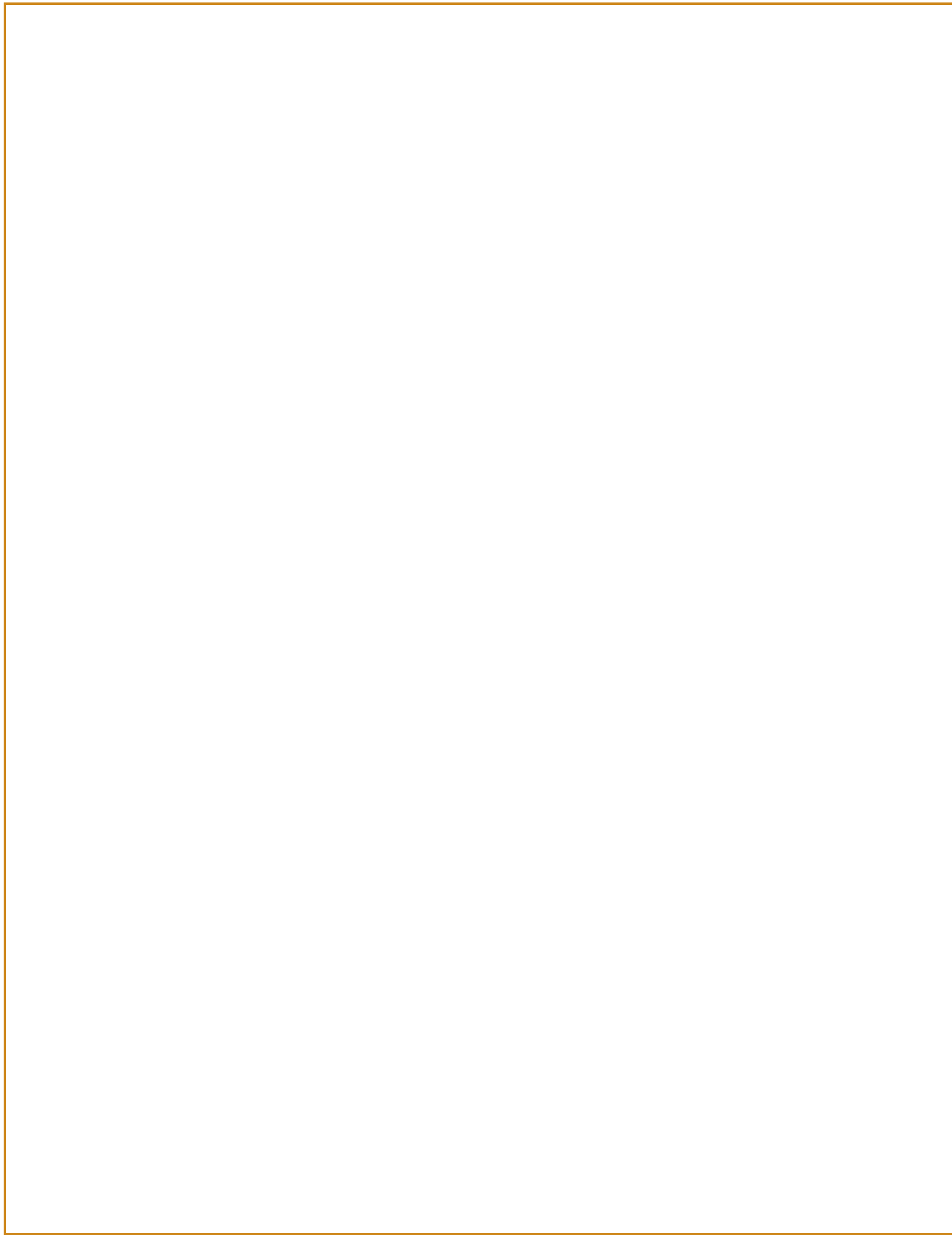
Suggested Course Practical List:

1. Detail and assembly of mechanism/machine.
2. Problems related to fundamentals of design (chapter no. 1 to 4)
3. Design and drawing of Joints and levers.
4. Design and drawing of screw jacks (Bottle neck and Toggle).
5. Design of machine components under fluctuates loading.
6. Case study for design of mechanical components.
7. 2D drawing of machine components using computer software.

List of Laboratory/Learning Resources Required:

Computational facility
CAD Software like Fusion 360

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SWAMINARAYAN UNIVERSITY

Program Name: Engineering

Level: UG

Course / Subject Code: BE101405

Course / Subject Name: Mechanical Drafting

w. e. f. Academic Year:	2024-25
Semester:	4th/ 2ND Year
Category of the Course:	PC

Prerequisite:	Fundamentals of engineering drawing and basic computer operating skills
Rationale:	NiL

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
L	T	PR	C	Theory		Tutorial / Practical		
				(E)	(M)	(I)	(V)	
0	0	2	1	00	00	20	30	50



SWAMINARAYAN UNIVERSITY

Program Name: Engineering

Level: UG

Course / Subject Code: BE101405

Course / Subject Name: Mechanical Drafting

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	Introduction to modeling software: System requirements, important terms and definitions, file menu options, managing file, Function of mouse, various toolbars.	2	8
2.	Sketcher: Configuring for sketcher, Setting sketching environment, Creating sketcher geometry, Modifying sketcher geometry, Dimensioning sketcher geometry, Constraining geometry, To study of Different entities : line, circle, rectangle, arc, ellipse, text, plane, point, fillet, polygon, straight slot, trim entity, convert entity, offset entity, mirror entity, linear sketch pattern, move entity, rapid sketch, quick sketch, repair sketch, Display delete relation.	4	10
3.	Part modeling: Basic (Parent child relationship), Base feature, Create datum's features, Edit features, Engineering features, Advanced features, Creating drawing, Working model views, Dimensioning and detailing your models, Controlling drawing details with layers, Importing and exporting data, Features: extrude boss/base, revolved boss/base, swept boss, lofted boss, boundary boss, extrude cut, hole wizard, revolve cut, swept cut, lofted cut, boundary cut, fillet, pattern, rib, draft, dome, mirror, reference geometry, curves, instant 3D	18	40
4.	Assembly: Reading top-down assemblies, creating bottom-up assemblies, Placement constraints, Assembly datum planes, assembling the components, redefining the components of the assembly, reordering the components, modifying the components of the assembly, the bill of material, Mechanism & animations: Motor, Spring , Contact, Gravity, Animation wizard, Motion study properties, Save animation, Play back mode. Edit component, insert component, mate, smart fasteners, move component, show hidden component, assembly features, reference geometry, Linear component pattern, bill of materials, exploded view, Interference detection, clearance verification, hole alignment, mass property, Section property, sensor, assembly visualization, symmetry check	08	12



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Course / Subject Code: BE101405

Course / Subject Name: Mechanical Drafting

5.	Drawing: View lay out, model view, projected view, auxiliary view, and section view, detail view, broken out section, break, and crop view. Annotation : smart dimension, model items, spell checker, format painter, note, balloon, surface finish, weld symbol, hole callout, geometric tolerances, datum features, datum target, area hatch/fill, blocks, centre mark, centre line, revision symbol, tables.	10	30
Total		42	100

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	40	40	-	-	-

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT level
1	Get acquainted with modelling software like Solid Works, Creo, etc.,	Understand
2	Generate details engineering drawing, General arrangement drawing, Bill of Material etc. in minimum time	Apply
3	Model components and assembly	Apply
4	Components and assembly analysis can be done	Understand



SWAMINARAYAN UNIVERSITY

Program Name: Engineering

Level: UG

Course / Subject Code: BE101405

Course / Subject Name: Mechanical Drafting

Program Outcomes (POs)

PO No.	PO Description (Abbreviated)
PO1	Engineering knowledge
PO2	Problem analysis
PO3	Design/development of solutions
PO4	Conduct investigations of complex problems
PO5	Modern tool usage
PO6– PO12	[Generally not directly mapped for CAD modeling unless interdisciplinary or ethical/societal design is considered]

CO-PO Mapping Table:

CO \ PO	PO1	PO2	PO3	PO4	PO5
CO1	2	1	1	-	3
CO2	2	-	2	-	3
CO3	2	-	3	2	3
CO4	2	2	2	3	3

Program Specific Outcomes (PSOs):

PSO No.	PSO Description
PSO1	Apply mechanical engineering knowledge and software tools for design and manufacturing of mechanical systems
PSO2	Use advanced CAD/CAM/CAE tools for modeling, analysis, and optimization of mechanical components

CO-PSO Mapping Table

CO \ PSO	PSO1	PSO2
CO1	3	2
CO2	3	3
CO3	3	3
CO4	2	3



SWAMINARAYAN UNIVERSITY

Program Name: Engineering

Level: UG

Course / Subject Code: BE101405

Course / Subject Name: Mechanical Drafting

References/Suggested Learning Resources:

(a) Books:

1. Bible, Matt Lombard, “Solid works 2010”, Wiley Publishing, Inc. Manual from the solid works web site.
2. Sham Tikoo, “Solid works for engineers & designers”, Release – 2011
3. Sham Tikoo, “Pro/Engineer PTC Creo Parametric 3.0 for Engineers and Designers” Release – 2015

(b) Open source software and website:

1. <https://nptel.ac.in/courses/112102101/37>
2. <https://www.youtube.com/watch?v=6c852zSMrSs&list=PLBHP-24ac73ScwMuQfgToQobHtsBZILe>
(INTRODUCTION TO MODELING SOFTWARE)
3. https://www.youtube.com/watch?v=DsqCEPlxVek&list=PL8MELgWj0RxPDAUJ25h9Nwp_gKAQE
K2w (SKETCHER)



SWAMINARAYAN UNIVERSITY

Program Name: Engineering

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Course / Subject Code: BE101405

Course / Subject Name: Mechanical Drafting



SWAMINARAYANUNIVERSITY

Program Name: Engineering Level: Degree

Course/ Subject Code: BE102401

Course/Subject Name: Automotive Technology

w.e.f. Academic Year:	2024-25
Semester:	4 th Semester/ 2 nd Year
Category of the Course:	BASIC SCIENCE

Prerequisite:	Zeal to learn the subject
Rationale:	The subject is designed to provide understanding of different automotive systems. The course is essential to build higher skills by studying different automobile systems such as transmission drive lines, braking, steering, and suspensions.

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+(PR/2)	Assessment Pattern and Marks				Total Marks
L	T	PR	C	Theory		Tutorial/Practical		
				(E)	(M)	(I)	(V)	
4	0	2	5	60	40	20	30	150

Course Content:

Unit No.	Content	No. of Hours	% of Weight age
1.	Automobile Basics: Generation of automobiles, Classification, Layouts of automobiles, Front engine & front wheel drive, front engine & rear wheel drive, rear engine & rear wheel drive, Four wheel drive. Performance of Vehicle: Vehicle motion, Resistances during motion, Power required for acceleration and constant velocity motions, Tractive effort and draw bar pull, Power required and engine characteristics, Motion on gradient. Chassis Frames and Body: Layout of chassis and its main components, Types of Chassis frames & body, Material, Unitized construction, design considerations,	12	20
2.	Transmission: Purpose and necessity of gearbox, classification, construction and working of different types of gearbox, gear selector mechanism, heavy vehicle gearboxes, lubrication, torque converters, overdrive, operational problems and fault finding. Semi-Automatic and Automatic Transmission: Hydraulic control systems, Electrohydraulic control systems, Automatic lay shaft gear boxes, Dual mode transmission with sequential gear change, Direct shift gear boxes, Over drive gears, Continuously variable transmissions.	12	



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	Electric Drives: General arrangement and description of electric transmissions, Working principle and control, advantages and limitations of electric drives.		20
3.	Drivelines: Drivelines, Universal joints, Constant velocity joints, Propeller shaft construction, Driveline arrangement, Rear-wheel drive and front-wheel drive layouts, Front-wheel drive shafts, Tandem axle drive for heavy vehicles, Drive lines for public service vehicles.	05	5
4.	Final Drive and Rear Axles: Final drive and its types, Differential gears, Differential – All types, Rear axle construction, Heavy vehicle rear axle.	05	5
5.	Braking System: Braking system: Requirements and classification, brake efficiency and stopping distance, hydraulic brakes, master cylinder, dual braking, power brake, parking brakes, anti-lock brake, bleeding of brake, maintenance of braking system. Suspension System: Basic ride considerations, types of suspension systems, types of suspension spring, tandem axle suspension, torsion bar, shock dampers, adaptive suspension systems, air suspension, active roll control systems.	14	30
6.	Steering Systems: Principles and layout, types of steering gears, front end geometry and wheel alignment, steering ratio, power steering, steering axles for heavy vehicles, hydraulic power-assisted steering, electro-hydraulic power-assisted steering, electrical power-assisted steering, types of four-wheel steering. Tyres, Wheels: Introduction to wheels, wheel balancing, tyres, classification, construction, tread patterns, cross ply, radial & tubeless tyres, specifications of tyres, tyre inflation, effects of tyre pressure on tyre performance, tyre wear patterns and their causes.	12	20
	Teaching hours	60	100



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Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10%	20%	25%	20%	15%	10%

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT level
1	Evaluate performance of an automobile due to various resistances, demonstrate selection of chassis frame of automobile body.	Evaluating (E) / Applying (A)
2	Classify and compare different braking and suspension system of automobile.	Understanding
3	Illustrate working and functions of various automotive transmission system performance assessments and selection of braking, suspension system of automobile.	Understanding (U) / Applying (A)
4	Examine steering system and selection of automobile wheel and tyre.	Analyzing (An)

Course Outcome to Program Outcome (CO-PO) Mapping

CO-PO Mapping				
PO \ CO	CO-1	CO-2	CO-3	CO-4
PO-1 Basic Engg Knowledge	3	2	3	2
PO-2 Problem Analysis	2	1	2	2
PO-3 Design/Development	2	3	3	2
PO-4 Investigations	2	2	1	2
PO-5 Modern Tool Usage	1	2	2	2
PO-6 Engineer & Society	0	0	0	0
PO-7 Environment & Sustainability	1	1	1	1
PO-8 Ethics	0	0	0	0



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Course/ Subject Code: BE102401

Course/Subject Name: Automotive Technology

PO-9 Individual & Team Work	1	0	1	0
PO-10 Communication	1	1	2	1
CO-PSO Mapping				
PSO \ CO	CO-1	CO-2	CO-3	CO-4
PSO1 (Automobile Manufacturing Skills)	3	3	3	2
PSO2 (Design and Analysis)	2	2	3	3

References/Suggested Learning Resources:

(a) Books:

- 1 Light and Heavy Vehicle Technology, M.J. Nunney, Elsevier, Fourth Edition.
- 2 Automotive Technology, Jack Erjavec, Cengage Learning, Fifth Edition.
- 3 Automotive Braking, Thomas W. Birch, Cengage Learning, Third Edition.
- 4 Motor Automotive Technology, Anthony E. Schwaller, Delmar, Third Edition.
- 5 Automotive Suspension and Steering Systems, Thomas W. Birch, Delmar Cengage Learning, Third Edition.
- 6 Automobile Engineering Vol-1, 2, Kirpal Singh, Standard Publishers.
- 7 A Textbook of Automobile Engineering, R.K. Rajput, Laxmi Publication.

(b) Open source software and website:

- NPTEL
- Syllabus contents videos

Suggested Course Practical List:

- 1 Study of different layout of transmission system for a front-wheel drive, rear-wheel drive, and a four-wheel drive arrangement
- 2 Study of manual type gearbox and its troubleshooting
- 3 Study of typical car body construction and propose new design sketches
- 4 Demonstration of steering system and measurement of steering geometry angles and their impact on vehicle performance
- 5 Study and measurement of the chassis frames of a heavy/light duty vehicle frame (Leyland, Tata, Maruti, etc.)
- 6 Study, dismantling, and assembling of front axle and rear axle
- 7 Study of braking system of an automobile
- 8 Study of suspension system of two-wheeler and four-wheeler vehicle
- 9 Study of effect of tyre pressure on vehicle performance



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List of Laboratory/Learning Resources Required:

- 1 Heavy duty vehicle chassis frame (Leyland or Tata)
- 2 Light duty vehicle chassis frame (Leyland or Tata)
- 3 Front axle
- 4 Rear axle
- 5 Steering system
- 6 Hydraulic brake system
- 7 Leaf spring
- 8 Coil spring
- 9 Torsion bar
- 10 Hydraulic shock absorber
- 11 Gear box (light duty)

Suggested Project List:

- 1 Design and Analysis of Front-Wheel, Rear-Wheel, and Four-Wheel Drive Layouts
- 2 Troubleshooting and Efficiency Improvement of Manual Transmission Gearbox
- 3 Modeling and Optimization of Chassis Frame Design for Light and Heavy Vehicles
- 4 Development of a Prototype Semi-Automatic Transmission System



Swaminarayan University

Teaching & Examination Scheme

Course – Faculty of Engineering (Degree)

Branch – Automobile Engineering

Semester – 4th

Subject Code	Subject Name	Category	L	T	P	Total Credit	E	M	I	V	Total Marks
BE102401	Automotive Technology	Basic Science	4	0	2	5	60	40	20	30	150
BE102402	Automotive Manufacturing Processes and Technology	Professional Core	3	0	2	4	60	40	20	30	150
BE101402	Fluid Mechanics and Hydraulics Machines	Professional Core	4	0	2	5	60	40	20	30	150
BE101403	Fundamentals of Machine Design	Professional Core	4	0	2	5	60	40	20	30	150
BE100401	Organisational Behaviour & Management	Humanities and Social Science	3	0	0	3	60	40	0	0	100
BE101405	Mechanical Drafting	Professional Core	0	0	2	1	0	0	20	30	50
	Total		18	0	10	23					

L=Lecture, T=tutorial, P=Practical, E=Theory External, M=Theory Internal, I=Practical Internal, V=Practical External