HERBERT MORRISON TECHNICAL HIGH SCHOOL
SYLLABUS OUTLINE

Grade: 13 **Subject**: BMED – Unit 2

Topic/ Sub Topics	Duration	General Objectives	Specific Objectives	Major Concept	Methods of Delivery
Systems of Forces by Graphical Methods	**Three Weeks**	***On completion of this Module, students should:*** 1. understand how forces in structures are graphically determined;	***Students should be able to:*** 1. determine forces by graphical methods; 2. construct shearing force and bending moments diagrams; 3. determine forces in beams;	(i) Triangle, parallelogram and polygon of forces to find resultant equilibrium; resolution of forces in members of simple framework. (ii) Space and polar diagrams and funicular (link) polygons to find the position of resultant or equilibrium. (iii) Shearing force and bending moment diagrams.	**PowerPoint Presentation, Worksheets, Demonstration, Research & Discussion**
Gears	**Three Weeks**	***On completion of this Module, students should:*** 1. develop skills to produce accurate drawings of gear tooth profiles;	***Students should be able to:*** 1. calculate the various parameters of the involute spur gears; 2. construct involute gear tooth profiles;	(i) Involute Spur Gears - definition of terms: (a) pitch circle diameter; (b) pitch point; (c) pressure angle; (d) addendum; (e) dedendum; (f) clearance; (g) circular pitch;	

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Gears Cont'd		***On completion of this Module, students should:*** 1. develop skills to produce accurate drawings of gear tooth profiles;	***Students should be able to:*** 1. calculate the various parameters of the involute spur gears; 2. construct involute gear tooth profiles;	(h) circular tooth thickness; (i) number of teeth; (j) diametrical pitch; (k) module; (l) base circle diameter. (ii) Calculation of parameters necessary for construction of gear tooth profiles. (iii) Construction of gear tooth profiles by involute and approximate methods.	

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Skew Lines	**Two Weeks**	***On completion of this Module, students should:*** 1. understand how true lengths and angles of skew lines are determined; 2. develop skills to locate planes in space;	***Students should be able to:*** 1. determine true angles; 2. locate lines and planes in space; 3. draw planes inclined to planes of reference; 4. determine the perpendiculars from given oblique planes; 5. determine the shortest distance between skew lines;	(i) True angles between intersecting lines. (ii) True angles between intersecting planes. (iii) True angles between lines and planes. (iv) Traces of lines on planes. (v) Traces of planes on planes. (vi) Traces of perpendicular planes and their inclination to the planes of reference. (vii) Traces of oblique planes and their inclination to the planes of reference. (viii) Oblique plane and its inclination to the planes of reference.	**PowerPoint Presentation, Worksheets & Demonstration**

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Materials	**Two Weeks**	***On completion of this Module, students should:*** 1. acquire knowledge of materials for the production of engineering components;	***Students should be able to:*** 1. select appropriate materials for the production of engineering components;	(i) ***Metals:*** (a) ferrous - wrought iron, cast iron, carbon steel, stainless steel; (b) non-ferrous – copper, aluminium, brass and other alloys. (ii) ***Plastics*** - manufactured material: (a) thermo-plastic – polyvinyl chloride (PVC), polytetrafluroethylene (fluorocarbons), polyethylene, polystyrene, polypropylene, polyamides (Nylon), polymethylmethacrylate (Perspex); (b) thermo-setting - epoxy-resin (bakelite, melamine, araldite), laminates (tufnol, formica). (iii) ***Rubber:*** (a) characteristics (organic, silicone, synthetic); (b) uses and applications.	**PowerPoint Presentation, Research & Discussion**

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Manufacturing Processes	**Three Weeks**	***On completion of this Module, students should:*** 1. Understand the different methods of producing engineering components;	***Students should be able to:*** 1. describe the appropriate manufacturing processes for the production of engineering components;	(i) ***Machining Tool Operations*** - turning, shaping, drilling, milling and grinding. (ii) ***Casting*** – sand, die, investment. (iii) ***Forging*** – drop, hand (upsetting, drawing down, swaging, bending). (iv) ***Fabrication:*** (a) welding – shielded metal arc welding (SMAW), oxyfuel gas welding (OFW), gas tungsten-arc (GTAW), oxy-gas (acetylene); (b) welding symbols and their application; (c) riveting - cold, hot, pop; (d) steel metal work - grooved seam, knock-up, pandown, flanging, rolling and bending. (v) ***Safety in Manufacturing:*** i. safety equipment and material; ii. safety procedures and processes in manufacturing; iii. safety design in manufacturing	**PowerPoint Presentation, Research & Discussion**

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Bearings	**Two Weeks**	***On completion of this Module, students should:*** 1. develop the ability to identify appropriate bearings for various applications;	***Students should be able to:*** 1. solve problems requiring knowledge of the application of bearings; 2. develop the ability to identify appropriate bearings for various applications;	(i) ***Roller***- cylindrical (radial, thrust), tapered, spherical, needle. (ii) ***Ball*** - radial, thrust, angular contact, self aligning, single/double row. (iii) ***Journal*** - pillow block, self lubricating. (iv) ***Typical applications.***	**PowerPoint Presentation, Handouts, Discussion & Research**
Bushing	**One Week**	***On completion of this Module, students should:*** 1. develop the ability to identify appropriate bushings for various applications;	***Students should be able to:*** 1. solve problems requiring knowledge of the application of bearings; 2. develop the ability to identify appropriate bushings for various applications;	(i) ***Bush*** – drill, sleeve (limits and fits). (ii) ***Typical applications.***	
Lubrication	**One Week**	***On completion of this Module, students should:*** 1. know appropriate lubricants and lubrication method for various applications;	***Students should be able to:*** 1. solve problems requiring knowledge of the application of lubricants;	(i) ***Types of lubricants*** - liquid, solid and gas. (ii) ***Methods of applications*** - liquid (splash, pressurised); solid; gas (mist, air).	

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Seals	**Two Weeks**	***On completion of this Module, students should:*** 1. develop the ability to identify seals for various applications.	***Students should be able to:*** 1. solve problems requiring knowledge of the application of seals.	(i) ***Static*** - gasket, o-ring. (ii) ***Dynamic*** - labyrinth, split ring, 'U', garter spring, o-ring.	**PowerPoint Presentation, Handouts, Discussion & Research**
Transmission of Motion and Power	**Two Weeks**	***On completion of this Module, students should:*** 1. develop skills to synthesize or modify designs using creativity, technical information and scientific principles; 2. develop skills to prepare freehand sketches and drawings of machine components suitable for different manufacturing processes.	***Students should be able to:*** 1. solve problems requiring knowledge of various elements of power transmission; 2. prepare freehand sketches and drawings of machine components; 3. explain the design process;	(i) ***Couplings*** - rigid, flanged, fluid, Oldham and universal point. (ii) ***Clutches*** - single plate, multi-plate and centrifugal. (iii) ***Gears*** - spur, helical, bevel and worm. (iv) ***Belt drives*** - vee, flat and toothed (tensioning of belts, fixed and movable shafts). (v) ***Brakes*** - single shoe, double shoe and internal drum. (vi) ***Chain drives*** – roller and inverted tooth/silent (tensioning of chain).	

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Design details	**One Weeks**	***On completion of this Module, students should:*** 1. develop skills to synthesize or modify designs using creativity, technical information and scientific principles;	***Students should be able to:*** 1. explain manufacturing processes	Design for casting, forging, machining and fabrication.	**PowerPoint Presentation, Handouts, Discussion & Research**
Design principles	**Two Weeks**	***On completion of this Module, students should:*** 1. develop skills to synthesize or modify designs using creativity, technical information and scientific principles;	***Students should be able to:*** 1. solve problems requiring knowledge of various elements of power transmission;	(i) Elements: materials specification, manufacturing processes, size and shape. (ii) Aesthetics and ergonomics (ergonomic control loop). (iii) Cost.	
Design process	**Three Weeks**	***On completion of this Module, students should:*** 1. develop skills to synthesize or modify designs using creativity, technical information and scientific principles;	***Students should be able to:*** 1. explain the design process;	***The six stages:*** (i) recognition of need; (ii) definition of problem; (iii) synthesis; (iv) analysis and optimization; (v) evaluation; (vi) presentation.	

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Prepared by K. Spence