Module Title:	Application of Mechanical Systems	Level:	4	Credit Value:	20

Module code:	ENG413	Is this a new module?	No	Code of module being replaced:	N/A

Cost Centre:	GAME	JACS3 code:	H300

Trimester(s) in which to be offered:	1, 2 & 3	With effect from:	September 17

School:	Applied Science, Computing & Engineering	Module Leader:	Bobby Manesh

Scheduled learning and teaching hours	60 hrs
Guided independent study	140 hrs
Placement	0 Hrs
Module duration (total hours)	200 hrs

Programme(s) in which to be offered	Core	Option
FdEng Industrial Engineering	☐	✓
BEng (Hons) Mechanical Manufacturing	✓	☐

Pre-requisites
None

Module Aims

1. To develop an understanding of and an overall appreciation of the knowledge of machine elements
2. To gain knowledge and understanding of the techniques and principles used in application and design of machine elements

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Intended Learning Outcomes

Key skills for employability

KS1	Written, oral and media communication skills
KS2	Leadership, team working and networking skills
KS3	Opportunity, creativity and problem solving skills
KS4	Information technology skills and digital literacy
KS5	Information management skills
KS6	Research skills
KS7	Intercultural and sustainability skills
KS8	Career management skills
KS9	Learning to learn (managing personal and professional development, self-management)
KS10	Numeracy

At the end of this module, students will be able to		Key Skills	
1	Demonstrate knowledge and understanding to explain the construction and operation of machine elements.	KS1	
		KS9	
2	Apply appropriate selection procedure for machine elements in a practical situation	KS5	
		KS3	
3	Analyse and calculate the solutions for mathematically based engineering problems	KS10	
		KS4	

Derogations

A derogation from regulations has been approved for this programme which means that whilst the pass mark is 40% overall, each element of assessment (where there is more than one assessment) requires a minimum mark of 30%.

Assessment:

A Portfolio of work to cover learning outcomes 1, 2 and 3. The work will present real-life problems relating to machine elements. An example would be an investigation of a machine mechanism train systems

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)	Duration (if exam)	Word count (or equivalent if appropriate)
1	1, 2 and 3	Portfolio	100	N/A	4000

Learning and Teaching Strategies:

The module will be presented to students through a specified series of lectures assisted by notes given to the student at the start of each lecture. Demonstrations will also be arranged, for example to show the operation and set up of a mechanical systems before the students are expected to carry out their own designs. Relevant videos will also be used to aid the learning process. Practical assignment exercises will be devised to enhance the students' learning. Approximately one third of the time will be devoted to practical activity. Investigation work will be assisted by access to computer based modelling software.

Syllabus outline:

Machine Elements: Principles, operation, and constructions of machine elements: bearings, cam, spur gears, helical gears, bevel gears, worm gears, clutches and brakes.
Mechanism Trains: Principles, operation, and constructions of parallel axis gear trains, determining tooth numbers, epicycle gear trains, Bevel-gear epicycle trains, all-wheel drive trains, applying solutions to a practical situation.
Power transmission: Belt drives: flat and v-section belts; limiting coefficient friction; limiting slack and tight side tensions; initial tension requirements; maximum power transmitted
Friction clutches: flat single and multi-plate clutches; conical clutches; coefficient of friction; spring force requirements; maximum power transmitted by constant wear and constant pressure theories; validity of theories
Flywheels: angular momentum; kinetic energy; coefficient of fluctuation of speed; coefficient of fluctuation of energy; calculation of flywheel mass/dimensions to give required operating conditions
Mass-spring systems: Natural vibrations: Damped vibrations: Forced vibrations:

Bibliography:
Essential reading
Childs, P.R.N. (2004) *Mechanical Design*, 2nd Edn, Butterworth Heinemann
Other indicative reading
Uicker J.J. et al. (2011) *Theory of Machines and Mechanisms* 4th Edn, OUP USA Juvinall, Robert C (2006) *Fundamentals of Machine Component Design* 4th Edn. John Wiley & Sons