Chisholm
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BACHELOR OF ENGINEERING TECHNOLOGY
CRS1201286

Mechanical and Manufacturing stream

SEMESTER 4 - Mechanical and Manufacturing stream				
4 Mech & Manuf subjects	**HEETMN401** Materials and Process Selection	**HEETMN402A** Mechanical Drive Systems	**HEETMN404** CAD/CAM and Engineering Practice	**HEETMN405** Practical Work Placement
PRE-REQUISITE	*HEETCM101A* *HEETCM201* *HEETCM303*	*HEETCM101A* *HEETCM301A* *HEETCM303*	*HEETCM301A* *HEETCM305*	10 SUBJECTS OF STUDY *HEETCM100*
SEMESTER 5 - Mechanical and Manufacturing stream				
4 Mech & Manuf subjects	**HEETMN501A** Industrial Project 1	**HEETMN502** Fluid Mechanics	**HEETMN503** Advance Manufacturing Systems	**HEETMN504** Project Management
PRE-REQUISITE	*HEETCM100*	*HEETCM100* *HEETCM202A* *HEETCM204A*	*HEETMN401* *HEETMN404*	*HEETCM100* *HEETCM101A*
SEMESTER 6 - Mechanical and Manufacturing stream				
4 Mech & Manuf subjects	**HEETMN601A** Industrial Project II	**HEETMN602** Quality Management	**HEETMN603A** Thermodynamics	**HEETMN604A** Machine Condition Monitoring
PRE-REQUISITE	*HEETCM100* *HEETCM101A* *HEETMN501A*	*HEETCM100* *HEETCM101A*	*HEETCM100* *HEETCM101A*	*HEETCM100* *HEETCM202A* *HEETCM204A* *HEETMN402A*

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Mechanical and Manufacturing stream

Semester 4

- HEETMN401A – Materials and Process Selection
- HEETMN402A – Mechanical Drive Systems
- HEETMN404 – CAD/CAM Engineering Practice
- HEETMN405 – Practical Work Placement

Semester 5

- HEETMN501A – Industrial Project I
- HEETMN502 – Fluid Mechanics
- HEETMN503A – Advanced Manufacturing Systems
- HEETMN504 – Project Management

Semester 6

- HEETMN601A – Industrial Project II
- HEETMN602 – Quality Management
- HEETMN603A - Thermodynamics
- HEETMN604A – Machine Condition Monitoring

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Subject information

HEETMN401 – Materials and Process Selection
11 credit points

Offering(s)
Semester 1 & Semester 2 (On-campus)

Prerequisites
HEETCM101A
HEETCM201
HEETCM303

Subject Lecturer
Masoud Goudarzi

Synopsis
Understanding materials, their properties and behaviour is fundamental to mechanical engineering design, and a key application of materials science. Advanced material science deals with the procedures for material selection in mechanical engineering design in order to ensure that the most suitable materials for a given application are identified from the full range of materials and section shapes available.

The subject builds on the foundation unit Material Science to develop significant competency in understanding the properties of various materials, selection and applications. This unit also expands on to application of computer-aided software for selecting the materials and process.

Outcomes
Upon successful completion of this subject, students should be able to:

a) Examine and specify appropriate materials using material selection charts and computer-aided software.

b) Apply first principles selection strategies in selecting materials.

c) Appraise appropriate processes using process selection charts and computer software.

d) Identify appropriate polymers for applications and evaluate the potential application of composite systems.

Assessment

- Continuous assessment – 50%
- Final exam – 50% (Hurdle)

Workload requirements
A combination of lectures and tutorials (3 hours per week), and self-directed study (3 hours per week).

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Prescribed and recommended readings
Prescribed reading:

Ashby, MF 2010 *Materials Selection in Mechanical Design*, 4th edn, Elsevier, Sydney.

Recommended reading:

Budinski, KG & Budinski, MK 2010, *Engineering Materials-properties and selection*, 9th edn,Pearson, Sydney

Bolton, W 1998, *Engineering Materials Technology*, 3rdedn. Butterworth-Heinemann, Sydney

Higgins, R.A2004, *Materials for the engineering technician*, 3rd edn. Butterworth-Heinemann, Sydney

Callister, WD & Rethwisch, DG 2012, *Fundamentals of Materials Science And Engineering: An integrated approach,* 3rd edn, John Wiley & Sons Australia, Ltd.

Current journal articles and useful websites will be made available within the booklist of each subject and revised at the commencement of each cohort of students.

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HEETMN/MT402A – Mechanical Drive Systems
11 credit points

Offering(s)
Semester 1 & Semester 2 (On-campus)

Prerequisites
HEETCM101A
HEETCM301A
HEETCM303

Subject Lecturer
Tiong Ha

Synopsis
In the past mechanical drive systems were a limiting factor for achieving higher production, but now due to the improvement of drive component materials, manufacturing techniques, design methodologies, and rating practices, mechanical drive systems are no longer a limiting factor. This subject introduces students to the characteristics of various components used in mechanical drive systems. In particular students are introduced to factors that influence system performance and reliability. A typical mechanical drive system consisting of a gear box, couplings, and bearings can be assembled with different combinations to increase power density and, in turn, increase production. Engineering Technologists are engaged in various production environments. Being able to identify and analyse mechanical drive system performance, efficiency and reliability is essential.

This unit first introduces students to various key mechanical drive system calculations and allied Australian Standards. Students will then study the various mechanical drive components such as; shafts, couplings, brakes and clutches, keys and splines, belt and chain drives, gears, bearings, and their applications. They will also consider the materials used for these components, and appropriate mechanical drive system lubricants.

Outcomes
Upon successful completion of this subject, students should be able to:

(a) Perform mechanical drive system calculations using appropriate formulae.

(b) Use appropriate Australian Standards.

(c) Design drive components for mechanical drive system using catalogues.

(d) Identify factors critical to mechanical drive system performance, efficiency and reliability.

(e) Evaluate the function of a mechanical drive system.

(f) Analyse and specify a mechanical drive system.

(g) Apply lubrication principles for mechanical drive systems.

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Assessment

- Continuous assessment – 70%
- Final exam – 30% (Hurdle)

Workload requirements

A combination of lectures and tutorials (6 hours per week), and self-directed study (3 hours per week).

Prescribed and recommended readings

Prescribed reading:

Budynas R.G & Nisbett K.J (2014). Shigley's Mechanical Engineering Design (10th Edition). McGraw-Hill

Design Standards for Mechanical Engineering Students SAA HB6 (1999), Standards Australia International

Hosking AQK & Harris MR 2002 Applied Mechanical Design, H & H Publishing

Busby, H.R & Staab G.H (2010). Mechanical Design of Machine Elements and Machines, John Wiley & Sons

Norton RL 2011, Machine Design – An Integrated Approach, Prentice Hall.

Hanbooks:

Erik Oberg et al. 2008, Machinery's handbook 28th Edition. Industrial Press, New York

Kempe's engineers year-book. CMP published, U.K.

E. Avallone et al 2007, Marks' standard handbook for mechanical engineers, McGraw-Hill.

Other:

Journal of Machine Design, http://machinedesign.com

Watson, R 2000, *Mechanical Equipment*, WestOne Services, Perth, Australia

Hibbeler, RC 2009, *Engineering Mechanics: Combined Statics and Dynamics,* 12th edn, Pearson, Australia, ISBN: 9780138149291 (used in Statics and Dynamics)

Recommended reading:

Bhandari, V B2008, *Design of Mechanical Elements*, 2nd edn. Tata McGraw-Hill company Limited, India.

Oberg, H, Jones, FD Horton, HL & Ryffel, HH 2008, *Machinery's Handbook* 28th edn, Industrial Press, New York.

Current journal articles and useful websites will be made available within the booklist of each subject and revised at the commencement of each cohort of students.

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HEETMN404 – CAD/CAM and Engineering Practice
11 credit points

Offering(s)
Semester 1 & Semester 2 (On-campus)

Prerequisites
HEETCM301A
HEETCM305

Subject Lecturer
Amit Krishnan
Tiong Ha

Synopsis
CAD is used for detailed engineering of 3D models and/or 2D drawings of physical components, throughout the engineering process from conceptual design and layout of plant and products, through strength and dynamic analysis of assemblies including computational fluid dynamics and even to the definition of manufacturing methods of components. However in the early 1970s software was first developed that enabled computer aided design (CAD) to be linked directly to the computer numerical control (CNC) software that controlled manufacturing processes to create CADCAM. Engineers and Technologists with high levels of expertise in CAD and associated computer aided engineering packages – and particularly those with skills in CADCAM - are in heavy demand internationally.

This unit builds on the foundation subject Engineering Design and Practice and Engineering CAD II to further develop competency in parametric 3D CAD using Solidworks software, before introducing students to the use of MasterCAM software to enable them to convert their CAD designs into Computer Aided Manufacture and the use of CADCAM software. A group project approach is used here by students designing multipart products with each student responsible for one part in the assembly.

Students also gain direct experience in the generation of computer numerical control programs to drive wire cutting, electro discharge machining and rapid prototyping operations. Electro discharge machining is a widespread technique used in industry for high precision machining and is an essential skill for technologists in the manufacturing of intricate shapes.

This subject also examines production practices, automated assemblies and advanced machining operations such as rapid prototyping - important skills for professional engineers and technologists involved in current manufacturing industries to manage the production targets effectively.

Outcomes
Upon successful completion of this subject, students should be able to:

(a) Use industry current software to convert CAD designs to CAM programs.

(b) Perform wire cutting and electro discharge machining operations using computer numerical control (CNC) software.

(c) Demonstrate metal stamping operations and apply troubleshooting methods in production practice.

(d) Demonstrate sound knowledge of Finite Element Analysis method by applying engineering mechanics and applied mathematics.

(e) Evaluate a prototype design through the use of rapid prototyping

(f) Develop jigs and fixtures using standardised parts to create automated assembly operations.

Assessment

- Continuous assessment – 70%
- Final exam – 30% (Hurdle)

Workload requirements
A combination of lectures and tutorials (6 hours per week), and self-directed study (3 hours per week).

Prescribed and recommended readings
Prescribed reading:

Ruiz, A. and Jack, G. (2010) *SolidWorks 2010: no experience required* (1st Ed). Wiley Technology Publishers, Hoboken, N.J.
Kurowski, P.M. (2009) *Engineering Analysis with SolidWorks Simulation 2009* SDC Publications, Mission,

Chisholm Institute of TAFE (2010), *Write Basic NC/CNC Programs for Electro Discharge Machining*, Chisholm Unit Guide, Chisholm Institute, Melbourne

Black, J.T. and Kohser, R.A. (2007), *DeGarmo's Materials and Processes in Manufacturing*, 10th edn., Wiley Publishing Company, Australia ISBN: 9780470055120

Recommended reading:

Kalpakjian, S and Schmid, S (2009), *Manufacturing Engineering and Technology*, Prentice Hall, ISBN 13:978-0136081685

Groover, M.P. (2009) *Fundamentals of Modern Manufacturing: Materials, Processes, and Systems* 4E, Wiley Publishing Company, Australia, ISBN: 9780470467008

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HEETMN/MT405 – Practical Work Placement
0 credit point

Offering(s)
Semester 1 & Semester 2 (On-campus)

Prerequisites
10 subjects of study
HEETCM100

Subject Lecturer
Jo Mawdsley

Synopsis
The BEngTech professional accrediting body, Engineers Australia, requires a minimum of eight weeks suitable work experience/practicum during the student's enrolment in the engineering technology degree program. A major requirement of the practicum is that it exposes students to the work of the professional engineering technologist to provide appropriate context for their studies, enable them to better recognise their responsibilities as professional engineering technologists and to further develop their professional attributes.

Chisholm Institute will support BEngTech students in gaining suitable work placements, but students are also free to seek suitable work placements themselves. In addition, mature part time students may already be undertaking suitable employment. In both of these cases students should confirm the suitability of this work experience with the subject chair.

The work placement would normally be taken during the summer break between the 4th and 5th semesters. However there are academic advantages in at least some of this taking place earlier in the student's studies and this is encouraged. Alternative work experience arrangements should be discussed with the subject chair and could include a number of shorter periods of work experience taken throughout the program.

On completion of the eight weeks work placement students are be required to submit a full report on their placement.

The assessment for this subject is pass or fail, subject to the work experience being satisfactory and the report is of a sufficiently high professional standard.

Outcomes
Upon successful completion of this subject, students should be able to:

(a) Formulate professional reports.

(b) Illustrate a range of professional attributes appropriate to the tasks undertaken in the practicum.

(c) Critically examine the professional responsibilities of engineering technologists.

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Assessment

- Continuous assessment – 100%

Workload requirements
A combination of lectures and tutorials (2 hours per week), and self-directed study (3 hours per week).

Prescribed and recommended readings
Prescribed reading:

On-line access to the *Chisholm CIES Guidelines for the Presentation of Reports* and the *Engineers Australia - Professional Attributes for Engineering Technologists* will be provided.

Recommended reading:

Snooks and Co. (2002) *Style Manual: For Authors, Editors and Printers, 6th edn* John Wiley and Sons, Australia ISBN 0 7016 3648 3

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HEETMN/MT501A – Industrial Project 1
11 credit points

Offering(s)
Semester 1 & Semester 2 (On-campus)

Prerequisites
HEETCM100

Subject Lecturer
Amit Krishnan

Synopsis
Industry Project I and II form the capstone of the BEngTech degree program. These two units enable the students to put into practice, through an authentic industry-based engineering technology project, the knowledge and attributes they have developed in the program enabling them to further develop the skill sets they will need as professional engineering technologists. This unit provides direction and support to ensure all students are well prepared for the project they will complete under the guidance of an academic supervisor in Industry Project II. As the project will be carried out in industry an industry liaison person ('industry supervisor' or 'client') will also be appointed to enable access to company facilities necessary for the student to complete the project.

Although every subject in the BEngTech program has potential to provide prerequisite knowledge and skills necessary to support their industry project, the need for students to properly administer their projects through project management tools makes the subject Project Management particularly important as a prerequisite unit.

It is anticipated that the allocation of industrial projects and associated industry and academic supervisors will be made towards the end of semester 5 to enable the student to have time prior to the commencement of semester 6 to visit the company to fully familiarise him/herself with the issues involved in the project through discussion with the academic and industry supervisor.

The subject content will focus on, but not be restricted to:

- A general overview and full open discussion of the requirements of the capstone industrial project
- Productive literature search and review including a tutorial and subsequent individual support from the BEngTech program liaison librarian on search strategies and appropriate journal data bases relevant to the students project
- Developing the final year project report including appropriate formatting and referencing
- An overview of the health and safety assessment requirements and the planning and progress reporting requirements
- Review of oral presentation techniques and strategies
- The engineering design process for innovative, professional and effective outcomes
- Recognise and develop valid methods for competent experimental research

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- Develop, assess and competently use equipment and systems for experimental data acquisition and analysis
- Review of common statistical analysis tools

Outcomes

Upon successful completion of this subject, students should be able to:

(a) Select appropriate project planning tools (critical path analysis, Gantt charts and project loading diagram).
(b) Evaluate the health and safety implications of project implementation and develop health and safety risk mitigation strategies.
(c) Use modern engineering design methods for innovative, professional and effective outcomes.
(d) Critically examine and competently use equipment and systems for experimental data acquisition and analysis.

Assessment

- Continuous assessment – 75%
- Final exam – 25% (Hurdle)

Workload requirements

A combination of lectures and tutorials (3 hours per week), and self-directed study (3 hours per week).

Prescribed and recommended readings

Prescribed reading:

Gibbings, J.C., Baker, A.G., Dixon, S.L., Drabble, F., Lewkowicz, A.K., Moffat D.G. and Shaw, R. (2009) *The Systematic Experiment: A Guide for Engineers and Industrial Scientists* Cambridge University Press, Cambridge, U.K

Recommended reading:

Snooks and Co. (2002) *Style Manual: For Authors, Editors and Printers, 6th edn* John Wiley and Sons, Australia ISBN 0 7016 3648 3

Leedy, P. and Ormrod, J.E. (2009) *Practical Research: Planning and Design 9th edn* Allyn & Bacon – Pearson Prentice Hall US.

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HEETMN/MT502 – Fluid Mechanics
11 credit points

Offering(s)
Semester 1 & Semester 2 (On-campus)

Prerequisites
HEETCM100
HEETCM202A
HEETCM204A

Subject Lecturer
Akbar Hessami

Synopsis
Fluid mechanics is a key engineering science in the disciplines of mechanical engineering, mechatronics, chemical engineering, process engineering, aeronautics, astronautics, marine engineering and a number of other engineering disciplines. It is used in such diverse areas as aerospace and automobile aerodynamics, ship performance and stability, pressures and forces on structures, fluidics, pneumatic, hydraulic systems, pipelines, pumps and pumping systems.

The study of fluids and the forces on them, fluid mechanics can be divided into fluid statics (the study of fluids at rest), and fluid dynamics (the study of fluids in motion). Fluids comprise liquids, gases and plasmas. However plasma flow dynamics is a very specialised field and so is not included here.

Fluid mechanics, especially fluid dynamics, is a very active field of research with many unsolved or partly solved problems. As such, the solution to many fluid problems is through experimentally derived empirical equations.

The subject content will focus on, but not be restricted to:

- Properties of fluids
- Introduction to common components such as tanks, pipes and fittings, channels, valves, pumps and turbines, pressure, flow and temperature instrumentation, and actuators.
- Fluid Statics
  - Variation of pressure with depth in a static liquid
  - Pressure measurement
  - Manometry
  - Hydrostatic forces on plane and curved surfaces
  - Buoyancy and Stability of submerged and floating bodies
- Fluid Flow including the equations of continuity and the Bernoulli equation.
- Fluid power
- Fluid Momentum Forces (the momentum equation).
- Physical similarity (physical modelling) and Dimensional Analysis: Reynolds and Froude numbers

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- Lamina and Turbulent Flow through pipes & fittings
- Pipe Networks
- Fluid Machinery including positive displacement pumps
- Centrifugal Pumps and Systems

Note: Reference will also be made to computational fluid dynamics to which they will become exposed in Engineering CAD II.

Outcomes
Upon successful completion of this subject, students should be able to:

(a) Demonstrate sound knowledge of essential fluid mechanics concepts.

(b) Recognise results and calculations in fluid mechanics based on analysis that may contain errors; identify the source and nature of the problem and take corrective action.

(c) Examine laboratory and testing procedures relevant to fluid mechanics.

Assessment

- Continuous assessment – 50%
- Final exam – 50% (Hurdle)

Workload requirements
A combination of lectures and tutorials (4 hours per week), and self-directed study (3 hours per week).

Prescribed and recommended readings
Prescribed reading:

Douglas, J. F., Gasiorek, J.M., Swaffield, J.A. and Jack, L.B. (2006) *Fluid Mechanics* (5th Edition). Pearson Prentice Hall, Harlow, Essex, U.K.

Recommended reading:

Ward-Smith, J. (2011). *Mechanics of Fluids* (9th Ed). CRC Press.

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HEETMN503 – Advanced Manufacturing Systems
11 credit points

Offering(s)
Semester 1 & Semester 2 (On-campus)

Prerequisites
HEETMN401
HEETMN404

Subject Lecturer
Fabian D'souza

Synopsis
The development and implementation of advanced manufacturing systems to continually improve product quality and reduce production costs are vital for Australian manufacturing industries to regain market share against low wage economies. At the same time the impact on occupational health and safety and the environment must be minimised.

This subject builds on the foundation subject Manufacturing Processes to develop significant competency in Advanced Manufacturing Systems. It focuses on three main areas: planning, advanced manufacturing applications, and the implementation using lean principles.

The subject will introduce process planning. It is essential for an engineering technologist to understand process planning, before using system applications and implementing advanced manufacturing systems.

Additionally, the subject explores advanced manufacturing system components and design, and the implementation of advanced manufacturing systems using lean principles.

The subject follows significant learning in engineering practices and manufacturing processes and provides considerable knowledge to implement manufacturing systems for cost effective manufacturing.

Outcomes
Upon successful completion of this subject, students should be able to:

(a) Analyse and specify advanced manufacturing system applications.

(b) Plan advanced manufacturing systems and automated assemblies using lean principles.

(c) Incorporate occupational health and safety procedures and practices in design plans.

(d) Evaluate a prototype design through the use of rapid prototyping.

(e) Develop jigs and fixtures using standardised parts to create automated assembly operations.

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Assessment

- Continuous assessment – 60%
- Final exam – 40% (Hurdle)

Workload requirements
A combination of lectures and tutorials (5 hours per week), and self-directed study (3 hours per week).

Prescribed and recommended readings
Prescribed reading:

Black, J.T. Kohser, R.A, (2011) *DeGarmo's Materials and Processes in Manufacturing* 10th edition., John Wiley and Sons, Hoboken, N.J.

Recommended reading:

Matta, A. and Semeraro, Q (2010) *Design of Advanced Manufacturing Systems*, Springer Publishing Company Inc, New York, N.Y.

Kuljanic, E. (2007) *Advanced Manufacturing Systems and Technology,* Springer Publishing Company Inc. New York, N.Y.

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HEETMN/MT504 – Project Management
11 credit points

Offering(s)
Semester 1 & Semester 2 (On-campus)

Prerequisites
HEETCM100
HEETCM101A

Subject Lecturer
Amit Krishnan

Synopsis
Project management would be most commonly applied in the workplace by the engineering technologist who has responsibility for the supervision of others and may be working in a management role.

It also applies to engineering technologists who are working with a high level of autonomy and alongside managers

Outcomes
Upon successful completion of this subject, students should be able to:

(a) Understand core project management concepts.

(b) Identify core requirements for successful project management in the engineering discipline.

(c) Develop effective project team oriented communication skills and problem-solving skills. Relate the PM Body of Knowledge (PMBOK) to their understanding of the core requirements of successful project management.

(d) Apply essential project management skills and techniques to a given problem scenario.

(e) Appreciate the relationship between project scope, project resources, scheduled time and product quality.

(f) Evaluate the appropriateness of available project selection and project reporting technique.

(g) Maintain well managed relationships with contractor and client organisations through a sound understanding of contract law.

Assessment

- Continuous assessment – 40%
- Final exam – 60% (Hurdle)

Workload requirements
A combination of lectures and tutorials (4 hours per week), and self-directed study (3 hours per week).

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Prescribed and recommended readings
Prescribed reading:

Lock, D. (2007) *Project Management* 9th edn. Gower, Aldershot, U.K. ISBN 978-0-08772-1

Recommended reading:

Smith, N. J. (ed) (2008) *Engineering Project Management*, Wiley-Blackwell ISBN 978-1-40516-802-1,

Kendrick, T. (2009) *Identifying and Managing Project Risk: Essential tools for failure proofing your projects*, 1st edn. AMACOM ISBN 978-0-81441-340-1,

Marmel, E. J. (2009) *In the Trenches with Microsoft Office Project,* Microsoft Press USAISBN 978-0-73562-6164,

Chapman, C. and Ward, S. (2008) *Project Risk Management: Process Techniques and Insights* John Wiley and Sons, Australia ISBN 978-0-470-85355-9

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HEETMN/MT601A – Industrial Project II
11 credit points

Offering(s)
Semester 1 & Semester 2 (On-campus)

Prerequisites
HEETCM100
HEETCM101A
HEETMN/MT501A

Subject Lecturer
Akbar Hessami
Brian Carter

Synopsis
Industrial Project II is the capstone of the BEngTech degree program in which students to put into practice, through an authentic industry-based engineering technology project, the knowledge and attributes they have developed in the program. In Industrial Project 1 the preliminary literature review and the project planning (including health and safety risk mitigation) was completed. In this subject the industrial project is implemented with advice and support from the appointed academic supervisor and progress is monitored using the project planning tools developed in Industrial Projects I. Associated with this is the completion of the capstone industrial project report (thesis) and the oral presentation.

This unit is primarily delivered through self-study which will significantly enhance the student's skills in lifelong learning. There are no lectures associated with this subject. Contact hours consist of weekly meetings with the academic supervisor (nominal duration 1 hour) and participation in the final oral presentation seminar including their presentation to an audience of peers, academic staff associated with the program, and invited industry guests. Thus this amounts to an average of 2 contact hours per week for this subject.

Outcomes
Upon successful completion of this subject, students should be able to:

(a) Compare and contrast project management skills.

(b) Employ sound professional report writing skills.

(c) Articulate and present valid methods for competent experimental research.

(d) Select the most appropriate statistical analysis tools for the analysis of experimental results.

Assessment

- Continuous assessment – 100%

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Workload requirements
A combination of lectures and tutorials (2 hours per week), and self-directed study (3 hours per week).

Prescribed and recommended readings
Prescribed reading:

Gibbings, J.C., Baker, A.G., Dixon, S.L., Drabble, F., Lewkowicz, A.K., Moffat D.G. and Shaw, R. (2009) *The Systematic Experiment: A Guide for Engineers and Industrial Scientists* Cambridge University Press, Cambridge, U.K.(as prescribed in Industrial Projects I)

Recommended reading:

Snooks and Co. (2002) *Style Manual: For Authors, Editors and Printers, 6th Edn* John Wiley and Sons, Australia ISBN 0 7016 3648 3

Leedy, P. and Ormrod, J.E. (2009) *Practical Research: Planning and Design 9th Edn* Allyn & Bacon – Pearson Prentice Hall US.

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HEETMN/MT602 – Quality Management
11 credit points

Offering(s)
Semester 1 & Semester 2 (On-campus)

Prerequisites
HEETCM100
HEETCM101A

Subject Lecturer
Brian Carter

Synopsis
Recently manufacturing in high wage economies has suffered significantly increased competition in direct high volume manufacturing from low wage economies and a trend by western (and Japanese) manufacturers to reduce manufacturing costs through outsourcing part or all of their manufacturing to low wage countries. Quality as a marketing differentiator, along with automation and lean manufacturing to reducing manufacturing costs, is increasingly acknowledged by high wage economies such as Australia as providing the best path to manufacturing survival.

Whilst earlier quality initiatives such as Quality Circles focused on shop floor involvement, more recent quality initiatives in manufacturing, such as six sigma, are more technologically advanced, demanding the involvement of more technologically skilled people such as engineers and engineering technologists.

The subject content will focus on, but not be restricted to:

- The Historical Development of Quality Management:– Industrial Standardisation, Taylor's Scientific Management, Ford, Shewhart – the Shewhart Cycle, Deming, The Toyota Production System, Crosby
- Defining Quality – Managing Error.
- Customer Focus – 'Voice of the Customer'.
- Key Quality Concepts
- Statistical Process Control
- Quality Circles
- Total Quality Management
  - TQM Tools and Techniques
- Six Sigma
  - Six Sigma Tools and Techniques
- Introduction to ISO 9000
- The cost of quality
- Practical Quality Management
- Quality Management for Projects

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Outcomes
Upon successful completion of this subject, students should be able to:

a) Apply the key tools and techniques of quality management.
b) Critically examine the contribution of the key thinkers in the historical development of quality management to modern quality management principles.
c) Examine the tools and contributions of the various quality movements to modern quality management practices: Quality Circles, Total Quality Management, ISO 9000 and Six Sigma.
d) Appraise quality management focused manufacturing environment requirements.

Assessment

- Continuous assessment – 50%
- Final exam – 50% (Hurdle)

Workload requirements
A combination of lectures and tutorials (3 hours per week), and self-directed study (3 hours per week).

Prescribed and recommended readings
Prescribed reading:

Kemp, S. (2006) *Quality Management Demystified*, McGraw-Hill, N.Y. USA ISBN: 0-07-144908-6

Recommended reading:

James R. Evans, William M. Lindsay (2005), Western "THE MANAGEMENT AND CONTROL OF QUALITY"6th Edition, Thomson South ISBN: 0-324-22503-2, book and CD.

Dale H. Besterfield (1995), "Quality Control"4th edition. Prentice Hall Career & Technology Prentice Hall Inc.ISBN 0-13-501115-9

Pyzdeh, T. and Keller, P (2009) *The Six Sigma Handbook* 3rd edition. McGraw-Hill, N.Y. USA ISBN: 978-0-07-162338-4

Cygi, C and DeCarlo, N. (2005) *Six Sigma for Dummies* Wiley, Indianapolis, Indiana. USA ISBN: 0-7645-6798-5.

Liker, J. (2004) *The Toyota Way*, McGraw-Hill, N.Y. USA ISBN: 0-07-139231-9

Hoyle, D. (2009) *ISO 9000 Quality Systems Handbook* 6th edition. Elsevier, Oxford, UK ISBN: 978-1-85617-684-2.

Current journal articles and useful websites will be made available within the booklist of each subject and revised at the commencement of each cohort of students.

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HEETMN603A - Thermodynamics
11 credit points

Offering(s)
Semester 1 & Semester 2 (On-campus)

Prerequisites
HEETCM100
HEETCM101A

Subject Lecturer
Akbar Hessami

Synopsis
Thermodynamics is a key engineering science in the disciplines of mechanical engineering, mechatronics, chemical engineering, process engineering, aeronautics, astronautics, marine engineering and a number of other engineering disciplines.

Thermodynamics deals with the relationship between the properties of a substance, the quantities of work and heat which cause a change of state, and the transfer of heat and work. The study of thermodynamics is crucial for the understanding of a wide range of engineering plant such as steam turbines, reciprocating engines, turbo-jets and rockets, combustion systems, heat pumps and refrigerators, air-conditioning plant, compressors, boilers, condensers, cooling towers, and heat exchangers, as well as direct energy conversion devices such as photovoltaic and fuel cells.

The subject content will focus on, but not be restricted to:

- Fundamental thermodynamic concepts
- First law
  - Conservation of energy
  - Non-flow energy equation
  - Steady flow energy equation
- The working fluid
- Second law
  - Reversibility and irreversibility
  - Entropy
- Properties of mixtures
- Combustion processes
- Steam and gas power cycles
- Work transfer
  - Reciprocating and positive displacement rotary compressors and expanders
  - The internal combustion engine
- Heat pump and refrigeration cycles

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- Psychometry and air conditioning plant
- Heat transfer
  - Conduction
  - Convection
  - Radiation
  - Combined modes
  - Heat exchanger design
- Sources, use and management of energy

Outcomes

Upon successful completion of this subject, students should be able to:

(a) Critically examine essential thermodynamic concepts in applying mathematics, and engineering science, to the analysis and solution of thermodynamic problems.
(b) Examine results and calculations in thermodynamics based on analysis that may be ill-founded or contain critical mathematical errors, identify the source and nature of the problem and take corrective action.
(c) Demonstrate an awareness of laboratory and testing procedures relevant to thermodynamic and a strong grasp of principles and practices of laboratory safety.
(d) Develop laboratory reports to a professional standard complete with well presented, labelled, accurate graphs, careful analysis of results and error sources and appropriate conclusions.

Assessment

- Continuous assessment – 60%
- Final exam – 40% (Hurdle)

Workload requirements

A combination of lectures and tutorials (5 hours per week), and self-directed study (3 hours per week).

Prescribed and recommended readings

Prescribed reading:

Eastop, T.D. and McConkey, A (1993) *Applied Thermodynamics for Engineering Technologists*, 5th edn. Pearson Australia, Camberwell, Australia

Recommended reading:

Cengel, Y. (2008), *Introduction to Thermodynamics and Heat Transfer + EES Software*, McGraw Hill, Sydney, ISBN13: 9780077235659

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HEETMN604A – Machine Condition Monitoring
11 credit points

Offering(s)
Semester 1 & Semester 2 (On-campus)

Prerequisites
HEETCM100
HEETCM202A
HEETCM204A
HEETMN402A

Subject Lecturer
Masoud Goudarzi

Synopsis
Maintenance can account for up to one half of most processing and manufacturing operations. Poor plant condition can affect the quality and safety of products whilst unplanned downtime caused by machine breakdowns can severely affect productivity, occupational health and safety and the environment. Thus monitoring of plant and equipment condition is becoming increasingly important. Of all the technologies used in condition monitoring, vibration analysis is the one most commonly used and the one that provides the most amount of information from the data acquired. This subject provides an overview of all aspects of the use of condition monitoring techniques paying special attention to the vibration analysis of rotating machines.

The subject content will focus on, but not be restricted to:

- Overview of failure mechanisms
- Root cause failure analysis
  - Fault tree analysis
- The Criticality Index
- Visual (and audio) Inspection
- Vibration Data Collection and Analysis
  - Detecting various stages of bearing failure
- Ultrasound monitoring
- Infrared thermography
  - Common thermographic error sources
- Wear Debris Analysis
  - Scanning Electron Microscopy
- Spectrographic oil analysis
- Motor current analysis
- Corrosion monitoring

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- Performance Analysis
- On-line condition monitoring

Outcomes
Upon successful completion of this subject, students should be able to:

(a) Demonstrate efficiency of a broad range of machine conditioning monitoring technologies.
(b) Critically examine the various technologies behind the main condition monitoring methods; their suitability, advantages and shortcomings in various applications; and how potential sources of error can develop.
(c) Interpret and evaluate data to form reliable conclusions.
(d) Critically appraise failure mechanisms and the criticality index of machinery.

Assessment

- Continuous assessment – 50%
- Final exam – 50% (Hurdle)

Workload requirements
A combination of lectures and tutorials (5 hours per week), and self-directed study (3 hours per week).

Prescribed and recommended readings
Prescribed reading:

Davies, A 2012 *Handbook of Condition Monitoring: techniques and methodology*, Chapman and Hall, London, U.K. ISBN 0 412 61320 4

Recommended reading:

Randall, R.B. 2010 *Vibration-based Condition Monitoring: Industrial, Automotive and Aerospace Applications.* John Wiley & Sons, Incorporated, Hoboken, N.J., ISBN: 0470747854

Rao, B.K.N. (ed.) 1996, *Handbook of Condition Monitoring* Elsevier Advanced Technology, Oxford, UK ISBN 1 85617 234 1

Current journal articles and useful websites will be made available within the booklist of each subject and revised at the commencement of each cohort of students.