SUBJECT DESCRIPTION FORMS

Subjects offered by the

Department of Mechanical Engineering

Subjects Code	Subject Title
ME534	Engineering Acoustics
ME536	Vibration and Structure-borne Noise
ME540	Fuels and Engines
ME548	Computer Aided Product Analysis
ME552	Integrated Engineering Design
ME556	Advanced Combustion Systems
ME557	CFD and Thermofluid System Design
ME558	Advanced Materials and Structural Design
ME559	Advanced Environmental and Transportation Noise Control
ME564	Principles and Design of Air Pollution Control Devices
ME565	Prevention and Control of Vehicular Emission
ME566	Industrial and Environmental Measurement Technology
ME567	Advanced Control Technology
ME569	Thermal System Design and Management
ME570	Advanced Product Mechatronics
ME571	Corrosion Control
ME572	Design for Sustainable Development
ME573	Project on Product Design and Management
ME574	Product Noise Control
ME576	Turbulent Flows and Aerodynamics
ME577	Advanced Aircraft Structures
ME578	Aircraft Design
ME579	Aircraft Noise and Aeroacoustics
ME583	Advanced Avionics Systems
ME584	Airworthiness and Maintenance
ME585	Human Factors in Aircraft Maintenance
ME586	Operations Research in Aviation

Subject Description Form

<table>
<tr><td>Subject Code</td><td>ME534</td></tr>
<tr><td>Subject Title</td><td>Engineering Acoustics</td></tr>
<tr><td>Credit Value</td><td>3</td></tr>
<tr><td>Level</td><td>5</td></tr>
<tr><td>Pre-requisite/
Co-requisite/
Exclusion</td><td>Students should have basic knowledge in Dynamics and Thermofluids.</td></tr>
<tr><td>Objectives</td><td>To provide the ingredients for students to acquire a sound background in modern acoustics and control of noise.</td></tr>
<tr><td>Intended Learning Outcomes</td><td>Upon completion of the subject, students will be able to:
a. possess state-of-the-art knowledge and skills in the area of physical characteristics of sound, noise radiation mechanism and phenomena of sound propagation;
b. apply their knowledge, skills and hand-on experience to measure and analyse the content of sound and design the noise control system;
c. extend their knowledge of noise radiation mechanism and noise control principles to different situations of engineering context and professional practice; and
d. have recognition of the need for, and an ability to engage in life-long learning.</td></tr>
<tr><td>Subject Synopsis/
Indicative Syllabus</td><td>Fundamentals of Acoustics: Physical characteristics and acoustic phenomena; noise effect on human beings; noise pollution; human ear; subjective response to noise; wave propagation in media; wave speed, energy and intensity; power and radiation from sources; modeling of wave phenomena; Euler’s equation of motion; wave equation and Helmholtz equation.
Wave Propagation with the Presence of Boundaries: Reflection at rigid and impedance boundaries; transmission through interfaces; reactive silencers; wave reflection inside enclosures and acoustic modes.
Noise Analysis: Quantitative measures of sound; frequency content of sounds; acoustic scales; data acquisition and acoustic measurement; digital sampling; signal processing; frequency analysis.
Noise Sources: Flow-induced noises; Von Karman vortices; turbulence noise; jet noise; structural acoustics and vibrations; acoustic structural coupling; elementary sound radiators; and sound source.
Noise Control: Noise attenuation; active noise cancellation; abatement of sound propagation; estimation of barrier insertion loss; acoustical properties of sound absorbing materials and measurement; damping and absorption; viscoelastic damping treatment; impedance of wall structures; calculation of noise level inside a room; transmission and acoustic isolation.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>1. The teaching and learning methods include lectures/tutorial sessions, homework assignments, test, case study report and examination.
2. The continuous assessment and examination are aimed at providing students with integrated knowledge required for engineering acoustics.
3. Technical/practical examples and problems are raised and discussed in class/tutorial sessions.

<table>
<tr><td rowspan="2">Teaching/Learning Methodology</td><td colspan="4">Intended subject learning outcomes</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td></tr>
<tr><td>1. Lecture</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>2. Tutorial</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>3. Homework assignment</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>4. Case study report and presentation</td><td>√</td><td>√</td><td>√</td><td></td></tr>
</table>
</td></tr>
</table>

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed			
		a	b	c	d
1. Homework assignment	20%	√	√	√	√
2. Test	20%	√	√		
3. Case study report and presentation or laboratory	10%	√	√	√	√
4. Examination	50%	√	√	√	√
Total	100%				

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Overall Assessment:

$0.50 \times$ End of Subject Examination + $0.50 \times$ Continuous Assessment

The continuous assessment consists of three components: homework assignments, test, and case study report & presentation. They are aimed at evaluating the progress of students study, assisting them in self-monitoring of fulfilling the respective subject learning outcomes, and enhancing the integration of the knowledge learnt.

The examination is used to assess the knowledge acquired by the students for understanding and analyzing the problems critically and independently; as well as to determine the degree of achieving the subject learning outcomes.

Student Study Effort Expected

Class contact:	
▪ Lecture	24 Hrs.
▪ Tutorial/ Case study/ Laboratory	15 Hrs.
Other student study effort:	
▪ Self Study	45 Hrs.
▪ Case study report preparation and presentation	21 Hrs.
Total student study effort	105 Hrs.

Reading List and References

Textbooks:

1. Hansen C. H. and Snyder S. D., *Active Control of Noise and Vibration*, Spon, latest eidtion.
2. Pierce A. D., *Acoustics*, Acoustic Society of America, latest edition.
3. Kleppe J. A., *Engineering Application of Acoustics*, Artech House, latest edition.
4. Everest F. A., *The Master Handbook of Acoustics*, Tab Books Inc., latest edition.
5. Bies D. A. and Hansen C. H., *Engineering Noise Control*, Spon, latest edition.
6. Norton M. P., Fundamentals of *Noise and Vibration Analysis for Engineers*, Cambridge University Press, latest edition.
7. Kinsler L. E. et al, *Fundamentals of acoustics*, Wiley, latest edition.

Journals:

- The Journal of the Acoustical Society of America, Acoustical Society of America.
- Journal of Sound and Vibration, Academic Press.
- Acustica united with Acta Acustica, S. Hirzel Verlag.
- Applied Acoustics, Elsevier Applied Science.

Subject Description Form

<table>
<tr><td>Subject Code</td><td>ME536</td></tr>
<tr><td>Subject Title</td><td>Vibrations and Structure-borne Noise</td></tr>
<tr><td>Credit Value</td><td>3</td></tr>
<tr><td>Level</td><td>5</td></tr>
<tr><td>Pre-requisite/
Co-requisite/
Exclusion</td><td>Students should have basic knowledge in Dynamics.

Exclusion: ME6101 Advanced Theory and Methods in Vibration Analysis</td></tr>
<tr><td>Objectives</td><td>To provide the students an in-depth study in vibration analysis and measurement, and to equip the students with the ability for treating the general vibration problems related to noise abatement at source.</td></tr>
<tr><td>Intended Learning Outcomes</td><td>Upon completion of the subject, students will be able to:
a. possess state-of-the-art knowledge and skills in the area of the noise radiation and vibration mechanism, the relation between noise and vibration and vibration control;
b. apply their knowledge, skills and hand-on experience to measure and analyse the content of vibration and design the vibration control system;
c. extend their knowledge of the analysis of structural vibration and sound radiation to different situations of engineering context and professional practice; and
d. have recognition of the need for, and an ability to engage in life-long learning.</td></tr>
<tr><td>Subject Synopsis/
Indicative Syllabus</td><td>Noise Pollution Control at Source: Relation between vibration and noise vibration as noise sources; classification of analysis of machinery vibrations.
Vibration Control: Sources of vibration; vibration basics; vibration analysis of continuous structures; vibration isolation and absorption; passive and active vibration control.
Experimental Assessment of Vibrations: Basic measurement system; signal processing; modal parameter identification; time-domain and frequency-domain vibration analysis.
Noise Generated by Vibrating Structures and Control: Elementary noise radiators; noise radiation by machine; noise source identification; sound intensity measurement; identification of noise source; noise radiation and transmission; design principles for noise reduction.
Typical Laboratory Experiments:
• Structural modal testing
• Vibration control
• Measurement of sound intensity</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>1. The teaching and learning methods include lectures/tutorial sessions, homework assignments, test, case study report and examination.
2. The continuous assessment and examination are aimed at providing students with integrated knowledge required for vibrations and structure-borne noise.
3. Technical/practical examples and problems are raised and discussed in class/tutorial sessions.

<table>
<tr><td rowspan="2">Teaching/Learning Methodology</td><td colspan="4">Intended subject learning outcomes</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td></tr>
<tr><td>1. Lecture</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>2. Tutorial</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>3. Homework assignment</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>4. Case study report and presentation</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
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</table>

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed			
		a	b	c	d
1. Homework assignment	20%	√	√	√	√
2. Test	20%	√	√		
3. Case study report and presentation	10%	√	√	√	
4. Examination	50%	√	√	√	√
Total	100%				

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Overall Assessment:

$0.50 \times$ End of Subject Examination + $0.50 \times$ Continuous Assessment

The continuous assessment consists of three components: homework assignments, test, and case study report & presentation. They are aimed at evaluating the progress of student study, assisting them in self-monitoring of fulfilling the respective subject learning outcomes, and enhancing the integration of the knowledge learnt.

The examination is used to assess the knowledge acquired by the students for understanding and analyzing the problems critically and independently; as well as to determine the degree of achieving the subject learning outcomes.

Student Study Effort Expected

Class contact:	
▪ Lecture	24 Hrs.
▪ Tutorial/Case study/Laboratory	15 Hrs.
Other student study effort:	
▪ Self Study	42 Hrs.
▪ Case study report preparation and presentation	24 Hrs.
Total student study effort	105 Hrs.

Reading List and References

1. Rao S. S., *Mechanical Vibrations*, Third Edition, Addison-Wesley, latest edition.
2. Thomson W. T, *Theory of Vibration with Applications*, Prentice Hall, latest edition.
3. Dimarogonas A., *Vibration for Engineers, Second Edition*, Prentice-Hall, latest edition.
4. Ewins D.J., *Modal Testing: Theory and Practice*, Research Studies Press Ltd., John Wiley, latest edition.
5. Barron R., *Engineering Condition Monitoring*: Practice, Methods and Applications, Addison Wesley Longman, latest edition.
6. Lyon R. H., *Machinery Noise and Diagnostics*, Butterworths, latest edition.
7. Junger M. C. and Feit D., Sound, Structures and Their Interaction, ASA, latest edition.

Subject Description Form

<table>
<tr><td>Subject Code</td><td>ME540</td></tr>
<tr><td>Subject Title</td><td>Fuels and Engines</td></tr>
<tr><td>Credit Value</td><td>3</td></tr>
<tr><td>Level</td><td>5</td></tr>
<tr><td>Pre-requisite/
Co-requisite/
Exclusion</td><td>Students should have basic knowledge in Thermofluids.

Exclusion: ME5106 Green Automotive Engine Technology</td></tr>
<tr><td>Objectives</td><td>To provide students with knowledge of fuel quality and engine technology effects on emissions.</td></tr>
<tr><td>Intended Learning Outcomes</td><td>Upon completion of the subject, students will be able to:
a. have the knowledge of fuel thermochemistry and fuel quality effects on emissions, engine technologies, engine combustion-related emissions and control technologies;
b. extend their knowledge of fuels and engines to different situations of engineering context and professional practice; and
c. have recognition of the need for, and an ability to engage in life-long learning.</td></tr>
<tr><td>Subject Synopsis/
Indicative Syllabus</td><td>Fuels: Fuels and their characteristics; hydrocarbon chemistry; automotive, alternative and aviation fuels; fuel cell; fuel quality; fuel effects on emissions.
Engines: Engine cycles and operating parameters; compression ignition, spark-ignition, liquefied petroleum gas, natural gas and aircraft jet engines.
Heat and Mass Transfer in Engines: Engine cooling systems; engine energy balance; finite heat release in engine cycles; cylinder heat transfer measurements; heat transfer modeling; heat transfer correlations; radiation heat transfer.
Air, Fuel and Exhaust Flow in Engines: Valve flow, intake and exhaust flow; fluid flow in the cylinder; turbulent flow; superchargers and turbochargers; fuel injectors.
Combustion-related Emissions and Control Technologies in Engines: Review of current and projected engine emissions concerns and legislative requirements; steady-state and transient emissions; fuel supply system and electronic control for engines; exhaust after treatment.
Engine Testing and Control: Dynamometers; fuel and air flow measurement; exhaust gas and particulate emission analysis; residual fraction; pressure-volume measurement and combustion analysis; vehicle emission testing; engine sensors and actuators in vehicles; engine control systems; effect of ambient pressure and temperature.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>1. The teaching and learning methods include lectures/tutorial sessions, homework assignments, test, case study report and examination.
2. The continuous assessment and examination are aimed at providing students with integrated knowledge required for fuels and engines.
3. Technical/practical examples and problems will be raised and discussed in class/tutorial sessions.
<table>
<tr><td rowspan="2">Teaching/Learning Methodology</td><td colspan="3">Intended subject learning outcomes</td></tr>
<tr><td>a</td><td>b</td><td>c</td></tr>
<tr><td>1. Lecture</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>2. Tutorial</td><td>√</td><td>√</td><td></td></tr>
<tr><td>3. Homework assignment</td><td>√</td><td>√</td><td></td></tr>
<tr><td>4. Case study report and presentation</td><td>√</td><td>√</td><td>√</td></tr>
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</td></tr>
</table>

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed		
		a	b	c
1. Homework assignment	20%	√	√	
2. Test	20%	√	√	
3. Case study report and presentation	10%	√	√	√
4. Examination	50%	√	√	
Total	100%			

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Overall Assessment:

0.50 × End of Subject Examination + 0.50 × Continuous Assessment

The continuous assessment consists of three components: homework assignments, interim test, and case study report & presentation. They are aimed at evaluating the progress of students study, assisting them in self-monitoring of fulfilling the respective subject learning outcomes, and enhancing the integration of the knowledge learnt.

The examination is used to assess the knowledge acquired by the students for understanding and analyzing the problems critically and independently; as well as to determine the degree of achieving the subject learning outcomes.

Student Study Effort Expected

Class contact:	
▪ Lecture	24 Hrs.
▪ Tutorial/Case study/Laboratory	15 Hrs.
Other student study effort:	
▪ Self Study	45 Hrs.
▪ Case study report preparation and presentation	21 Hrs.
Total student study effort	105 Hrs.

Reading List and References

1. Bosch R.G., *Gasoline-Engine Management*, Bosch, latest edition.
2. Bosch R.G., *Diesel-Engine Management*, Bosch, latest edition.
3. Elvers B., *Handbook of Fuels*, Wiley-Vch, latest edition.
4. European Conference of Ministers of Transport, *Vehicle Emission Reductions*, OECD, latest edition.
5. Ferguson C.R. and Kirkpatrick A. T., *Internal Combustion Engines*, John Wiley & Sons Inc., latest edition,
6. Guibet J.C., *Fuels and Engines- Technology, Energy and Environment*, Vol. 1 & 2, Technip, Paris, latest edition.
7. Hoag K.L., *Vehicular Engine Design*, Springer-Verlag, latest edition.
8. Klingenberg H., *Automobile Exhaust Emission Testing*, Springer, latest edition.
9. Pulkrabek W.W., *Engineering Fundamentals of the Internal Combustion Engine*, Pearson Prentice Hall, latest edition.
10. Sher E., *Handbook of Air Pollution from Internal Combustion Engines*, Academic Press, latest edition.

Journals/Magazines:

- Atmospheric Environment, Elsevier Science Ltd.
- Automotive Engineering International (Chinese Edition), Society of Automotive Engineers International, USA.
- Energy and Fuels, American Chemical Society Publications, USA.
- Fuel, Elsevier Science Ltd.
- Journal of Automobile Engineering, Institution of Mechanical Engineers, UK.
- SAE Technical Papers & Automotive Engineering International Magazine, Society of Automotive Engineers International, USA.
- Transport Research Part D: Transport and Environment, Elsevier Science Ltd.

Subject Description Form

<table>
<tr><td>Subject Code</td><td>ME548</td></tr>
<tr><td>Subject Title</td><td>Computer Aided Product Analysis</td></tr>
<tr><td>Credit Value</td><td>3</td></tr>
<tr><td>Level</td><td>5</td></tr>
<tr><td>Pre-requisite/
Co-requisite/
Exclusion</td><td>Students should have basic knowledge in Mechanical Engineering; Building Service Engineering; Civil & Structural Engineering; Manufacturing Engineering; Product Design & Engineering.</td></tr>
<tr><td>Objectives</td><td>To provide students with good understanding of the CAD and CAE technologies. The subject covers computer aided analysis, integration of CAD and CAE, and virtual engineering.</td></tr>
<tr><td>Intended Learning Outcomes</td><td>Upon completion of the subject, students will be able to:
a. possess knowledge in the area of principle and formulations of finite element method, computer aided design and engineering;
b. analyze static and dynamic stress and strain behaviors of structures and products using CAD and CAE techniques;
c. apply their knowledge and skills to design and develop new products; and
d. have recognition of the need for, and an ability to engage in life-long learning.</td></tr>
<tr><td>Subject Synopsis/
Indicative Syllabus</td><td>Geometric Modeling Systems: Wireframe modeling systems; surface modeling systems; solid modeling systems.
Computer Aided Analysis: Introduction to finite element analysis; finite element software; automatic mesh generation; node connection approach; topology decomposition approach; geometry decomposition approaches; grid-based approach; mapped element approach; improvement of mesh quality; case study.
Finite Element Models of Aircraft Structure: Truss elements; Beam elements; Plate elements; and Shell elements.
Structural Optimization: Sizing optimization; shape optimization; topology optimization; case study.
Virtual Engineering: Definition of virtual engineering; components of virtual engineering; virtual design; digital simulation; virtual prototyping; product lifecycle management.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>1. The teaching and learning methods include lectures/tutorial sessions, homework assignments, test, case study report and examination.
2. The continuous assessment and examination are aimed at providing students with integrated knowledge required for computer aided analysis.
3. Technical/practical examples and problems are raised and discussed in class/tutorial sessions.
<table>
<tr><td rowspan="2">Teaching/Learning Methodology</td><td colspan="4">Intended subject learning outcomes</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td></tr>
<tr><td>1. Lecture</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>2. Tutorial</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>3. Homework assignment</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>4. Case study report and presentation</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
</table>
</td></tr>
</table>

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed			
		a	b	c	d
1. Homework assignment	25%	√	√	√	√
2. Test	10%	√	√	√	√
3. Project report and presentation	25%	√	√	√	√
4. Examination	40%	√	√	√	√
Total	100%				

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Overall Assessment:

0.40 × End of Subject Examination + 0.60 × Continuous Assessment

The continuous assessment consists of three components: homework assignments, test, and project report & presentation. They are aimed at evaluating the progress of students study, assisting them in self-monitoring of fulfilling the respective subject learning outcomes, and enhancing the integration of the knowledge learnt.

The examination is used to assess the knowledge acquired by the students for understanding and analyzing the problems critically and independently; as well as to determine the degree of achieving the subject learning outcomes.

Student Study Effort Expected

Class contact:	
▪ Lecture	24 Hrs.
▪ Tutorial/Case Study/Laboratory	15 Hrs.
Other student study effort:	
▪ Self Study	42 Hrs.
▪ Case study report preparation and presentation	24 Hrs.
Total student study effort	105 Hrs.

Reading List and References

1. Lee K., *Principles of CAD/CAM/CAE Systems*, Addison Wesley, latest edition.
2. Law A. M. and Kelton D. W., *Simulation Modeling and Analysis*, McGraw-Hill, latest edition.
3. Przemieniecki, J. S., Finite Element Structural Analysis, New Concepts, AIAA, latest edition.
4. Donaldson, B. K., Analysis of Aircraft Structures, An Introduction, Cambridge University Press. Latest edition.

Subject Description Form

<table>
<tr><td>Subject Code</td><td>ME552</td></tr>
<tr><td>Subject Title</td><td>Integrated Engineering Design</td></tr>
<tr><td>Credit Value</td><td>3</td></tr>
<tr><td>Level</td><td>5</td></tr>
<tr><td>Pre-requisite/
Co-requisite/
Exclusion</td><td>Students should have a good foundation in mechanical sciences.</td></tr>
<tr><td>Objectives</td><td>To provide the students with practical experiences in the consecutive stages in design, analysis and development of a new product; to introduce various important considerations in product design and development, and their integration with critical engineering analysis in producing a new product; to introduce project management techniques in producing a new product.</td></tr>
<tr><td>Intended Learning Outcomes</td><td>Upon completion of the subject, students will be able to:
a. possess state-of-the-art knowledge and skills in the area of engineering design and product development process;
b. be able to apply their knowledge and contribute to professional competence, including ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability;
c. work as an effect team member and have the readiness in assuming a leadership role in a design project;
d. think holistically, critically, strategically and creatively in dealing with complex problems and situations pertinent to a design project.
e. have a good mastery of critical and creative thinking skills and generate practical and innovative solutions to novel problems; and
f. have an ability to recognize the need and engage in life-long learning.</td></tr>
<tr><td>Subject Synopsis/
Indicative Syllabus</td><td>Conceptual Product Design: Customer needs and market situation; technical and business concerns; environmental issues; cultural and social issues; aesthetic and semantic issues; establish product function; visualization skills and CAD.
Engineering Analysis of Design: Benchmarking and establishing engineering specifications of the product; design concept selection; product embodiment: design refining and system modeling; analytical and numerical model solutions; design for manufacture and assembly; CAE and optimization.
Product Development Techniques: Goals of prototyping; types and uses of prototypes; rapid prototyping techniques; physical models and experimentation.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>1. The teaching and learning methods include lectures/tutorial sessions, homework assignments, test, case study report and examination.
2. The continuous assessment and examination are aimed at providing students with integrated knowledge required for integrated engineering design.
3. Technical/practical examples and problems are raised and discussed in class/tutorial sessions.
<table>
<tr><td rowspan="2">Teaching/Learning Methodology</td><td colspan="6">Intended subject learning outcomes</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td><td>f</td></tr>
<tr><td>1. Lecture</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>2. Tutorial</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>3. Homework assignment</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>4. Case study report and presentation</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
</table>
</td></tr>
</table>

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed					
		a	b	c	d	e	f
1. Homework assignment	20%	√	√	√	√	√	√
2. Test	20%	√	√		√	√	√
3. Case study report and presentation	20%	√	√	√	√	√	√
4. Examination	40%	√	√	√	√	√	√
Total	100%						

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Overall Assessment:

$0.40 \times$ End of Subject Examination + $0.60 \times$ Continuous Assessment

The continuous assessment consists of three components: homework assignments, test, and case study report & presentation. They are aimed at evaluating the progress of students study, assisting them in self-monitoring of fulfilling the respective subject learning outcomes, and enhancing the integration of the knowledge learnt.

The examination is used to assess the knowledge acquired by the students for understanding and analyzing the problems critically and independently; as well as to determine the degree of achieving the subject learning outcomes.

Student Study Effort Expected

Class contact:	
▪ Lecture	24 Hrs.
▪ Tutorial/Case study/Laboratory	15 Hrs.
Other student study effort:	
▪ Self Study	45 Hrs.
▪ Case study report preparation and presentation	21 Hrs.
Total student study effort	105 Hrs.

Reading List and References

1. Pahl G. and Beitz W., *Engineering Design*, Springer-Verlag, latest edition.
2. Ulrich K. and Eppinger S., *Product Design and Development*, McGraw-Hill, latest edition.
3. Otto K. and Wood K., Product Design: *Techniques in Reverse Engineering and New Product Development*, Prentice Hall, latest edition.
4. Clausing D., *Quality Function Deployment*, MIT Press, latest edition.
5. Crawford C. M. and Di Benedetto C.A., *New Product Management*, McGraw-Hill, latest edition.
6. Cooper R. G., Winning at *New Products: Accelerating the Process from Idea to Launch*, Perseus Books, latest edition.
7. Buchanan R. et al., *The Idea of Design*, MIT Press, latest edition.
8. Adams J. L., *Conceptual Blockbusting: a Guide to Better Ideas*, Addison-Wesley, latest edition.

Subject Description Form

<table>
<tr><td>Subject Code</td><td>ME556</td></tr>
<tr><td>Subject Title</td><td>Advanced Combustion Systems</td></tr>
<tr><td>Credit Value</td><td>3</td></tr>
<tr><td>Level</td><td>5</td></tr>
<tr><td>Pre-requisite/
Co-requisite/
Exclusion</td><td>Students should have basic knowledge in Thermofluids.

Exclusion: ME541 Combustion Systems and Air Pollution Control</td></tr>
<tr><td>Objectives</td><td>To provide knowledge about the constructions and operation principles, as well as the techniques for performance evaluation of the domestic and industrial combustion systems, which are commonly used in Hong Kong and the surrounding regions; to provide knowledge about the flame and combustion characteristics, and the emissions associated with these combustion systems; to provide knowledge about the thermal modelling techniques of industrial furnace, the design method of industrial chimney and the techniques to predict the dispersion from chimney.</td></tr>
<tr><td>Intended Learning Outcomes</td><td>Upon completion of the subject, students will be able to:
a. possess state-of-the-art knowledge and skills and be able to contribute to their professional competence in the area of combustion systems (including combustion, heat transfer and emissions);
b. think holistically and critically in solving complex problems and situations pertaining to their professional practice;
c. have recognition of the need for, and an ability to engage in life-long learning;
d. increase their awareness of the local and global environmental issues, existing regulation and policies, as well as the state-of-the-art technologies.</td></tr>
<tr><td>Subject Synopsis/
Indicative Syllabus</td><td>Flame: Premixed and diffusion flames; flame structures and characteristics; effect of fuel types; laminar and turbulent flames; effects of equivalence ratio and Reynolds number; flame stability; effect of combustion on emissions.

Domestic Gas-fired Appliances: Applications; flame and fuel types; design criteria of burner/appliance; heating efficiency assessment; emissions and safety.

Industrial Furnaces: Gas-fired, oil-fired and coal-fired industrial furnaces; burning of gaseous, liquid and solid fuels in furnaces; burners and atomizers; stoker-fired and pulverized-fired furnaces; types of emissions and their control; measurement and analysis of flue gases; handling equipment; selection of combustion equipment.

Thermal Modeling of Furnaces: Heat transfer mechanisms in furnaces; forced convection and gaseous radiation in furnaces; Hottel's zonal method; single gas zone and plug-flow regions; energy balance in furnaces; modeling of combustion products for gaseous radiation calculations.

Chimneys and Flues: Function and operation problems of chimney; design criteria; chimney sizing and thermal insulation; construction and linings; modeling of dispersion of emissions from chimney.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>1. The teaching and learning methods include lectures/tutorial sessions, homework assignments, test, case study report and examination.
2. The continuous assessment and examination are aimed at providing students with integrated knowledge required for advanced combustion systems.
3. Technical/practical examples and problems are raised and discussed in class/tutorial sessions.
<table>
<tr><td rowspan="2">Teaching/Learning Methodology</td><td colspan="4">Intended subject learning outcomes</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td></tr>
<tr><td>1. Lecture</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>2. Tutorial</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>3. Homework assignment</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>4. Case study report and presentation</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
</table>
</td></tr>
</table>

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed			
		a	b	c	d
1. Homework assignment	20%	√	√	√	√
2. Test	20%	√	√		√
3. Case study report and presentation	10%	√	√	√	√
4. Examination	50%	√	√	√	√
Total	100%				

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Overall Assessment:

$0.50 \times$ End of Subject Examination + $0.50 \times$ Continuous Assessment

The continuous assessment consists of three components: homework assignments, test, and case study report & presentation. They are aimed at evaluating the progress of students study, assisting them in self-monitoring of fulfilling the respective subject learning outcomes, and enhancing the integration of the knowledge learnt.

The examination is used to assess the knowledge acquired by the students for understanding and analyzing the problems critically and independently; as well as to determine the degree of achieving the subject learning outcomes.

Student Study Effort Expected

Class contact:	
▪ Lecture	24 Hrs.
▪ Tutorial/Case study/Laboratory	15 Hrs.
Other student study effort:	
▪ Self Study	45 Hrs.
▪ Case study report preparation and presentation	21 Hrs.
Total student study effort	105 Hrs.

Reading List and References

1. Borman G. L. and Ragland K. W., *Combustion Engineering*, McGraw-Hill, latest edition.
2. Turns S. R., *An Introduction to Combustion: Concepts and Applications*, McGraw-Hill, latest edition.
3. CIBSE, *Combustion Systems*, CIBSE Guide, Section B13, latest edition.
4. Rogers G. and Mayhew Y., *Engineering Thermodynamics* – Work and Heat Transfer, 4th edition, Longman, latest edition.
5. Modest M. F., *Radiative Heat Transfer*, McGraw-Hill, latest edition.

Subject Description Form

<table>
<tr><td>Subject Code</td><td>ME557</td></tr>
<tr><td>Subject Title</td><td>CFD and Thermofluid System Design</td></tr>
<tr><td>Credit Value</td><td>3</td></tr>
<tr><td>Level</td><td>5</td></tr>
<tr><td>Pre-requisite/
Co-requisite/
Exclusion</td><td>Students should have basic knowledge in Thermofluids

Exclusion: ME549 Computational Fluid Dynamics and Its Applications</td></tr>
<tr><td>Objectives</td><td>To provide students with knowledge of computational fluid dynamics and numerical heat transfer; to make the students have the ability to model and solve the practical problems in industry.</td></tr>
<tr><td>Intended Learning Outcomes</td><td>Upon completion of the subject, students will be able to:
a. possess state-of-the-art knowledge and skills in the area of computational fluid dynamics and numerical heat transfer, be able to apply their knowledge and skills in designing and developing products or engineering systems;
b. think critically and holistically in dealing with real CFD problems, and generate practical solutions; and
c. recognize the need for, and engage in life-long learning.</td></tr>
<tr><td>Subject Synopsis/
Indicative Syllabus</td><td>Introduction to Numerical Methods: Governing equations of fluid flow and heat transfer; finite element method; finite difference method; finite volume method; lattice Boltzmann method and other numerical techniques.
Numerical Techniques: Steady and unsteady solution; influence of relaxation factors; stability and convergence; explicit and implicit methods.
Boundary Conditions: Boundary conditions for internal flow; boundary conditions for external flow; boundary conditions for thermal problem.
Mesh Generation: Types of the mesh; 2D mesh; 3D mesh; mesh refinement and optimization; mesh generation using software.
Viscous Models: Laminar model; inviscid model; Spalart-Allmaras model (1 equation); k-epsilon model (2 equations); Reynolds stress model; Large Eddy Simulation model.
Case Study – Fan and Impeller Design: Airfoil and cascade; impeller simulation; vorticity analysis; fan efficient analysis.
Case Study – Thermal Management of Electronic Equipment: Conjugated heat transfer in electronic package design; cooling electronic equipment by natural convection; optimum heat transfer; flow around cylinders.
Case Study – Room Ventilation Design: Diffuser design; diffuser arrangement design; air quality evaluation.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>1. The teaching and learning methods include lectures/tutorial sessions, homework assignments, test, case study report and examination.
2. The continuous assessment and examination are aimed at providing students with integrated knowledge required for CFD and thermofluid system design.
3. Technical/practical examples and problems are raised and discussed in class/tutorial sessions.

<table>
<tr><td rowspan="2">Teaching/Learning Methodology</td><td colspan="3">Intended subject learning outcomes</td></tr>
<tr><td>a</td><td>b</td><td>c</td></tr>
<tr><td>1. Lecture</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>2. Tutorial</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>3. Homework assignment</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>4. Case study report and presentation</td><td>√</td><td>√</td><td>√</td></tr>
</table>
</td></tr>
</table>

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed		
		a	b	c
1. Homework assignment	20%	√	√	√
2. Test	20%	√	√	
3. Case study report and Presentation	20%	√	√	√
4. Examination	40%	√	√	√
Total	100%			

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Overall Assessment:

$$0.40 \times \text{End of Subject Examination} + 0.60 \times \text{Continuous Assessment}$$

The continuous assessment consists of three components: homework assignments, test, and case study report & presentation. They are aimed at evaluating the progress of students study, assisting them in self-monitoring of fulfilling the respective subject learning outcomes, and enhancing the integration of the knowledge learnt.

The examination is used to assess the knowledge acquired by the students for understanding and analyzing the problems critically and independently; as well as to determine the degree of achieving the subject learning outcomes.

Student Study Effort Expected

Class contact:	
▪ Lecture	21 Hrs.
▪ Tutorial/Case study	18 Hrs.
Other student study effort:	
▪ Self Study	45 Hrs.
▪ Case study report preparation and presentation	21 Hrs.
Total student study effort	105 Hrs.

Reading List and References

1. Fletcher C. A. J., *Computational Techniques for Fluid Dynamics: A Solutions Manual*, Springer-Verlag, latest edition.
2. Reddy J. N. and Gartling D. K., *The Finite Element Method in Heat Transfer and Fluid Dynamics*, Boca Raton, Fla., CRC Press, latest edition.
3. Anderson J. D., *Computational Fluid Dynamics*, McGraw-Hill, latest edition.
4. Versteeg H. K. & Malalasekera W., *An Introduction to Computational Fluid Dynamics*, Longman, latest edition.
5. Rao, S. S**.,** *The finite element method in engineering*, Pergamon Press, latest edition.
6. Shaw C. T., Using Computational Fluid Dynamics, Prentice Hall, latest edition.

Subject Description Form

Subject Code	ME558
Subject Title	Advanced Materials and Structural Design
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Students should have basic knowledge in Mathematics, Engineering Materials, and Solid Mechanics. Exclusion: ME550 Materials and Smart Structural Design
Objectives	To provide students with knowledge of the mechanical behaviour, manufacturing process and utilizations of advanced composite materials, smart materials and structures, and nano-materials for product design and development with a special emphasize on aircraft applications.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. understand the mechanics of advanced composite materials, especially the mechanics of a lamina and laminates, including failure mechanisms; b. possess the state-of-the-art knowledge on smart materials and smart structure design; c. recognize the importance of nano-materials in advanced technology; and d. understand the application of advanced composites, smart materials, smart structures, and nano-materials in aircraft design.
Subject Synopsis/ Indicative Syllabus	***Advanced Composite Materials:*** Composite constituents; principles of fibre-reinforced composites; mechanics of a lamina; mechanics of laminates, tooling and manufacturing processes; failure criteria for composites; aircraft applications and related design issues. ***Piezoelectric Materials:*** The fundamental mechanisms of piezoelectric materials and major applications, Curie temperature, concept of piezoelectric moduli and applications of these moduli in design of sensors and actuators, smart structure design issues. ***Shape Memory Alloys (SMA):*** Phenomena & mechanisms of temperature controlled shape memory effect, critical temperatures, stress effect on critical temperatures, mechanical properties of SMA at different phases and temperatures, shape memory and superelasticity, modeling of the effects of temperature and stress, special design considerations at joints, continuum vs. discrete applications of SMA, major impediments to applications of SMA. ***Nanomaterials:*** Nano-materials for product design; mechanical and thermal properties of nano-composite materials. ***Smart Structures:*** Introduction to smart structures; fibre-optic sensors; integrated sensing, controlling and actuating techniques. Selected applications of smart structures in aircraft design. ***Laboratory Works:*** • Mechanical properties of shape memory alloys. • Strain measurement of composite structures using embedded fibre-optic sensors.
Teaching/Learning Methodology	1. The teaching and learning methods include lectures/tutorial sessions, homework assignments, test, mini-project or case study and examination. 2. The continuous assessment and examination are aimed at providing students with integrated knowledge required for advanced materials and structural design. 3. Technical/practical examples and problems are raised and discussed in class/tutorial sessions.

Teaching/Learning Methodology	Intended subject learning outcomes			
	a	b	c	d
1. Lecture	√	√	√	√
2. Tutorial	√	√	√	√
3. Homework assignment	√	√		√
4. Mini-project/Case study report and presentation		√	√	√

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed			
		a	b	c	d
1. Homework assignment	20%	√	√		√
2. Test	15%	√			
3. Mini-project/Case study report and presentation	15%		√	√	√
4. Examination	50%	√	√	√	√
Total	100%				

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Overall Assessment:

$0.50 \times$ End of Subject Examination + $0.50 \times$ Continuous Assessment

The continuous assessment consists of three components: homework assignments, test, mini-project or case study report & presentation. They are aimed at evaluating the progress of students study, assisting them in self-monitoring of fulfilling the respective subject learning outcomes, and enhancing the integration of the knowledge learnt.

The examination is used to assess the knowledge acquired by the students for understanding and analyzing the problems critically and independently; as well as to determine the degree of achieving the subject learning outcomes.

Student Study Effort Expected

Class contact:	
▪ Lecture	24 Hrs.
▪ Tutorial/Case Study/Laboratory	15 Hrs.
Other student study effort:	
▪ Self Study	42 Hrs.
▪ Mini-project/Case study report preparation and presentation	24 Hrs.
Total student study effort	105 Hrs.

Reading List and References

1. Alan Baker, Stuart Dutton and Donald Kelly, *Composite Materials for Aircraft Structures,* AIAA, latest edition.
2. Ronald F. Gibson, *Principles of Composite Material Mechanics*, McGRAL-HILL, latest edition.
3. Srinivasan A. V. and McFarland D. M., *Smart Structures*, Cambridge University Press, latest edition.
4. Banks H. T., Smith R. C. and Wang Y., *Smart Material Structures*, John Wiley & Sons, latest edition.
5. Nanostructured Materials - Processing, Properties, and Applications, edited by Carl C. Koch, William Andrew Publishing, latest edition.

Subject Description Form

<table>
<tr><td>Subject Code</td><td>ME559</td></tr>
<tr><td>Subject Title</td><td>Advanced Environmental and Transportation Noise Control</td></tr>
<tr><td>Credit Value</td><td>3</td></tr>
<tr><td>Level</td><td>5</td></tr>
<tr><td>Pre-requisite/
Co-requisite/
Exclusion</td><td>Students should have basic knowledge in Thermofluids and Noise. Some working experience in industry or environmental sectors is desirable.

Exclusion: ME535 Industrial and Transportation Noise Control</td></tr>
<tr><td>Objectives</td><td>To provide students with knowledge of practical and systematic approach to control noise due to environmental and transportation noise sources.</td></tr>
<tr><td>Intended Learning Outcomes</td><td>Upon completion of the subject, students will be able to:
a. possess state-of-the-art knowledge and skills in the area of physical parameters of sound in transportation and the assessment method;
b. apply their knowledge, skills and hand-on experience to measure, calculate and assess the noise level in transportation and keeping aware of the environmental issues, existing regulation and policies concerning noise control;
c. extend their knowledge of sound prediction and noise assessment to different situations of engineering context and professional practice; and
d. have recognition of the need for, and an ability to engage in life-long learning.</td></tr>
<tr><td>Subject Synopsis/
Indicative Syllabus</td><td>Road Traffic Noise: Traffic noise indices; calculation of road traffic noise (CRTN) – prediction procedures; the measurement of road traffic noise; the standard drive past test; assessment of noise and vibration impacts due to road traffic.
Control of Vehicle Noise: Identification of noise sources; strategies for controlling vehicle noise; porous pavement for reducing tyre noise; acoustical performance of traffic noise barriers; absorptive barriers; in-situ determination of the acoustical performance of roadside barriers.
Aircraft Noise: Aircraft noise indices; noise certification; aircraft noise sources; the integrated noise model (INM) for aircraft noise prediction; Nordic guidelines for calculation of air traffic noise.
Rail Transport Noise: Railway noise indices; sources of train noise; prediction of train noise – calculation of rail noise (CRN); strategies of controlling rail noise; vibration from railways and its control; measurement techniques.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>1. The teaching and learning methods include lectures/tutorial sessions, homework assignments, test, case study report and examination.
2. The continuous assessment and examination are aimed at providing students with integrated knowledge required for advanced environmental and transportation noise control.
3. Technical/practical examples and problems are raised and discussed in class/tutorial sessions.
<table>
<tr><td rowspan="2">Teaching/Learning Methodology</td><td colspan="4">Intended subject learning outcomes</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td></tr>
<tr><td>1. Lecture</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>2. Tutorial</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>3. Homework assignment</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>4. Case study report and presentation</td><td>√</td><td>√</td><td>√</td><td></td></tr>
</table>
</td></tr>
</table>

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed			
		a	b	c	d
1. Homework assignment	20%	√	√	√	√
2. Test	20%	√	√		
3. Case study report and presentation	20%	√	√	√	
4. Examination	40%	√	√	√	√
Total	100%				

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Overall Assessment:

$0.40 \times$ End of Subject Examination + $0.60 \times$ Continuous Assessment

The continuous assessment consists of three components: homework assignments, test, and case study report & presentation. They are aimed at evaluating the progress of students study, assisting them in self-monitoring of fulfilling the respective subject learning outcomes, and enhancing the integration of the knowledge learnt.

The examination is used to assess the knowledge acquired by the students for understanding and analyzing the problems critically and independently; as well as to determine the degree of achieving the subject learning outcomes.

Student Study Effort Expected

Class contact:	
▪ Lecture	24 Hrs.
▪ Tutorial/Case study	15 Hrs.
Other student study effort:	
▪ Self Study	45 Hrs.
▪ Case study report preparation and presentation	21 Hrs.
Total student study effort	105 Hrs.

Reading List and References

1. Bies D. A. and Hansen C. H., *Engineering Noise Control – Theory and Practice,* E&FN Spon, latest edition.
2. Bell, L. H. *Industrial Noise Control – Fundamentals and Applications*, Marcel Dekker Inc., latest edition.
3. Institute of Acoustics, *Diploma in Acoustics and Noise Control – Tutored Distance Learning Programme, Transportation Noise Unit 1 and Unit 2*.
4. Nelson P. M. (Ed.), *Transportation noise Reference Book*, Butterworths, latest edition.

Subject Description Form

<table>
<tr><td>Subject Code</td><td>ME564</td></tr>
<tr><td>Subject Title</td><td>Principles and Design of Air Pollution Control Devices</td></tr>
<tr><td>Credit Value</td><td>3</td></tr>
<tr><td>Level</td><td>5</td></tr>
<tr><td>Pre-requisite/
Co-requisite/
Exclusion</td><td>Students should have basic knowledge in Thermofluids and Air Pollution.

Exclusion: ME539 Treatments of Dust, Fume and Wastewater</td></tr>
<tr><td>Objectives</td><td>To provide the student with an in-depth understanding of the working principles and design features of air pollution control devices.</td></tr>
<tr><td>Intended Learning Outcomes</td><td>Upon completion of the subject, students will be able to:
a. possess state-of-the-art knowledge and skills in the area of air pollution control;
b. apply their knowledge, skills and hand-on experience to evaluate different methods for reducing gaseous emission and reducing particulate emission;
c. extend their knowledge of air pollution control to different situations of engineering context and professional practice; and
d. have recognition of the need for, and an ability to engage in life-long learning.</td></tr>
<tr><td>Subject Synopsis/
Indicative Syllabus</td><td>Nature of Gaseous and Particulate Pollutants in Air: Nature and composition of the atmosphere. Sources of air pollutants. Common gaseous pollutants in air and their chemical properties. Common particulates in air. Physical and chemical properties of aerosols.

Principles and Design of Gaseous Pollution Control Devices: Processes for removal of pollutant gases and vapours. Adsorption: adsorption material, breakthrough time, adsorption zone velocity, regeneration. Absorption: packed bed scrubber, mass transfer process, NTU and HTU. Catalytic converter: catalysts, catalyst requirements for different applications, typical catalytic reactions for reducing pollutants. Design of absorber, absorber and catalytic converter.

Principles and Design of Particulate Control Devices: Motion of particles: drag forces, equations of particle motion, settling velocity. Filters: surface filter and depth filter, filtering mechanisms, determination of filtering efficiencies. Cyclones: axial flow and tangential flow cyclones, equations governing motion of particles in the cyclone, determination of collection efficiency. Electrostatic precipitation: principle of electrostatic precipitation, equations governing motion of particles in electrostatic precipitator, determination of collection efficiency. Air purifiers: analysis of the design and function of air purifiers.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>1. The teaching and learning methods include lectures/tutorial sessions, homework assignments, test and examination.
2. The continuous assessment and examination are aimed at providing students with integrated knowledge required for air pollution control devices.
3. Technical/practical examples and problems will be raised and discussed in class/tutorial sessions.
<table>
<tr><td rowspan="2">Teaching/Learning Methodology</td><td colspan="4">Intended subject learning outcomes</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td></tr>
<tr><td>1. Lecture</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>2. Tutorial</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>3. Homework assignment</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
</table>
</td></tr>
</table>

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed			
		a	b	c	d
1. Homework assignment	15%	√	√	√	√
2. Test	35%	√	√		√
3. Examination	50%	√	√	√	√
Total	100%				

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Overall Assessment:

0.50 × End of Subject Examination + 0.50 × Continuous Assessment

The continuous assessment will consist of two components: homework assignments and test. They are aimed at evaluating the progress of students study, assisting them in self-monitoring of fulfilling the respective subject learning outcomes, and enhancing the integration of the knowledge learnt.

The examination will be used to assess the knowledge acquired by the students for understanding and analyzing the problems critically and independently; as well as to determine the degree of achieving the subject learning outcomes.

Student Study Effort Expected

Class contact:	
▪ Lecture	24 Hrs.
▪ Tutorial/Case study/Laboratory	15 Hrs.
Other student study effort:	
▪ Self Study	45 Hrs.
▪ Case study report preparation and presentation	21 Hrs.
Total student study effort	105 Hrs.

Reading List and References

1. Heinsohn R. J. and Kabel R. L., *Sources and Control of Air Pollution*, Prentice Hall, latest edition.
2. Nevers N. D., *Air Pollution Control Engineering*, McGraw-Hill, latest edition.
3. Toole-O'Neil B., *Dry Scrubbing Technology for Flue Gas Desulfurization*, Kluwer Academic Publisher, latest edition.
4. Lewandowski, D. A., *Design of Thermal Oxidation Systems for Volatile Organic Compounds*, Lewis Publishers, latest edition.
5. Dickenson, T. C., *Filters and Filtration Handbook*, 4th edition, Elsevier Advanced Technology, latest edition.
6. Crittenden B. and Thomas, W. J., *Adsorption Technology and Design*, Butterworth Heinemann, latest edition.

Journals

- Aerosol Science and Technology
- AICHE Journal
- Environmental Technology
- Journal of Aerosol Science
- Separation Science and Technology

Subject Description Form

<table>
<tr><td>Subject Code</td><td>ME565</td></tr>
<tr><td>Subject Title</td><td>Prevention and Control of Vehicular Emissions</td></tr>
<tr><td>Credit Value</td><td>3</td></tr>
<tr><td>Level</td><td>5</td></tr>
<tr><td>Pre-requisite/
Co-requisite/
Exclusion</td><td>Students should have basic knowledge in Thermofluids and Air Pollution.</td></tr>
<tr><td>Objectives</td><td>To provide students with in-depth knowledge in prevention and control of vehicular emissions.</td></tr>
<tr><td>Intended Learning Outcomes</td><td>Upon completion of the subject, students will be able to:
a. possess the knowledge of vehicle emission trends and control, transport and dispersion of vehicle-generated emissions, and advanced engine technologies and devices for vehicular emission reduction;
b. extend their knowledge of prevention and control of vehicular emissions to different situations of engineering context and professional practice; and
c. have recognition of the need for, and an ability to engage in life-long learning.</td></tr>
<tr><td>Subject Synopsis/
Indicative Syllabus</td><td>Vehicle Emission Trends: Background. Environmental and health aspects associated with motor vehicle emissions; worldwide emissions control programmes.
Atmospheric Transport and Dispersion of Air Pollutants Associated with Vehicular Emissions: Definition of transport and dispersion; meteorological parameters; scales of motion; theory of transport and dispersion in open highway and urban street canyons.
Vehicular Emissions: Driving cycle and behavior; driving cycles for emission testing; development of driving cycle; vehicle emission testing on chassis dynamometers; testing procedures; effect of driving mode and driving behavior on vehicle emissions; analysis of vehicle emission test data.
Advanced Engine Technology for Vehicular Emission Reduction: Advanced design features of gasoline engines: lean burn combustion, gasoline direction injection; advanced design features of diesel engines: air-handling system, fuel handling system and combustion system; Homogeneous charge compression ignition engine.
Advanced Aftertreatment Devices for Vehicular Emission Reduction: Catalytic converter with preheating; lean NOx catalyst and NOx absorber; continuously regenerative trap; selective catalytic reduction (SCR) of NOx; SCR-Trap system; non-thermal plasma.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>1. The teaching and learning methods include lectures/tutorial sessions, homework assignments, test, case study report and examination.
2. The continuous assessment and examination are aimed at providing students with integrated knowledge required for prevention and control of vehicular emissions.
3. Technical/practical examples and problems are raised and discussed in class/tutorial sessions.
<table>
<tr><td rowspan="2">Teaching/Learning Methodology</td><td colspan="3">Intended subject learning outcomes</td></tr>
<tr><td>a</td><td>b</td><td>c</td></tr>
<tr><td>1. Lecture</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>2. Tutorial</td><td>√</td><td>√</td><td></td></tr>
<tr><td>3. Homework assignment</td><td>√</td><td>√</td><td></td></tr>
<tr><td>4. Case study report and presentation</td><td>√</td><td>√</td><td>√</td></tr>
</table>
</td></tr>
</table>

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed		
		a	b	c
1. Homework assignment	20%	√	√	
2. Test	20%	√	√	
3. Case study report and presentation	10%	√	√	√
4. Examination	50%	√	√	
Total	100%			

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Overall Assessment:

0.50 × End of Subject Examination + 0.50 × Continuous Assessment

The continuous assessment consists of three components: homework assignments, test, and case study report & presentation. They are aimed at evaluating the progress of students study, assisting them in self-monitoring of fulfilling the respective subject learning outcomes, and enhancing the integration of the knowledge learnt.

The examination is used to assess the knowledge acquired by the students for understanding and analyzing the problems critically and independently; as well as to determine the degree of achieving the subject learning outcomes.

Student Study Effort Expected

Class contact:	
▪ Lecture	24 Hrs.
▪ Tutorial/Case study/Laboratory	15 Hrs.
Other student study effort:	
▪ Self Study	45 Hrs.
▪ Case study report preparation and presentation	21 Hrs.
Total student study effort	105 Hrs.

Reading List and References

1. Eastwood P., *Critical Topics in Exhaust Gas Aftertreatment*, Research Studies Press Ltd., latest edition.
2. European Conference of Ministers of Transport, *Vehicle Emission Reductions*, OECD, latest edition.
3. Heck R. M., Farrauto R. J. and Guklati S. T., *Catalytic Air Pollution Control-Commercial Technology*, John Wiley & Sons, Inc., latest edition.
4. IMechE Seminar Publication, *Future Engine and System Technology*, Professional Engineering Publishing Limited, latest edition.
5. Khare M. and Sharma P., *Modelling Urban Vehicle Emissions*, WIT Press, Southampton, latest edition.

Journals:

1. Atmospheric Environment, Elsevier Science Ltd.
2. Journal of Aerosol Science, Elsevier Science Ltd.
3. SAE Technical Paper, Society of Automotive Engineers International, USA.
4. The Science of the Total Environment, Elsevier Science Ltd.
5. Transport Research Part D: Transport and Environment, Elsevier Science Ltd.
6. Journal of the Air and Waste Management Association, Air & Waste Management Association

Subject Description Form

<table>
<tr><td>Subject Code</td><td>ME566</td></tr>
<tr><td>Subject Title</td><td>Industrial and Environmental Measurement Technology</td></tr>
<tr><td>Credit Value</td><td>3</td></tr>
<tr><td>Level</td><td>5</td></tr>
<tr><td>Pre-requisite/
Co-requisite/
Exclusion</td><td>Students should have basic knowledge in Mechanical Engineering; Building Services; Civil & Structural Engineering, Manufacture Engineering. Some working experience in industries is desirable.</td></tr>
<tr><td>Objectives</td><td>To provide students with knowledge of advanced measurement technology and applications in industry.</td></tr>
<tr><td>Intended Learning Outcomes</td><td>Upon completion of the subject, students will be able to:
a. possess state-of-the-art knowledge and skills in the area of random data analysis, various measurement techniques, including flow, temperature / heat, force, etc;
b. apply their knowledge, skills and hand-on experience, gained from the subject, to the measurement of flow systems and data analysis;
c. extend their knowledge of mechanical engineering to different situations of engineering context and professional practice; and
d. have recognition of the need for, and an ability to engage in life-long learning.</td></tr>
<tr><td>Subject Synopsis/
Indicative Syllabus</td><td>Random Signal Analysis: Probability density function, time-average, variance, skewness and kurtosis of signals; auto-correlation and cross-correlation functions; power spectral density function of a signal; spectral phase and coherence between two random signals; ensemble averaging technique.
Flow Measurement: Thermal anemometers; laser Doppler velocimetry; particle imaging velocimetry; flow visualization techniques.
Temperature and Heat Measurements: Fibre-optic grating sensors; constant current anemometer and thermocouples; surface temperature sensing with thermochromic liquid crystals and laser interferometry.
Vibration Measurement: Vibration measurement system; fibre-optic Bragg grating sensors, transducers, piezoelectric accelerometers, force transducers, laser vibrometers, strain gauge, electromechanical shakers and hammers.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>1. The teaching and learning methods include lectures/tutorial sessions, homework assignments, test, case study report and examination.
2. The continuous assessment and examination are aimed at providing students with integrated knowledge required for industrial and environmental measurement technology.
3. Technical/practical examples and problems are raised and discussed in class/tutorial sessions.
<table>
<tr><td rowspan="2">Teaching/Learning Methodology</td><td colspan="4">Intended subject learning outcomes</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td></tr>
<tr><td>1. Lecture</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>2. Tutorial</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>3. Homework assignment</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>4. Case study report and presentation</td><td>√</td><td>√</td><td>√</td><td></td></tr>
</table>
</td></tr>
</table>

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed			
		a	b	c	d
1. Homework assignment	20%	√	√	√	√
2. Test	20%	√	√		
3. Case study report and presentation	20%	√	√	√	
4. Examination	40%	√	√	√	√
Total	100%				

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Overall Assessment:

$0.40 \times$ End of Subject Examination + $0.60 \times$ Continuous Assessment

The continuous assessment consists of three components: homework assignments, test, and case study report & presentation. They are aimed at evaluating the progress of students study, assisting them in self-monitoring of fulfilling the respective subject learning outcomes, and enhancing the integration of the knowledge learnt.

The examination is used to assess the knowledge acquired by the students for understanding and analyzing the problems critically and independently; as well as to determine the degree of achieving the subject learning outcomes.

Student Study Effort Expected

Class contact:	
▪ Lecture	24 Hrs.
▪ Tutorial/Case study/Laboratory	15 Hrs.
Other student study effort:	
▪ Self Study	45 Hrs.
▪ Case study report preparation and presentation	21 Hrs.
Total student study effort	105 Hrs.

Reading List and References

1. Goldstein R. J., *Fluid Mechanics Measurements*, Taylor & Francis, latest edition.
2. Beckwith, T. G., Marangoni R. D. and Lienhard J. H., *Mechanical Measurements,* Addison-Wesley Publishing Company, latest edition.
3. Bendat J. S. and Piersol A. G., *Engineering Applications of Correlation and Spectral Analysis*, John Wiley & Sons, Inc. latest edition.

Subject Description Form

<table>
<tr><td>Subject Code</td><td>ME567</td></tr>
<tr><td>Subject Title</td><td>Advanced Control Technology</td></tr>
<tr><td>Credit Value</td><td>3</td></tr>
<tr><td>Level</td><td>5</td></tr>
<tr><td>Pre-requisite/
Co-requisite/
Exclusion</td><td>Students should have basic knowledge in System Dynamics and Control, Industrial Automation, and Mechatronics. Some working experience in Control and Automation is desirable.</td></tr>
<tr><td>Objectives</td><td>To provide students with a good understanding of advanced control technology and its applications in mechanical engineering.</td></tr>
<tr><td>Intended Learning Outcomes</td><td>Upon completion of the subject, students will be able to:
a. possess state-of-the-art knowledge and skills in the area of advanced control technology and its application to different mechanical systems;
b. apply their knowledge, skills and hand-on experience to design, develop, manufacture, and analyze mechanical systems with advanced control features or functions for desired needs;
c. extend their knowledge of advanced control technology and its application to different situations of engineering context and professional practice; and
d. have recognition of the need for, and an ability to engage in life-long learning.</td></tr>
<tr><td>Subject Synopsis/
Indicative Syllabus</td><td>Analog Control: Controller design using state-space methods; causality of feedback systems; controllability and observability of linear systems.
Optimal Control: Motivation of optimal feedback controller design; linear quadratic optimal control; elementary theory of nonlinear feedback control; feedback linearization control.
Digital Control: Introductory digital control; sampled-data systems; anti-alias filters; sample rate selection; discrete-time systems and z-transform; digital controller design.
Microcomputer Implementation: Microcomputer implementation of controllers; introduction to system identification; self-tuning control; control of twin-rotor system; control of an inverted pendulum.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>1. The teaching and learning methods include lectures/tutorial sessions, homework assignments, test, case study report and examination.
2. The continuous assessment and examination are aimed at providing students with integrated knowledge required for advanced control technology.
3. Technical/practical examples and problems are raised and discussed in class/tutorial sessions.

<table>
<tr><td rowspan="2">Teaching/Learning Methodology</td><td colspan="4">Intended subject learning outcomes</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td></tr>
<tr><td>1. Lecture</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>2. Tutorial</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>3. Homework assignment</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>4. Case study report and presentation</td><td>√</td><td>√</td><td>√</td><td></td></tr>
</table>
</td></tr>
</table>

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed			
		a	b	c	d
1. Homework assignment	30%	√	√	√	√
2. Case study/Lab report and presentation	10%	√	√	√	
3. Examination	60%	√	√	√	√
Total	100%				

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Overall Assessment:

$0.60 \times$ End of Subject Examination + $0.40 \times$ Continuous Assessment

The continuous assessment consists of three components: homework assignments, test, and case study report & presentation. They are aimed at evaluating the progress of students study, assisting them in self-monitoring of fulfilling the respective subject learning outcomes, and enhancing the integration of the knowledge learnt.

The examination is used to assess the knowledge acquired by the students for understanding and analyzing the problems critically and independently; as well as to determine the degree of achieving the subject learning outcomes.

Student Study Effort Expected

Class contact:	
▪ Lecture	24 Hrs.
▪ Tutorial/Case study/Laboratary	15 Hrs.
Other student study effort:	
▪ Self Study	45 Hrs.
▪ Case study report preparation and presentation	21 Hrs.
Total student study effort	105 Hrs.

Reading List and References

1. Bryson A. E., *Applied Linear Optimal Control: Examples and Algorithms,* New York, N.Y.: Cambridge University Press, latest edition.
2. Dorsey, John. *Continuous and Discrete Control Systems: Modeling, Identification, Design, and Implementation*, Boston: McGraw-Hill, latest edition.
3. Kisačanin, Branislav, *Linear Control Systems: with Solved Problems and MATLAB Examples,* New York : Kluwer Academic/Plenum Publishers, latest edition.

Subject Description Form

<table>
<tr><td>Subject Code</td><td>ME569</td></tr>
<tr><td>Subject Title</td><td>Thermal System Design and Management</td></tr>
<tr><td>Credit Value</td><td>3</td></tr>
<tr><td>Level</td><td>5</td></tr>
<tr><td>Pre-requisite/
Co-requisite/
Exclusion</td><td>Students should have basic knowledge in Thermofluids.</td></tr>
<tr><td>Objectives</td><td>To provide students with knowledge of advanced thermal technology; and make students have the ability to solve practical problems in industry.</td></tr>
<tr><td>Intended Learning Outcomes</td><td>Upon completion of the subject, students will be able to:
a. possess state-of-the-art knowledge and skills in the area of heat transfer and thermal sciences, be able to apply their knowledge and skills in designing and developing products or engineering systems;
b. think critically and holistically in dealing with real thermal and energy problems, and generate practical solutions; and
c. have recognition of the need for, and an ability to engage in life-long learning.</td></tr>
<tr><td>Subject Synopsis/
Indicative Syllabus</td><td>Review of Heat Transfer: Steady and unsteady conduction; forced and natural convection, and radiation.
Heat Pipe: Theory of heat pipe; types of the heat pipe; heat pipe design and manufacturing; heat pipe applications.
Cooling of Electronic Equipment: Cooling load of electronic equipment; thermal environment; conduction cooling, convection cooling and liquid cooling.
Heating and Cooling of Buildings: Thermal comfort; design conditions for heating and cooling; heat gain from people; lights and appliances; solar heat gain; infiltration heat load and weatherizing.
Refrigeration and Freezing of Foods: Control of microorganisms in foods; thermal properties of foods; refrigeration of fruits, vegetables and cut flowers; refrigeration of meats, poultry and fish; refrigeration of eggs, milk and bakery products; refrigeration load of cold storage rooms; transportation of refrigerated foods.
Solar Energy: Solar irradiation, solar energy conversion, solar energy collector.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>1. The teaching and learning methods include lectures/tutorial sessions, homework assignments, test, case study report and examination.
2. The continuous assessment and examination are aimed at providing students with integrated knowledge required for thermal system design and management.
3. Technical/practical examples and problems are raised and discussed in class/tutorial sessions.

<table>
<tr><td rowspan="2">Teaching/Learning Methodology</td><td colspan="3">Intended subject learning outcomes</td></tr>
<tr><td>a</td><td>b</td><td>c</td></tr>
<tr><td>1. Lecture</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>2. Tutorial</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>3. Homework assignment</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>4. Case study report and Presentation</td><td>√</td><td>√</td><td>√</td></tr>
</table>
</td></tr>
</table>

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed		
		a	b	c
1. Homework assignment	20%	√	√	√
2. Test	20%	√	√	
3. Case study report and presentation	20%	√	√	√
4. Examination	40%	√	√	√
Total	100%			

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Overall Assessment:

$0.40 \times$ End of Subject Examination + $0.60 \times$ Continuous Assessment

The continuous assessment consists of three components: homework assignments, test, and case study report & presentation. They are aimed at evaluating the progress of students study, assisting them in self-monitoring of fulfilling the respective subject learning outcomes, and enhancing the integration of the knowledge learnt.

The examination is used to assess the knowledge acquired by the students for understanding and analyzing the problems critically and independently; as well as to determine the degree of achieving the subject learning outcomes.

Student Study Effort Expected

Class contact:	
▪ Lecture	24 Hrs.
▪ Tutorial/Case study	15 Hrs.
Other student study effort:	
▪ Self Study	45 Hrs.
▪ Case study report preparation and presentation	21 Hrs.
Total student study effort	105 Hrs.

Reading List and References

1. Cengel Y. A., *Heat Transfer*, McGraw-Hill, latest edition.
2. Rohsenow W. M., Hartnett J. P. and Ganić E. N., *Handbook of Heat Transfer Applications*, New York: McGraw-Hill, latest edition.
3. Incropera F. P. and DeWitt D. P., *Fundamentals of Heat and Mass Transfer*, John Wiley & Sons, Inc. latest edition.

Subject Description Form

Subject Code	ME570
Subject Title	Advanced Product Mechatronics
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Students should have basic knowledge in fundamentals of system dynamics and automatic control, familiar with control systems, computer language in Matlab. Exclusion: ME553 Product Mechatronics
Objectives	To provide students with knowledge of designing and analyzing intelligent product embedded with microcontrollers. Students will learn to integrate sensors, microcontrollers, and actuators to design intelligent products.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. possess state-of-the-art knowledge and skills in the area of advanced mechatronics in product design and analysis; b. apply their knowledge, skills and hand-on experience to design, develop, manufacture, and analyze new products with advanced mechantronics features or functions for desired needs; c. extend their knowledge of advanced mechatronics to different situations of engineering context and professional practice; and d. have recognition of the need for, and an ability to engage in life-long learning.
Subject Synopsis/ Indicative Syllabus	***Mechatronic System:*** Configuration of mechatronic systems; sensors and transducers, and signal conditioning circuits; actuators: electrical, mechanical and pneumatic; drivers; measurement and guidance of moving parts. ***Signal Processing Techniques:*** Analog and digital filters; Nyquist sampling theorem; controller design and implementation; data converters (analog-to-digital, digital-to-analog); microcontrollers and their applications; interfacing and power sources. ***Mechatronic System Analysis:*** Design and implementation; problem definition; system requirement; integration and design criteria. ***Typical Case Studies and Projects of Mechatronic Systems:*** • Design of a home security system • Analysis and design of auto-focusing in a camera lens system • Skip control of a CD player • Programming and control of robots or CNC machines • Application of mechatronics to the design of smart toys or products • Intelligent control of home appliances • Integration of ultrasonic sensors, infrared sensors, actuators, and a • microcontroller in an AGV system. • Mechatronic systems with multiple microcontrollers ***Typical Laboratory Experiments:*** • Implementation and tuning of DC motor and stepper motor controllers • Implementation of an ultrasonic sensor system • Interfacing between microcontrollers (serial or parallel)

Teaching/Learning Methodology

1. The teaching and learning methods include lectures/tutorial sessions, homework assignments, test, case study report and examination.
2. The continuous assessment and examination are aimed at providing students with integrated knowledge required for advanced product mechatronics.
3. Technical/practical examples and problems are raised and discussed in class/tutorial sessions.

Teaching/Learning Methodology	Intended subject learning outcomes			
	a	b	c	d
1. Lecture	√	√	√	√
2. Tutorial	√	√	√	√
3. Homework assignment	√	√	√	√
4. Case study report and presentation	√	√	√	√

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed			
		a	b	c	d
1. Homework assignment	20%	√	√	√	√
2. Test, case study report and presentation	20%	√	√		√
3. Examination	60%	√	√	√	√
Total	100%				

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Overall Assessment:

$0.60 \times$ End of Subject Examination + $0.40 \times$ Continuous Assessment

The continuous assessment consists of three components: homework assignments, test, and case study report & presentation. They are aimed at evaluating the progress of students study, assisting them in self-monitoring of fulfilling the respective subject learning outcomes, and enhancing the integration of the knowledge learnt.

The examination is used to assess the knowledge acquired by the students for understanding and analyzing the problems critically and independently; as well as to determine the degree of achieving the subject learning outcomes.

Student Study Effort Expected

Class contact:	
▪ Lecture	24 Hrs.
▪ Tutorial/Case study	15 Hrs.
Other student study effort:	
▪ Self Study	45 Hrs.
▪ Case study report preparation and presentation	21 Hrs.
Total student study effort	105 Hrs.

Reading List and References	Textbooks: 1. *Design with Microprocessors for Mechanical Engineers* by Stiffler, McGraw-Hill 2. *Introduction to Mechatronics and Measurement Systems*, by Alciatore and Histand, McGraw-Hill 3. *Mechatronics,* by Necsulescu, Prentice Hall 4. *Mechatronics - Electromechanics and Controlmechanics*, by Mill, Springer-Verlag 5. *Mechatronics - Electronic Control Systems in Mechanical Engineering*, by Bolton, Addison Wesley 6. *Mechatronics - Electronics in Products and Processes*, by Bradley, et al., Chapman and Hall 7. *Mechatronics - Mechanical System Interfacing*, by Auslander and Kempf, Prentice Hall 8. *Mechatronics System Design*, by Shetty and Kolk, PWS Publishing Journals: 1. *Transactions on Mechatronics*, IEEE and ASME 2. *Transactions on Industrial Electronics*, IEEE 3. *Transactions on Instrumentation and Measurement*, IEEE

Subject Description Form

Subject Code	ME571
Subject Title	Corrosion Control
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Students should have basic knowledge in Engineering Materials. Exclusion: ME538 Corrosion Controls in Pollution Management
Objectives	To provide students with comprehensive knowledge about corrosion/ materials degradation and preventive methodologies.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. possess state-of-the-art knowledge and skills in the area of metal corrosion and protection technology; b. think critically and holistically in dealing with real corrosion problems, and generate practical solutions; and c. have recognition of the need for, and an ability to engage in life-long learning.
Subject Synopsis/ Indicative Syllabus	***Significance of Corrosion and Materials Degradation:*** Definitions and forms of corrosion and materials degradation; implications to economy and human society. ***Oxidation & Its Control:*** Oxidation at elevated temperature; thermodynamics and kinetics of oxidation; oxide structures; oxidation rate; effects of alloying; high temperature alloys and coatings for oxidation control. ***Corrosion Theory:*** Structure of water and aqueous solution; concept of pH; thermodynamics of corrosion; electrodes and electrode potentials; Nernst equation; corrosion products and passivity; classification of corrosion; corrosion rate. ***Metallurgical Cells and Environmental Cells:*** Effect of purity and crystal defects; galvanic corrosion; dealloying; stress cell and concentration cells; effect of velocity and temperature; crevice corrosion; pitting; microbial corrosion. ***Corrosive-mechanical Interaction:*** Erosion corrosion; corrosive wear; corrosion fatigue; hydrogen damage; stress corrosion cracking. ***Protective Coatings:*** Surface preparation; electrodeposition; hot-dip coatings; conversion coatings; paint coatings for metals. ***Corrosion Control of Common Metals:*** Iron and steels; aluminium and its alloys. ***Corrosion Control in Aviation:*** Airframes; gas turbine engines. ***Corrosion Control in Automobile:*** Automobile bodies, engines, and bright trim. ***Corrosion Control in Food Processing:*** Tinplate for food and beverage cans; dairy industries; brewing. ***Corrosion Control in Building Construction:*** Structures of buildings; cladding; metal roofs; siding and flashing; pumping and central heating; timber; leisure pool. ***Materials Selection and Design for Corrosion Control*** **Laboratory works:** • AFM examination of surface morphology • Corrosion rate measurement of steel • Oxidation kinetics of copper

Teaching/Learning Methodology

1. The teaching and learning methods include lectures/tutorial sessions, homework assignments, test, case study report and examination.
2. The continuous assessment and examination are aimed at providing students with integrated knowledge required for corrosion control.
3. Technical/practical examples and problems are raised and discussed in class/tutorial sessions.

Teaching/Learning Methodology	Intended subject learning outcomes		
	a	b	c
1. Lecture	√	√	√
2. Tutorial	√	√	√
3. Homework assignment	√	√	√
4. Case study report and presentation	√	√	√

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed		
		a	b	c
1. Homework assignment	20%	√	√	√
2. Test	20%	√	√	
3. Case study report and presentation	10%	√	√	√
4. Examination	50%	√	√	√
Total	100%			

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Overall Assessment:

$$0.50 \times \text{End of Subject Examination} + 0.50 \times \text{Continuous Assessment}$$

The continuous assessment consists of three components: homework assignments, test, and case study report & presentation. They are aimed at evaluating the progress of students study, assisting them in self-monitoring of fulfilling the respective subject learning outcomes, and enhancing the integration of the knowledge learnt.

The examination is used to assess the knowledge acquired by the students for understanding and analyzing the problems critically and independently; as well as to determine the degree of achieving the subject learning outcomes.

Student Study Effort Expected

Class contact:	
▪ Lecture	24 Hrs.
▪ Tutorial/Case study/Laboratory	15 Hrs.
Other student study effort:	
▪ Self Study	42 Hrs.
▪ Case study report preparation and presentation	24 Hrs.
Total student study effort	105 Hrs.

Reading List and References

1. David Talbot and James Talbot (1998), "*Corrosion Science and Technology*", *H749.H34B78*, latest edition.
2. Denny A. Jones (1996), *"Principles and Prevention of Corrosion", TA462.J59,* latest edition.
3. Mars G. Fontana (1986), *"Corrosion Engineering", TA418.74.F6*, latest edition.
4. J.C. Scully (1990), *"The Fundamentals of Corrosion", TA462.S39*, latest edition.
5. Samuel A. Bradford (2001), *"Corrosion Control", TA462.B648*, latest edition.

Subject Description Form

<table>
<tr><td>Subject Code</td><td>ME572</td></tr>
<tr><td>Subject Title</td><td>Design for Sustainable Development</td></tr>
<tr><td>Credit Value</td><td>3</td></tr>
<tr><td>Level</td><td>5</td></tr>
<tr><td>Pre-requisite/
Co-requisite/
Exclusion</td><td>Students should have basic knowledge in engineering and applied sciences.</td></tr>
<tr><td>Objectives</td><td>To provide students with knowledge of design for sustainable development.</td></tr>
<tr><td>Intended Learning Outcomes</td><td>Upon completion of the subject, students will be able to:
a. possess the knowledge of environmental issues in the manufacturing environment, environmental management system and design for environment;
b. apply their knowledge, skills and hand-on experience to design for environment; and
c. have recognition of the need for, and an ability to engage in life-long learning.</td></tr>
<tr><td>Subject Synopsis/
Indicative Syllabus</td><td>Introduction to Environmental Issues in the Manufacturing Environment: Global environmental issues; environmental issues in the manufacturing environment: air quality, water quality and hazardous waste issues; impact on our environment and health hazards; sustainable development.
Environmental Management System: Environmental management standards; development of ISO 14000 series; design and implementation of environmental management system; environmental auditing, environmental performance, life cycle assessment, and environmental labels and declarations; environmental products declarations.
Design for Environment: Introduction to design for environment; product life cycle; eco-design and traditional design; sustainable product design; integrated product and process design and development; eco-design strategies; packaging and distribution. materials recycling.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>
<table>
<tr><td rowspan="2">Teaching/Learning Methodology</td><td colspan="3">Intended subject learning outcomes</td></tr>
<tr><td>a</td><td>b</td><td>c</td></tr>
<tr><td>1. Lecture</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>2. Tutorial</td><td>√</td><td>√</td><td></td></tr>
<tr><td>3. Homework assignment</td><td>√</td><td>√</td><td></td></tr>
<tr><td>4. Case study report and presentation</td><td>√</td><td>√</td><td>√</td></tr>
</table>
1. The teaching and learning methods include lectures/tutorial sessions, homework assignments, test, case study report and examination.
2. The continuous assessment and examination are aimed at providing students with integrated knowledge required for design for sustainable development.
3. Technical/practical examples and problems are raised and discussed in class/tutorial sessions.</td></tr>
</table>

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed		
		a	b	c
1. Homework assignment	15%	√	√	
2. Test	20%	√	√	
3. Case study report and presentation	15%	√	√	√
4. Examination	50%	√	√	
Total	100%			

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Overall Assessment:

0.50 × End of Subject Examination + 0.50 × Continuous Assessment

The continuous assessment consists of three components: homework assignments, test, and case study report & presentation. They are aimed at evaluating the progress of students study, assisting them in self-monitoring of fulfilling the respective subject learning outcomes, and enhancing the integration of the knowledge learnt.

The examination is used to assess the knowledge acquired by the students for understanding and analyzing the problems critically and independently; as well as to determine the degree of achieving the subject learning outcomes.

Student Study Effort Expected

Class contact:	
▪ Lecture	24 Hrs.
▪ Tutorial/Case study	15 Hrs.
Other student study effort:	
▪ Self Study	45 Hrs.
▪ Case study report preparation and presentation	21 Hrs.
Total student study effort	105 Hrs.

Reading List and References

1. Allen D.T. and Shonnard D.R., *Green Engineering- Environmentally Conscious Design of Chemical Processes*, Prentice Hall, latest edition.
2. Azapagic A. and Perdan S., *Sustainable Development in Practice.* John Wiley, latest edition.
3. Block M.R., *Effective Implementation of ISO 14001*, ASQ Quality Press, latest edition.
4. Fiksel J., *Design for Environment: Creating Eco-Efficient Products and Processes*, McGraw Hill, latest edition.
5. Giudice F., Rosa G.L. and Risitano A., *Product Design for the Environment: A Life Cycle Approach*, CRC Press, latest edition.
6. Goosen M.F.A., Schaffner, F.C., Laboy-Nieves, E.N. and Abdelhadi, A.H., *Environmental Management, Sustainable Development and Human Health*, CRC Press, latest edition.
7. Kinsella J. and McCully, A.D., *Handbook for Implementing an ISO 14001 Environmental Management System: a Practical Approach*, Shaw Environmental, latest edition.
8. Morris A.S., *ISO14000 Environmental Management Standards- Engineering and Financial Aspects*, John Wiley & Sons Ltd., latest edition.
9. Piper L., Ryding S.O. and Henricson C., *Continual Improvement with ISO14000*, IOS Press, latest edition.
10. Sheldon C. and Yoxon M., *Environmental Management Systems: a Step-by-Step Guide to Implementation and Maintenance*, Earthscan, latest edition.
11. Wright R.T., *Environmental Science: Toward a Sustainable Future*, Pearson/Prentice Hall, latest edition.

Journals:

- International Journal of Sustainable Development and Planning, WIT Press.
- International Journal of Sustainable Engineering, Taylor & Francis.
- Sustainable Development, Wiley InterScience.
- The Journal of Sustainable Product Design, Springer.

Subject Description Form

<table>
<tr><td>Subject Code</td><td>ME573</td></tr>
<tr><td>Subject Title</td><td>Project on Product Design and Management</td></tr>
<tr><td>Credit Value</td><td>3</td></tr>
<tr><td>Level</td><td>5</td></tr>
<tr><td>Pre-requisite / Co-requisite/ Exclusion</td><td>Students should have basic knowledge in Engineering and Applied Sciences.</td></tr>
<tr><td>Objectives</td><td>The subject helps student to learn, through a capstone project, how to carry out market analysis and how to manage a project. Through this project, the student will develop teamwork skills and product development abilities.</td></tr>
<tr><td>Intended Learning Outcomes</td><td>Upon completion of the subject, students will be able to:
a. Think critically and holistically in dealing with product design project with real products, and generate realizable solutions.
b. Possess state-of-the-art knowledge and skills in the area of project on product design and management.</td></tr>
<tr><td>Subject Synopsis/ Indicative Syllabus</td><td>Overview of Marketing: Market needs research; dynamic marketing environment; identification and selection of markets; price determination and pricing strategies; knowledge of user requirements.
New Product Management: Product life cycle; product life management; user-centered and market-driven approaches; team dynamics, budget, specifications and time management techniques; quality assurance and ISO. risk management.
Capstone Project: A group product design project.
<u>Capstone project assessment:</u>
• Feasibility study report;
• Creativity, design considerations, analysis and work accomplishment;
• Group discussion on the progress (Peer evaluation is required.)
• An interim group oral presentation.
• A formal written group report and an oral presentation at the end of the study, effort of every member in the same project group should be clearly acknowledged.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>1. The teaching and learning methods include lectures/tutorial sessions, assignments, and group product design project.
2. The continuous assessment is aimed at providing students with integrated knowledge required for product design and management.
3. Technical/practical examples and problems are raised and discussed in class/tutorial sessions.

<table>
<tr><td rowspan="2">Teaching/Learning Methodology</td><td colspan="2">Intended subject learning outcomes</td></tr>
<tr><td>a</td><td>b</td></tr>
<tr><td>1. Lectures</td><td>√</td><td>√</td></tr>
<tr><td>2. Tutorials</td><td>√</td><td>√</td></tr>
<tr><td>3. Assignments</td><td>√</td><td>√</td></tr>
<tr><td>4. Group product design project</td><td>√</td><td>√</td></tr>
</table>
</td></tr>
</table>

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed	
		a	
1. Group assessment (Interim oral presentation & report, final project report & oral presentation)	50%	√	√
2. Individual assessment (Project proposal, conceptual designs, final oral presentation, peer assessment, test)	50% (30% for the Test)	√	√
Total	100%		

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Overall Assessment: 1.0 □ Continuous Assessment

The subject learning outcomes are achieved through a group product design project undertaken by the students. Each group consists of 3 to 4 students. Both individual and group level contributions are necessary to complete the project. The assessments are done based on the written reports, oral presentations and assignments submitted by the students periodically. The evaluations and the feedback provided will help the students in self-monitoring and fulfilling the respective subject learning outcomes, and enhancing the integration of the knowledge learnt.

Student Study Effort Expected

Class contact:	
• Lecture	16 Hrs.
• Tutorial/Consultation	23 Hrs.
Other student study effort:	
• Self Study/Group activities	45 Hrs.
• Project report preparation and presentation	21 Hrs.
Total student study effort	105 Hrs.

Reading List and References

Textbook:

1. Karl T. Ulrich and Steven D. Eppinger, Product Design and Development, McGraw-Hill, 2008.

References:

1. George E. Dieter and Linda C. Schmidt, Engineering Design, McGraw- Hill, 2009.
2. Product realization [electronic resource]: a comprehensive approach/Mileta M. Tomovic, Shaoping Wang, (http://www.springerlink.com/content/978-0-387-09481-6)
3. E-Book: Project management in new product development [electronic resource]/Burce T. Barkley, Sr. (http://lib.myilibrary.com/browse/open.asp?id=110947&loc=)

Subject Description Form

<table>
<tr><td>Subject Code</td><td>ME574</td></tr>
<tr><td>Subject Title</td><td>Product Noise Control</td></tr>
<tr><td>Credit Value</td><td>3</td></tr>
<tr><td>Level</td><td>5</td></tr>
<tr><td>Pre-requisite/
Co-requisite/
Exclusion</td><td>Students should have basic knowledge in Dynamics and Thermofluids.</td></tr>
<tr><td>Objectives</td><td>To provide the advanced knowledge of noise radiation mechanisms including the vibration of moving parts and flow induced noise. The principle and methodology of noise control, in particular during designing a product, are then demonstrated with a few of examples.</td></tr>
<tr><td>Intended Learning Outcomes</td><td>Upon completion of the subject, students will be able to:
a. possess state-of-the-art knowledge and skills in the area of noise radiation mechanisms and noise/vibration control principles;
b. apply their knowledge, skills and hand-on experience to design, develop, manufacture, and analyze new products by considering noise/vibration control and keeping aware of the environmental issues, existing regulation and policies concerning noise control;
c. extend their knowledge of noise radiation mechanism and noise/vibration control principles to different situations of engineering context and professional practice; and
d. have recognition of the need for, and an ability to engage in life-long learning.</td></tr>
<tr><td>Subject Synopsis/
Indicative Syllabus</td><td>Acoustic Quality of Products: Basics of sound radiation; hearing and hearing loss; A-weighting; Characterization of sound sources and sound propagation; ISO standards of noise source testing for typical products and industrial facilities, use of anechoic and reverberation chambers.
Basic Sources of Product Noise: Mechanisms, estimates and measurement of noise radiated by a variety of mechanical equipment such as fans, blowers, compressors, pumps, cooling towers, turbines and jets; flow-induced noise.
Noise Abatement Techniques and Applications: Sound absorption by fibrous materials, sound reflection by impedance discontinuities, active noise control; noise isolation, enclosures, control of flow noise in fans, pumps and compressors, silencers/mufflers and other control of noise along its propagation path.
Vibration Control and Applications: Structural response to excitation, vibration and flutter of engineering structure; active and passive vibration control and suppression; structural vibration control for engineering products, including bridge, aircraft, etc.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>1. The teaching and learning methods include lectures/tutorial sessions, homework assignments, test, case study report and examination.
2. The continuous assessment and examination are aimed at providing students with integrated knowledge required for product noise control.
3. Technical/practical examples and problems are raised and discussed in class/tutorial sessions.
<table>
<tr><td rowspan="2">Teaching/Learning Methodology</td><td colspan="4">Intended subject learning outcomes</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td></tr>
<tr><td>1. Lecture</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>2. Tutorial</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>3. Homework assignment</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>4. Case study report and presentation</td><td>√</td><td>√</td><td>√</td><td></td></tr>
</table>
</td></tr>
</table>

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed			
		a	b	c	d
1. Homework assignment	20%	√	√	√	√
2. Test	20%	√	√		
3. Case study report and presentation	10%	√	√	√	
4. Examination	50%	√	√	√	√
Total	100%				

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Overall Assessment:

$0.50 \times$ End of Subject Examination + $0.50 \times$ Continuous Assessment

The continuous assessment consists of three components: homework assignments, test, and case study report & presentation. They are aimed at evaluating the progress of students study, assisting them in self-monitoring of fulfilling the respective subject learning outcomes, and enhancing the integration of the knowledge learnt.

The examination is used to assess the knowledge acquired by the students for understanding and analyzing the problems critically and independently; as well as to determine the degree of achieving the subject learning outcomes.

Student Study Effort Expected

Class contact:	
▪ Lecture	24 Hrs.
▪ Tutorial/Case study/Laboratory	15 Hrs.
Other student study effort:	
▪ Self Study	45 Hrs.
▪ Case study report preparation and presentation	21 Hrs.
Total student study effort	105 Hrs.

Reading List and References

1. Beranek L. L. and Ver I. L. (editors), *Noise and Vibration Control Engineering, principles and applications*. New York: Wiley, latest edition.
2. Pierce A. D., *Acoustics: An Introduction to its Physical Principles and Applications*. Woodbury, N.Y. : Acoustical Society of America, latest edition.
3. Fahy F., *Sound Intensity*. London : E & FN Spon, latest edition.
4. Koopmann G. H., *Designing Quiet Structures: A Sound Power Minimization Approach*. San Diego : Academic Press, latest edition.
5. Crocker M. J. (editor), *Handbook of Acoustics*. New York : Wiley, latest edition.

Subject Description Form

<table>
<tr><td>Subject Code</td><td>ME576</td></tr>
<tr><td>Subject Title</td><td>Turbulent Flows and Aerodynamics</td></tr>
<tr><td>Credit Value</td><td>3</td></tr>
<tr><td>Level</td><td>5</td></tr>
<tr><td>Pre-requisite/
Co-requisite/
Exclusion</td><td>Students should have basic knowledge in fundamental fluid mechanics.

Exclusion: ME568 Flow System Design and Analysis</td></tr>
<tr><td>Objectives</td><td>To provide students with knowledge of advanced fluid mechanics and aerodynamics knowledge.</td></tr>
<tr><td>Intended Learning Outcomes</td><td>Upon completion of the subject, students will be able to:
a. possess state-of-the-art knowledge in the area of advanced fluid dynamics, typical engineering flows and aerodynamics;
b. apply their knowledge, skills and hand-on experience, gained from the subject, to the design and analysis of engineering flow and aeronautical systems;
c. extend their knowledge of mechanical engineering to different situations of engineering context and professional practice; and
d. have recognition of the need for, and an ability to engage in life-long learning.</td></tr>
<tr><td>Subject Synopsis/
Indicative Syllabus</td><td>A Review of Kinematics and Dynamics of Flow Fields: Eulerian and Lanrangian descriptions; rotational and irrotational flows; acceleration of a fluid particle; Euler’s equation; Bernoulli’s equation; conservation equations of mass; momentum and energy.

Time-averaged Conservation Equations: Reynolds-averaged equations of mass; momentum and energy conservations; turbulence modelling: large-eddy simulation, eddy-viscosity hypothesis, mixing length models and two equation transport models.

Typical Turbulent Flows: Wakes of bluff bodies, plane and round jets, mixing layers, boundary layers, pipe and channel flows.

Compressible Flows: Subsonic compressible flows. Transonic, supersonic and hypersonic flows. Stagnation properties; one-dimensional isentropic flow; isentropic flow through nozzles; shock waves and expansion waves.

Aerodynamic Characteristic of Airfoils and Wings: Vortex street; vortex street in thin-airfoil theory; properties of the symmetrical airfoil; properties of the cambered airfoil; flapped airfoil. Wings of finite span: lift, drag, lift/drag ratio.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>1. The teaching and learning methods include lectures/tutorial sessions, homework assignments, test, case study report and examination.
2. The continuous assessment and examination are aimed at providing students with integrated knowledge required for flow and aerodynamic system design and analysis.
3. Technical/practical examples and problems are raised and discussed in class/tutorial sessions.
<table>
<tr><td rowspan="2">Teaching/Learning Methodology</td><td colspan="4">Intended subject learning outcomes</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td></tr>
<tr><td>1. Lecture</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>2. Tutorial</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>3. Homework assignment</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>4. Case study report and presentation</td><td>√</td><td>√</td><td>√</td><td></td></tr>
</table>
</td></tr>
</table>

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed			
		a	b	c	d
1. Homework assignment	20%	√	√	√	√
2. Case study report and presentation	20%	√	√	√	
3. Examination	60%	√	√	√	√
Total	100%				

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Overall Assessment:

$0.60 \times$ End of Subject Examination + $0.40 \times$ Continuous Assessment

The continuous assessment consists of three components: homework assignments and case study report & presentation. They are aimed at evaluating the progress of students study, assisting them in self-monitoring of fulfilling the respective subject learning outcomes, and enhancing the integration of the knowledge learnt.

The examination is used to assess the knowledge acquired by the students for understanding and analyzing the problems critically and independently; as well as to determine the degree of achieving the subject learning outcomes.

Student Study Effort Expected

Class contact:	
▪ Lecture	24 Hrs.
▪ Tutorial/Case study/Laboratory	15 Hrs.
Other student study effort:	
▪ Self Study	45 Hrs.
▪ Case study report preparation and presentation	21 Hrs.
Total student study effort	105 Hrs.

Reading List and References

1. Cengel Y A, Cimbala J M, *Fluid Mechanics: Fundamentals and Applications*. McGraw Hill, latest edition.
2. Kuethe A M, Chow C-Y, *Fundamentals of Aerodynamics: Bases of Aerodynamic Design*, John Wiley & Sons, Inc. latest edition.
3. Rathakrishnan E, *Gas Dynamics*, PHI Learning Private Ltd., latest edition.

Subject Description Form

<table>
<tr><td>Subject Code</td><td>ME577</td></tr>
<tr><td>Subject Title</td><td>Advanced Aircraft Structures</td></tr>
<tr><td>Credit Value</td><td>3</td></tr>
<tr><td>Level</td><td>5</td></tr>
<tr><td>Pre-requisite/
Co-requisite/
Exclusion</td><td>Nil</td></tr>
<tr><td>Objectives</td><td>To provide students the key knowledge relevant to the structures and composite materials in aircraft; to provide students with tools of stress analysis to formulate and solve engineering problems in aircraft structures.</td></tr>
<tr><td>Intended Learning Outcomes</td><td>Upon completion of the subject, students will be able to:
a. demonstrate a good understanding of key aspects of aircraft structures, components and systems;
b. analyze an aircraft structure subject to a combined state of loading using stress analysis tools;
c. apply failure criteria to analyze an aircraft structure subject to loading;
d. formulate and solve problems concerning compression/tension, bending, torsion and buckling in aircraft structures;
e. understand mechanical behaviors of composites used in aircraft;
f. analyze the effects of various loads or displacement boundary conditions on aircraft structures; and
g. gain appreciation of the wide design flexibility composites in aircraft.</td></tr>
<tr><td>Subject Synopsis/
Indicative Syllabus</td><td>Characteristics of Aircraft Structures and Materials: Structural elements in aircraft. Wing, fuselage, tail and landing gear. Aircraft materials.
Elasticity: Stress and strain. Equations of equilibrium. Principal stresses. Linear stress-strain relations. Elastic strain energy. St. Venant’s principle. Thin plate theory.
Loads Applied on Aircraft: Compression/tension. Torsion. Bending. Closed single-cell thin-walled sections. Transverse shear stress. Flexural shear in thin-walled sections and in open thin-walled section. Buckling of columns. Aircraft structures under combined loading.
Failure Criteria for Isotropic Materials: Strength criteria for brittle materials. Yield criteria for ductile materials. Fracture mechanics. Stress intensity factor. Fatigue.
Aircraft Composites: Classification and characteristics of composite materials. Mechanical behavior of composite materials. Interface properties. Processing and Fabrication techniques for aircraft composites. Analysis of Lamina and Laminates Failures of composites.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>Lectures are used to deliver the fundamental knowledge in relation to aircraft structures and composites (outcomes a to g).
Tutorials are used to illustrate the application of fundamental knowledge to practical situations (outcomes a to g).
<table>
<tr><td rowspan="2">Teaching/Learning Methodology</td><td colspan="7">Intended subject learning outcomes</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td><td>f</td><td>g</td></tr>
<tr><td>Lecture</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>Tutorial</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
</table>
</td></tr>
</table>

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed						
		a	b	c	d	e	f	g
1. Examination	50%	√	√	√	√	√	√	√
2. Assignment and test	50%	√	√	√	√	√	√	√
Total	100%							

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Overall Assessment:

$0.50 \times$ End of Subject Examination + $0.50 \times$ Continuous Assessment

Examination is adopted to assess students on the overall understanding and the ability of applying the concepts. It is supplemented by continuous assessment including assignments and closed-book tests. The continuous assessment is aimed at enhancing the students' comprehension and assimilation of various topics of the syllabus.

All assigned homework inclusive of any computer problems should be worked independently. It is the students' responsibilities to work out the problems individually and to ask questions on those problems they have difficulty with. Unless stated otherwise, no group submission or copies are permitted. If a copy is detected, a zero score will be assigned.

Student Study Effort Expected

Class contact:	
▪ Lecture	24 Hrs.
▪ Tutorial/Case Study	15 Hrs.
Other student study effort:	
▪ Course work	42 Hrs.
▪ Self-study	25 Hrs.
Total student study effort	106 Hrs.

Reading List and References

1. C.T. Sun, Mechanics of Aircraft Structures, John Wiley & Sons, 1998.
2. T.H.G. Megson, Aircraft Structures for Engineering Students, Elsevier, 2007.
3. R.F. Gibson, Principles of Composite Material Mechanics, McGraw-Hill International Editions, 1994.
4. I. Moir and A.G. Seabridge, Design and Development of Aircraft Systems – An Introduction, AIAA Education Series, 2004.

Subject Description Form

Subject Code	ME578
Subject Title	Aircraft Design
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	To provide students with the key knowledge relevant to the process and principle of aircraft design, especially from aerodynamic point of view, and the capacity to formulate the design requirements for an aircraft using modern engineering tools; to provide students with the opportunity to conduct aircraft system design studies from aerodynamics, propulsion, structure, stability, and performance perspectives; to develop management skills in teamwork and develop skills in carrying out detailed design tasks.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. understand fundamental concepts and constraints during an aircraft design process; b. evaluate common aircraft configurations; c. design and layout aircraft major components; d. understand engine characteristics; e. identify key design features from aerodynamic point of view; f. design and sizing aircraft that meets aerodynamic requirements; g. develop a simple aircraft design program; h. understand airworthiness and safety consideration during an aircraft design process; i. Able to analyze aircraft performance based on aerodynamics.
Subject Synopsis/ Indicative Syllabus	***Introduction to Aircraft Design:*** Design method and basic requirements. Evolution of aircraft design and its performance: a brief history. Overview of aircraft design cycle and process. ***Aircraft Configuration:*** CAdvantages and drawbacks of conventional and alternative configurations. Considerations for special aircraftSpecial considerations. Primary considerations for fuselage and wingfuselage, wing, and tail design. ***Jet propulsion:*** Basic considerations in the analysis of jet propulsion. Gas-turbine engines. Inter-cooling. Reheating. Regeneration. Ideal jet-propulsion cycles. Modifications to turbojet engines. ***Aerodynamic consideration of aircraft design:*** Fundamentals of aerodynamics. Flow separation. Friction and pressure drag. Parallel flow over flat plate and wings. Airfoils. Finite wings. Drag and lift. Lift-to-drag ratio. Dependence of lift and drag on the angle of attack. Flapped airfoils. End effects of wing tips. Induced drag. ***Sizing and Costing:*** Internal layout. Structures and weight. Geometry constraints. Sizing equation. Weight fraction method. Weight and balance. Cost analysis. Elements of life-cycle cost. Cost-estimating methods. Operations and maintenance costs. Cost measures of merit. ***Main Components Selection and Design:*** Selection and design of main components such as fuselage, wing, tail, and landing gear. Calculation and design of control surfaces such as aileron, elevator, and rudder. ***Airworthiness and Safety:*** Airworthiness requirements. Load factor determination. Aircraft safety. Airframe loads. Designing against fatigue. Prediction of aircraft fatigue life. ***Mini project practice:*** A design project will be carried out for students to learn the aircraft design process through practice.

Teaching/Learning Methodology

Lectures are used to deliver the fundamental knowledge in relation to aircraft design (outcomes a to h).

Tutorials are used to illustrate the application of fundamental knowledge to practical situations (outcomes a to h).

Teaching/Learning Methodology	Intended subject learning outcomes							
	a	b	c	d	e	f	g	h
Lecture	√		√		√		√	√
Tutorial	√		√		√		√	√
Min project		√		√		√		

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed							
		a	b	c	d	e	f	g	h
1. Examination	50%	√	√	√	√	√	√	√	√
2. Assignment	20%	√	√	√	√	√	√	√	√
3. Group mini-project	30%	√	√		√	√	√		
Total	100%								

Overall Assessment:

0.50 × End of Subject Examination + 0.50 × Continuous Assessment

Examination is adopted to assess students on the overall understanding and the ability of applying the concepts. It is supplemented by continuous assessment including assignments, closed-book tests and group mini-project. The continuous assessment is aimed at enhancing the students' comprehension and assimilation of various topics of the syllabus. In particular, group mini-project is used to assess the students' capacities of self-learning and problem-solving and effective communication skill in English so as to fulfill the requirements of being aircraft design engineers.

All assigned homework inclusive of any computer problems should be worked independently. It is the students' responsibilities to work out the problems individually and to ask questions on those problems they have difficulty with. Unless stated otherwise, no group submission or copies are permitted. If a copy is detected, a zero score will be assigned.

Student Study Effort Expected

Class contact:	
▪ Lecture	24 Hrs.
▪ Tutorial/Case Study	15 Hrs.
Other student study effort:	
▪ Course work	42 Hrs.
▪ Self-study	25 Hrs.
Total student study effort	106 Hrs.

Reading List and References

1. D. Raymer, Aircraft Design: A Conceptual Approach. American Institute of Aeronautics and Astronautics, Inc., 2018.
2. S.A. Brandt, *et al*., Introduction to Aeronautics: A Design Perspective, American Institute of Aeronautics and Astronautics Inc., 20042015.
3. D.P. Raymer, Aircraft Design : A Conceptual Approach, American Institute of Aeronautics and Astronautics Inc., 1999.
4. J. Anderson, Introduction to Flight. McGraw Hill, 2015.J. Anderson, Fundamentals of aerodynamics, 8th ed. McGraw Hill, 2011.

Subject Description Form

<table>
<tr><td>Subject Code</td><td>ME579</td></tr>
<tr><td>Subject Title</td><td>Aircraft Noise and Aeroacoustics</td></tr>
<tr><td>Credit Value</td><td>3</td></tr>
<tr><td>Level</td><td>5</td></tr>
<tr><td>Pre-requisite/
Co-requisite/
Exclusion</td><td>Students should have fundamental knowledge in acoustics and fluid mechanics.</td></tr>
<tr><td>Objectives</td><td>To provide students in-depth knowledge of the noise generation mechanisms of aircraft noise and its environmental issues. Analysis using aeroacoustic theory will be introduced.</td></tr>
<tr><td>Intended Learning Outcomes</td><td>Upon completion of the subject, students will be able to:
a. possess state-of-the-art knowledge and skills in the area of aircraft noise;
b. apply their knowledge, skills and hand-on experience to analyze the noise generation of key aircraft components, its radiation and environmental consequences;
c. extend their ability to integrate various noise suppression techniques in achieving quiet design and operation of aircraft; and
d. have recognition of the need for, and an ability to engage in life-long learning.</td></tr>
<tr><td>Subject Synopsis/
Indicative Syllabus</td><td>Noise Radiation from Aircraft: Aircraft noise descriptors. Human response to aircraft noise. Actions against aircraft noise. Noise certification and regulation.
Introduction to Aeroacoustic Theory: Equation of linear acoustics. Free-space Green’s function. Acoustics of point sources. Lighthill’s acoustic analogy and its extensions. Acoustics of turbulence near a rigid body. Radiation from compact and non-compact sources. Fuselage dynamics and cabin noise.
Noise Source Mechanisms: Airframe noise. Propeller noise. Fan and compressor noise. Turbine noise. Jet noise. Combustor noise. Sonic boom. Helicopter noise. Interior noise.
Noise Control: Noise control at sources. Cabin noise control. Quiet aircraft design and operational characteristics. Quiet airport operation.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>1. The teaching and learning methods include lectures/tutorial sessions, homework assignments, test, case study report and examination.
2. The continuous assessment and examination are aimed at providing students with integrated knowledge required for understanding and analysis of aircraft noise.
3. Technical/practical examples and problems are raised and discussed in class/tutorial sessions.

<table>
<tr><td rowspan="2">Teaching/Learning Methodology</td><td colspan="4">Intended subject learning outcomes</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td></tr>
<tr><td>1. Lecture</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>2. Tutorial</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>3. Homework assignment</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>4. Case study report and presentation</td><td>√</td><td>√</td><td>√</td><td></td></tr>
</table>
</td></tr>
</table>

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed			
		a	b	c	d
1. Homework assignment	20%	√	√	√	√
2. Test	20%	√	√		
3. Case study report and presentation or Laboratory	10%	√	√	√	√
4. Examination	50%	√	√	√	√
Total	100%				

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Overall Assessment:

0.50 × End of Subject Examination + 0.50 × Continuous Assessment

The continuous assessment consists of three components: homework assignments, test, and case study report & presentation. They are aimed at evaluating the progress of students study, assisting them in self-monitoring of fulfilling the respective subject learning outcomes, and enhancing the integration of the knowledge learnt.

The examination is used to assess the knowledge acquired by the students for understanding and analysing the problems critically and independently; as well as to determine the degree of achieving the subject learning outcomes.

Student Study Effort Expected

Class contact:	
▪ Lecture	24 Hrs.
▪ Tutorial/Case study/Laboratory	15 Hrs.
Other student study effort:	
▪ Self Study	45 Hrs.
▪ Case study report preparation and presentation	21 Hrs.
Total student study effort	105 Hrs.

Reading List and References

Textbooks:

1. Crighton, D. G., Dowling, A. P., Ffowcs Williams, J. E., Heckl, M., Leppington, F. G., *Modern Methods in Analytical Acoustics – Lecture Notes*, Springer, latest edition.
2. Goldstein, M. E., *Aeroacoustics*, McGraw-Hill, latest edition.
3. Howe, M. S., *Theory of Vortex Sound*, Cambridge University Press, latest edition.
4. Hubbard, H. H. (Ed.), *Aeroacoustics of Flight Vehicles – Theory and Practice*, *Vols. 1 & 2*, Acoustical Society of America, latest edition.
5. Nelson, P. M. (Ed.), *Transportation Noise Reference Book*, Butterworths, latest edition.
6. Pierce, A. D., *Acoustics – An Introduction to Its Physical Principles and Applications*, Acoustical Society of America, latest edition.
7. Smith, M. J. T., *Aircraft Noise*, Cambridge University Press, latest edition.

Journals:

1. *AIAA Journal*, American Institute of Aeronautics and Astronautics.
2. *International Journal of Aeroacoustics,* Multi-Science.
3. *Journal of the Acoustical Society of America*, Acoustical Society of America.
4. *Journal of Sound and Vibration*, Academic Press.

Subject Description Form

Subject Code	ME583
Subject Title	Advanced Avionics Systems
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Students should have basic knowledge in mathematics, electronics, and physics.
Objectives	To provide students with knowledge of communications, electronics and electrical aspects of avionics, including aircraft electrical systems, aircraft instruments and integrated systems, and navigation systems
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. possess state-of-the-art knowledge and skills in the area of advanced avionics systems; b. apply their knowledge, skills and hand-on experience to design, develop, manufacture, and analyze new products with advanced avionics systems for desired needs; c. extend their knowledge of advanced avionics systems to different situations of engineering context and professional practice; and d. have recognition of the need for, and an ability to engage in life-long learning.
Subject Synopsis/ Indicative Syllabus	***Importance and Role of Avionics:*** The avionic environment. Increased role of digital electronics in modern flight control systems. ***Reliability and Fault-tolerant Systems:*** Basic concepts. Tools and techniques in reliability estimation of fault-tolerant systems. ***Terrestrial Radio Navigation & Landing Aids:*** NDB**;** VOR; DVOR; DME; ILS & GP; Radar altimeters & AID. ***Aircraft Integrated Systems:*** Integrated system of substantially all aircraft attitude and flight path command and control parameters and mode annunciation for the flight director and automatic pilot systems. Real time software and advanced distributed architectures. ***Airborne Communications Systems:*** VHF & HF transceivers, VDL modes; NAVCOM; EPIRB. ***Inertial Sensors and Navigation Systems:*** Gyros and accelerometers. Inertial navigation system. Strapdown system. Mechanization, Quaternions, Attitude and heading reference systems. Global position systems . ***Fly-by-wire Flight Control:*** FBW flight control features. Control laws. Safety and integrity. Redundancy and failure survival. Digital implementation and problems. Flight control software functions. ***Global Navigation Satellite System:*** Required navigation performance. Alternative positioning, navigation and timing services. Performance-based navigation. Automatic dependent surveillance broadcast. the required navigation performance; accuracy and integrity; least squares and estimation theory; satellite position determination; DOP. ***Aircraft Based Augmentation System:*** single point positioning, RAIM, consistency check, protection level, availability prediction ***Satellite Based Augmentation System:*** large area differential positioning, ionosphere correction, integrity information, example systems ***Ground Based Augmentation System:*** local area differential positioning, threats characterization, integrity monitoring, future development. **Integrated navigation system:** GNSS/INS integration, loosely-coupled integration, tightly-coupled integration, Kalman filter ***Case study and/or Technical Visits:*** • Technical visits to an aircraft maintenance organization's avionics workshop and/or airline's flight simulator. • Case study on an avionics system/avionics subsystem/avionics component.

Teaching/Learning Methodology

1. The teaching and learning methods include lectures/tutorial sessions, homework assignments, test, case study report and examination.
2. The continuous assessment and examination are aimed at providing students with integrated knowledge required for advanced avionics systems.
3. Technical/practical examples and problems are raised and discussed in class/tutorial sessions.

Teaching/Learning Methodology	Intended subject learning outcomes			
	a	b	c	d
1. Lecture	√	√	√	√
2. Tutorial	√	√	√	√
3. Homework assignment	√	√	√	√
4. Case study report and presentation	√	√	√	

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed			
		a	b	c	d
1. Homework assignment	20%	√	√	√	√
2. Test	20%	√	√		
3. Case study report and presentation	20%	√	√	√	
4. Examination	40%	√	√	√	√
Total	100%				

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Overall Assessment:

0.40 × End of Subject Examination + 0.60 × Continuous Assessment

The continuous assessment consists of three components: homework assignments, test, and case study report & presentation. They are aimed at evaluating the progress of students study, assisting them in self-monitoring of fulfilling the respective subject learning outcomes, and enhancing the integration of the knowledge learnt.

The examination is used to assess the knowledge acquired by the students for understanding and analyzing the problems critically and independently; as well as to determine the degree of achieving the subject learning outcomes.

Student Study Effort Expected

Class contact:	
▪ Lecture	24 Hrs.
▪ Tutorial/Case study/Laboratory	15 Hrs.
Other student study effort:	
▪ Self Study	45 Hrs.
▪ Case study report preparation and presentation	21 Hrs.
Total student study effort	105 Hrs.

Reading List and References

1. Collinson R.P.G., *Introduction to Avionics Systems*, Springer, latest edition.
2. Tooley M, and Wyatt, *Aircraft Electrical and Electronic Systems: Principles, Maintenance and Operation*, Elsevier Ltd, latest edition.
3. Helfrick A, *Principles of Avionics*, Avionics Communications, latest edition.
4. Kayton Myron Walter R. *Fried Avionics Navigation Systems*, John Wiley and Son, Published online, latest edition.

Subject Description Form

Subject Code	ME584
Subject Title	Airworthiness and Maintenance
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	To provide students with knowledge of airworthiness and aircraft maintenance to facilitate compliance with the mandatory civil airworthiness requirements.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. understand the objectives and mandatory requirements of airworthiness and the role of regulatory bodies; b. know the characteristics of different maintenance strategieprocesses; c. analyze the time dependenceapply reliability analysis of failure rates in alert level development; and d. establish the reliability alert levels for transport category aircraft; and e. identify the essential qualities of a Condition Monitored Maintenance Programme.
Subject Synopsis/ Indicative Syllabus	***Airworthiness Regulation:*** Role of the HK CAD Airworthiness Office. HK Air Operator Certificate. HKAR-145 Approved Maintenance Organization. Management commitment and responsibility. Safety accountabilities of AMO managers. ***Airworthiness Certification:*** Compliance with the HK airworthiness codes. Airworthiness Certificate requirements in respect of civil aircraft – engines and associated equipment, aircraft radio equipment, aeronautical materials, etc. Maintenance, overhaul and repair manuals. Continued airworthiness – responsibilities of the operator. ***HK Airworthiness Requirements:*** Airworthiness procedures. Administrative and guidance materials. Certification of aircraft and related products, parts and appliances, and of design and production organisations. Licensing of maintenance personnel. Approved maintenance organisations. Approved maintenance training/examination. Minimum equipment list. ***Reliability and System Availability:*** Failure probability distributions. Parallel and series hybrid systems. Failure characteristics of aircraft mechanical, electrical and electronic components. System redundancy and availability evaluation. Mean time between unscheduled removal(MTBUR). Mean time between failure(MTBF). ***Condition Monitored Maintenance Application:*** Primary maintenance processes. Transport category aircraft. Maintenance review board and maintenance steering group procedures. Pireps. Flight crew reports of unscheduled engine shut-downs. Line maintenance reports on mechanical delays and cancellations. Miscellaneous reports, especially on component unscheduled removals and confirmed failures. Reliability alert levels. Compliance with civilcontinuous airworthiness requirements. Maintenance steering group logic analysis. ***Maintenance Error Management:*** Safety management system. Human factors in aircraft maintenance and inspection. Technical maintenance planning. Mandatory occurrence reporting. Required inspection items – continuing analysis and surveillance.

Teaching/Learning Methodology

1. The teaching and learning methods include lectures/tutorial sessions, homework assignments, test, case study report and examination.
2. The continuous assessment and examination are aimed at providing students with integrated knowledge required for advanced materials and structural design.
3. Technical/practical examples and problems are raised and discussed in class/tutorial sessions.

Teaching/Learning Methodology	Intended subject learning outcomes			
	a	b	c	d
1. Lecture	√	√	√	√√
2. Tutorial	√	√	√	√
3. Homework assignment	√	√	√	√
4. Case study report and presentation	√	√	√	√

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed			
		a	b	c	d
1. Homework assignment	20%	√	√	√	√
2. Test	20%	√	√	√	√
3. Case study report and presentation	20%	√	√	√	√√
4. Examination	40%	√	√	√	√
Total	100%				

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Overall Assessment:

$0.40 \times$ End of Subject Examination + $0.60 \times$ Continuous Assessment

The continuous assessment consists of three components: homework assignments, test, and case study report & presentation. They are aimed at evaluating the progress of students study, assisting them in self-monitoring of fulfilling the respective subject learning outcomes, and enhancing the integration of the knowledge learnt.

The examination is used to assess the knowledge acquired by the students for understanding and analyzing the problems critically and independently; as well as to determine the degree of achieving the subject learning outcomes.

Student Study Effort Expected

Class contact:	
▪ Lecture	24 Hrs.
▪ Tutorial/Case study/Laboratory	15 Hrs.
Other student study effort:	
▪ Self Study	45 Hrs.
▪ Case study report preparation and presentation	21 Hrs.
Total student study effort	105 Hrs.

Reading List and References

1. Lewis, E.E. Introduction to reliability engineering, John Wiley & Sons, latest edition.
2. Pham, H. Handbook of reliability engineering. Springer, latest edition.
3. HK Civil Aviation Department. CAD 418, Condition Monitored Maintenance: an Explanatory Handbook, latest edition.

Subject Description Form

<table>
<tr><td>Subject Code</td><td>ME585</td></tr>
<tr><td>Subject Title</td><td>Human Factors in Aircraft Maintenance</td></tr>
<tr><td>Credit Value</td><td>3</td></tr>
<tr><td>Level</td><td>5</td></tr>
<tr><td>Pre-requisite/
Co-requisite/
Exclusion</td><td>Nil</td></tr>
<tr><td>Objectives</td><td>To provide practical Human Factors guidance — based on international recommended practices — to aircraft maintenance engineers and to introduce the non-specialist to Human Factors issues in aircraft maintenance and inspection.</td></tr>
<tr><td>Intended Learning Outcomes</td><td>Upon completion of the subject, students will be able to:
a. have a better understanding of contemporary aircraft maintenance and inspection problems;
b. categorize human errors in the maintenance environment;
c. realize the need of good communication, teamwork, training methods and facilities in aircraft maintenance; and
d. know the importance of team work and organizational issues; and
e. be aware of develop maintenance error prevention strategies.</td></tr>
<tr><td>Subject Synopsis/
Indicative Syllabus</td><td>Contemporary Maintenance Problems: Design defects and technical failures. Aircraft maintenance and inspection errors and violations.
Human Factor Models: Basic concept of human factors. Shell model. Reason model. Dirty Dozen.
Human Error in Aircraft Maintenance and Inspection: Leading maintenance re-occurrence discrepancies. Main categories of maintenance error. Organizational perspective examples of maintenance error.
HF Issues Affecting Aircraft Maintenance: Information exchange and communication. Training of aircraft maintenance engineers. Impact of teamwork, facilities and work environment.
Teams and Organizational Issues in Aircraft Maintenance: Team work, Job design, reward systems, selection & staffing and training.
Error Prevention Strategies: Organization of maintenance data. Error reduction, capture and tolerance. Application of Maintenance Error Decision Aid.Gap between the maintenance community and psychology.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>1. The teaching and learning methods include lectures/tutorial sessions, homework assignments, test, case study report and examination.
2. The continuous assessment and examination are aimed at providing students with integratedessential knowledge required for advanced materials and structural designhuman factor analysis of aviation occurrences.
3. Technical/practical examples and problems are raised and discussed in class/tutorial sessions.
<table>
<tr><td rowspan="2">Teaching/Learning Methodology</td><td colspan="4">Intended subject learning outcomes</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td></tr>
<tr><td>1. Lecture</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>2. Tutorial</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>3. Homework assignment</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>4. Case study report and presentation</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
</table></td></tr>
<tr><td>Assessment Methods in Alignment with</td><td>
<table>
<tr><td>Specific assessment</td><td>%</td><td>Intended subject learning outcomes to</td></tr>
</table></td></tr>
</table>

Intended Learning Outcomes

methods/tasks	weighting	be assessed			
		a	b	c	d
1. Homework assignment	20%	√	√	√	√
2. Test	20%	√	√	√	√
3. Case study report and presentation	20%	√	√	√	√
4. Examination	40%	√	√	√	√
Total	100%				

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Overall Assessment:

0.40 × End of Subject Examination + 0.60 × Continuous Assessment

The continuous assessment consists of three components: homework assignments, test, and case study report & presentation. They are aimed at evaluating the progress of students study, assisting them in self-monitoring of fulfilling the respective subject learning outcomes, and enhancing the integration of the knowledge learnt.

The examination is used to assess the knowledge acquired by the students for understanding and analyzing the problems critically and independently; as well as to determine the degree of achieving the subject learning outcomes.

Student Study Effort Expected

Class contact:	
▪ Lecture	24 Hrs.
▪ Tutorial/Case study/Laboratory	15 Hrs.
Other student study effort:	
▪ Self Study	45 Hrs.
▪ Case study report preparation and presentation	21 Hrs.
Total student study effort	105 Hrs.

Reading List and References

1. ICAO. Human Factors Digest No.12. Human Factors in Aircraft Maintenance and Inspection. ICAO. Montreal:Canada, latest edition.
2. Hollnagel, E. Human Reliability Analysis-Context & Control. San Diego. CA:Academic Press, latest edition.
3. Reason, J. & Hobbs, A. Managing Maintenance Error: A Practical Guide. London, UK:Ashgate Publishing, latest edition.

Subject Description Form

Subject Code	ME586
Subject Title	Operations Research in Aviation
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	To provide students with knowledge of operations research methods for application in the aviation industry. These methods would equip students with the necessary tools to interpret, analyze and solve aviation operational problems.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. formulate and solve flight scheduling and aircraft routing problems; b. apply network planning in engine overhaul and resources allocation; c. develop appropriate aircraft maintenance/replacement strategy; d. derive the availability of repairable aircraft systems; e. estimate the number of mechanical installations such as baggage conveyor system in a new airport; and f. forecast air traffic for airport operations management.
Subject Synopsis/ Indicative Syllabus	***Decision Making with Uncertain Demand:*** Decision criteria under uncertainty. Discrete and continuous probability distributions. Uncertain demand examples in airport operations and maintenance planning. ***Linear Programming:*** The linear programming model and assumptions. Sensitivity analysis. Advantages and cautions of linear programming methods. Application in production and service scheduling. ***Transportation Methods:*** Methods of solving the transportation problem. Optimization of distribution schedules. Applications in aircraft routing and placement of aircraft orders. ***Network Analysis for Maintenance Planning:*** The basics of network planning. The case of computerized maintenance planning. Resource utilization. Development of scheduled engine shutdown/removal programme. ***Dynamic Programming:*** Characteristics and structure of dynamic programming problems. Optimization of aircraft overhaul, repair and replacement policies. ***Markov Analysis:*** State classification of a Markov chain. First passage times. Long-run properties of Markov chains. Absorption states. Applications in aircraft system availability assessment. ***Queueing Theory:*** Fundamentals. Arrival and service distributions. Simple and multi-channel queueing models. Estimation of parking bays or baggage conveyors in airport. ***Forecasting:*** Judgmental techniques. Time series. Forecasting procedure for linear trend model. Forecasting errors. Air traffic forecasting.

Teaching/Learning Methodology

1. The teaching and learning methods include lectures/tutorial sessions, homework assignments, test, case study report and examination.
2. The continuous assessment and examination are aimed at providing students with integrated knowledge required for advanced materials and structural design.
3. Technical/practical examples and problems are raised and discussed in class/tutorial sessions.

Teaching/Learning Methodology	Intended subject learning outcomes					
	a	b	c	d	e	f
1. Lecture	√	√	√	√	√	√
2. Tutorial	√	√	√	√	√	√
3. Homework assignment	√	√	√	√	√	√
4. Case study report and presentation	√	√	√	√	√	√

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed					
		a	b	c	d	e	f
1. Homework assignment	20%	√	√	√	√	√	√
2. Test	20%	√	√	√	√	√	√
3. Case study report and presentation	20%			√		√	√
4. Examination	40%	√	√	√	√	√	√
Total	100%						

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Overall Assessment:

$$0.40 \times \text{End of Subject Examination} + 0.60 \times \text{Continuous Assessment}$$

The continuous assessment consists of three components: homework assignments, test, and case study report & presentation. They are aimed at evaluating the progress of students study, assisting them in self-monitoring of fulfilling the respective subject learning outcomes, and enhancing the integration of the knowledge learnt.

The examination is used to assess the knowledge acquired by the students for understanding and analyzing the problems critically and independently; as well as to determine the degree of achieving the subject learning outcomes.

Student Study Effort Expected

Class contact:	
▪ Lecture	24 Hrs.
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Other student study effort:	
▪ Self Study	45 Hrs.
▪ Case study report preparation and presentation	21 Hrs.
Total student study effort	105 Hrs.

Reading List and References

1. Taha, Hamdy A. Operations Research : An introduction, Upper Saddle River, NJ: Prentice Hall/Pearson, latest edition.
2. Wells, A.T. & S.B. Young, Airport Planning & Management, New York: McGraw-Hill, latest edition.