•MLO1. Apply knowledge and understanding of scientific principles and methodology related to solving w

Northumbria University Programme Framework for Northumbria Awards - Module Specification

Faculty	Engineering and Environment	**Department**		BEng (Hons) Mechanical Engineering (Manufacturing Systems and Design)	**Subject**		**Module Tutor**	Nak-Kyun Cho			
Module Title	Computer Aided Engineering						**Module Code**	MSDE 327			
Module Type* *(see key below)*	Choose an item.										
Module size credits	**Level 3:**		**Level 4:**		**Level 5:**	**10**	**Level 6:**		**Level 7:**		
Home programme/s for which the module is designed				BEng (Hons) Mechanical Engineering (Manufacturing Systems and Design)				**Code/s**			
Additional Programme/s other than that/those for which the module for specifically designed								**Code/s**			
Delivery Pattern (Please tick)		**Semester based** *(please specify)*		Sem 1 ☐ Sem 2 ☒	**Year Long**	☐	**Full-time** **Part-time** **Distance Learning**		☒ ☐ ☐		
Location(s) of delivery: If delivered at EPWO partners please give partner name and location											

KEY:

APL	*Accreditation for prior learning*	*P/F*	*Pass/fail module*	*PLIN*	*Placement - Industrial*
CORE	*PNVQ core skills module*	*P/F_DS*	*Pass/fail dissertation module*	*PRAC*	*Practical*
DISS	*Dissertation*	*P/F_PJ*	*Pass/fail project module*	*PROJ*	*Project*
FLDW	*Fieldwork*	*P/F_PL*	*Pass/fail placement module*	*STAN*	*Standard module*
INDS	*Independent study*	*PLAY*	*Placement – academic study abroad FT*	*WKBS*	*Work base study*
MAFOUN	*MA foundation modules - ASS*	*PLCL*	*Placement – Clinical*	*WORK*	*Workshop*

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Module Overview (Max 250 words per section) (This section is aimed at providing a prospective or current student with a brief overview of the module in answer to the specific questions and will form an element of the module handbook)

What will I learn on this module? (SRS 0001) Please give a brief indication of the content of the module including the main topic / subject areas studied
The module concentrates on the basic theory of the Finite Element Method (FEM) and its applications by using the CAE commercial program such as the ANSYS. Before making and analysing a modelling using the ANSYS, solid mechanics are reviewed to make the students understand the theoretical backgrounds. The basic concept is introduced at the beginning while considering one dimensional problems and its extension to two and three dimensional problems is briefly discussed. Applications to one and two dimensional problems are discussed.
How will I learn on this module? (SRS 0002) Please provide a brief overview the learning and teaching approaches the student can expect to experience.
This module will be delivered through regular lectures and computer tutorial sessions. In the lectures, students will review linear algebra, key numerical approaches, and the fundamentals of structural mechanics. They will also gain knowledge of numerical approximation methods and the finite element method for 1D and 2D problems. During the computer tutorial sessions, students will perform stress analysis for 2D and 3D problems, including static analysis, modal analysis, and explicit dynamic analysis, using the FE software Ansys. Learning sessions will be used to present you with new material and assist you in exploring fundamental concepts and topics within the module. Sessions will involve a combination of content delivery and practical learning exercises to enable you to apply your learning to well-defined, authentic management problems. Learning activities will enable students to work collaboratively through the development of teamwork and communication skills, and the encouragement of creative thinking to solve problems issued from project management.
How will I be supported academically on this module? (SRS 0003) Please provide a brief overview of the academic support available to students, including any support that may be accessed outside formal scheduled teaching.
During your active learning sessions, academic support will be available to facilitate your exploration of the problem-solving activities. Formative feedback will be provided by the module team, including answering student queries and providing guidance concerning the module such as assessments and your academic progress. The electronic learning platform (e-class) provides a comprehensive resource for integrated learning incorporating learning materials and reading lists that will facilitate directed and self-directed learning. Contact with academic tutors and your peers outside formal teaching hours is encouraged through dedicated 'office hours', discussion boards, and messaging systems within the e-class.
What will I be expected to read on this module? (SRS 0004) All modules at Seoul Tech include a range of reading materials that students are expected to engage with. The reading list for this module can be found from MSDE Module Descriptor – https://msde.seoultech.ac.kr/curriculum_/syllabus_/

Northumbria University Library Reading List Service (please confirm the following)	**Please give date added**
A draft reading list has been created and on the university Library Reading List Service	Click here to enter a date.
Reading material has been acquired and digitised (following approval)	Click here to enter a date.
Reading list has been published to students (for module delivery)	Click here to enter a date.

NB – for PFNA alignment process only, module authors should complete either the University Library e-Reading List, or Appendix 1.

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Module Learning Outcomes (MLOs) *(Max of five in total*, for standard 20-credit modules)*

**this can increase to a maximum of 10, for modules with more than 20 credits*

What will I be expected to achieve? (SRS 0005)	**How will I be assessed?** (SRS 0006) *Please give details of all formative and summative assessment process indicating which MLOs will be addressed and how feedback will be provided.*	**Programme (Level) Learning Outcomes that this module contributes to:** *[Please insert PLO number as listed on the programme specification]*
• C2: Analyse complex problems to reach substantiated conclusions using first principles of mathematics, statistics, natural science and engineering principles • C3: Select and apply appropriate computational and analytical techniques to model complex problems, recognising the limitations of the techniques employed • C6: Apply an integrated or systems approach to the solution of complex problems • C13: Select and apply appropriate materials, equipment, engineering technologies and processes, recognising their limitations	**Formative Assessment** Academic staff on the module will assess you in a formative manner to help build your confidence and highlight any misunderstandings you may have of the theoretical and professional concepts presented in the module. Your formative feedback will be given to you either verbally by academic staff on the module during formally scheduled teaching sessions. Your formative feedback aims to help you learn and prepare for the submission of your summative assessment. **Summative Assessment** Academic staff on the module will assess you in a summative manner by three pieces of assessment: Component 1. The group term project assesses your problem-solving capability for engineering issues using finite element analysis software (C2, C3, C6, C13). Component 2, Final exam assesses your knowledge and understanding of finite element method (C3)	**Knowledge & Understanding:** • KU1. Apply advanced knowledge of the scientific and mathematical foundations of engineering to solve problems. • KU3. Identify and utilise advanced methodologies to create solutions to a variety of engineering problems. • KU4. Define and investigate complex interdisciplinary problems and constraints that occur in mechanical engineering design with the aid of specialist tools and the latest research. **Intellectual / Professional skills & abilities:** • IPSA4. Illustrate solutions to basic engineering problems. **Personal Values Attributes** (Global / Cultural awareness, Ethics, Curiosity) (PVA): • PVA2. Apply creativity in the development of solutions to standard engineering problems. • PVA4. Apply effective interpersonal and learning skills.

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Pre-requisite(s) (SRS 0007) Any module which must already have been taken, or any stipulated level of prior knowledge required in order to study this module, (co-requisite core models need not be listed	Mechanics of Material, CAD, Dynamics, Engineering Math
Co-requisite(s) (SRS 0008) Modules at this level which must be taken with this module	n/a

Module abstract (SRS 0009)

Please provide a brief a brief abstract of the module (150 words max). This section acts as the 'shop window' for the module, therefore it needs to engage and inspire the student. This is the first thing that the student will read about this module, so it must immediately grab their attention. The main aim is to encourage the student to read on, however the summary should be written in such a way that if the student reads nothing else this section will convey all key messages and benefits that the module will offer. Start by explaining the module title where necessary. Then highlight any selling points relating to the four pillars: Research-Rich Learning; Technology Enhanced Learning; Assessment and Feedback; Employability and Entrepreneurship. Examples may include student satisfaction rates, learning environment, state-of-the-art facilities etc. Finally indicate benefits of the module such as the key skills that the students will gain for future employment and career paths that are open to them.
In this module, students will gain an understanding of the fundamental principles of solid mechanics, numerical approaches, and finite element method. Building upon this knowledge, students will design an engineering structure and conduct linear elastic analysis using the commercial finite element analysis software Ansys. In the module, students will be encouraged to investigate and gain confidence in research and critical thinking through the application of appropriate knowledge and methodologies to tackle broadly defined problems. Active learning sessions will allow you to engage with elevated material and assist you in exploring key concepts and topics. Sessions will involve a series of practical learning exercises to enable you to apply your learning to authentic, broadly defined engineering problems that may involve conflicting and/or incomplete information.

Programme Framework for Northumbria Awards Research Rich Learning Design Pillar (SRS 0090)

Embedding Research Rich Learning into the curriculum: Indicate how students will be actively engaged in research rich learning in this module through: research/enquiry based learning, research tutored learning, research led learning and/or research oriented learning, providing a brief overview of how this / these will feature within the delivery of the module (250 words max) **Note:** • **Research/enquiry Based:** L&T_Based on student-centred enquiry and research activities (conducting research). • **Research Tutored**: L&T Emphasises learning focused on students actively discussing research, and critically engaging with research outputs • **Research Led**: T&L structured around subject content and that content is based on the research (learning about research) • **Research Orientated:** T&L Emphasises understanding of the knowledge production process, and methods of enquiry in the subject (learning how to research)
You will be given the opportunity to build and practice critical enquiry and to further develop your understanding of key knowledge and methodologies in the mechanics of materials. Greater scope for investigation is encouraged through more broadly defined problems that seek to increase your responsibility and enhance the independent investigation. This module will further introduce you to research methodologies and the application of knowledge in engineering mechanics. The module will emphasise theoretical, computational, and practical analyses and how they interact and differ to provide insight and solutions to key research questions. In your second year, the underlying approach is focused

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on research tutored learning with the incorporation of some research-orientated learning. For example, you will relate the capabilities and application of the finite element method to component design and materials research.

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Notional Student Workload (NSW) for each mode of delivery

Complete for each delivery mode where the distribution of NSW **Full Time Mode of Delivery**				**Part Time Mode of Delivery**			
Activity type	**Hours**	KIS category	KIS category hours		**Hours**	KIS category	KIS category hours
Lecture	40	Scheduled	80	Lecture		Scheduled	
Seminar				Seminar			
Tutorial	24			Tutorial			
Project Supervision	16			Project Supervision			
Demonstration				Demonstration			
Practical classes and workshops				Practical classes and workshops			
Supervised time in studio/ workshop				Supervised time in studio/ workshop			
Fieldwork				Fieldwork			
External visits				External visits			
Tutor guided independent learning		Independent	20	Tutor guided independent learning		Independent	
Student independent learning	20			Student independent learning			
Placement		Placement		Placement		Placement	
Study abroad				Study abroad			
Work based learning				Work based learning			
Total workload *200 hours for 20 credit module*	*100*		*100*	**Total workload**			

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Summative Assessment

Sequence *001, 002 etc.*	**Activity type** *indicate **ONE** of the following types:*	**Brief description of assessment (max.120 characters)** *e.g. type/ length of exam, type/ word limit of coursework*	**Weighting** % or Pass/Fail (for grade only components) *Note: % weightings should add up to 100% for module overall*	**Final assessment**		**Anonymous submission**		**ESAF submission**	
				Yes	*No*	*Yes*	*No*	*Yes*	*No*
001	EXAM (Written examination)	Final Exam (120 min)	40%	☒	☐	☐	☒	☐	☐
002	PRE (Presentation)	Group Term Project (4 weeks) Report & Presentation	60%	☒	☐	☐	☒	☐	☐
003				☐	☐	☐	☐	☐	☐
004	Choose an item.			☐	☐	☐	☐	☐	☐
005	Choose an item.			☐	☐	☐	☐	☐	☐
006	Choose an item.			☐	☐	☐	☐	☐	☐
007	Choose an item.			☐	☐	☐	☐	☐	☐
008	Choose an item.			☐	☐	☐	☐	☐	☐
009	Choose an item.			☐	☐	☐	☐	☐	☐
010	Choose an item.			☐	☐	☐	☐	☐	☐
011	Choose an item.			☐	☐	☐	☐	☐	☐
012	Choose an item.			☐	☐	☐	☐	☐	☐

Reassessment (specify either synoptic or non-synoptic)

Synoptic reassessment *One form of reassessment that tests all module learning outcomes*	Yes	☒	No	☐
Non-synoptic reassessment *Where module referred overall, individual failed components of assessment are reassessed*	Yes	☐	No	☒

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Date of FPARSC Approval Click here to enter a date.

Date of entry onto SITS	Click here to enter a date.

LOG OF CHANGES POST-APPROVAL

Please indicate any changes to the approved module descriptor from 2012/13 onwards

Section No.	**Brief description of change**	**Date of Approval**	**Semester and year of first implementation**
		Click here to enter a date.	
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Appendix 1

Indicative Reading for PFNA alignment approval only *(to be completed only if e-reading list unavailable at point of alignment approval)*

N.B. This outline indicative reading list will be utilised for approval purposes only, and **a full e-reading list must be produced and available by the June of the academic year prior to the first delivery date of the module** (at which point the section of p.2 referring to University Library Reading Lists should be completed).

Please list below essential key text underpinning the module content and ultimately the learning outcomes:

1) Shigley's Mechanical Engineering Design, Richard G. Budynas and J. Keith Nisbett, 11th Edition, 2021
2) Machine Design An Integrated Approach, Robert Norton, Prentice Hall, 2008