Northumbria University NEWCASTLE

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**	Dongha SHIM		
Module Title	Microcontroller Engineering							**Module Code**	MSDE 347		
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							Mugung Hall (Seoultech)				

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*

Version Dated 04/03/2024 06:45:00

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
This module covers fundamental topics necessary for analysing microcontroller for the automation systems in manufacturing. The covered topic includes: Electronics and Digital fundamentals; Introduction to Microcontroller; Microcontroller programming; Microprocessor I/O, Interrupt, and Timer/Counter. The module is delivered in a series of lectures and practical work which is designed to help the students understand the taught materials. The assessment is composed of a written exam and lab reports.
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 by regular lectures and laboratories. In the lectures, students learn fundamental principles and operation of a microcontroller and its applications in the lectures. Students implement microcontroller applications using a simulator in the laboratories. The understanding and knowledge of students are assessed in a written exam and lab reports.
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 tutor, including answering student queries and providing guidance concerning the module such as assessments and your academic progress. Lecture materials will be provided to students in advance and they can have a chance to study in advance before the class. Contact with academic tutors and your peers outside formal teaching hours is encouraged through dedicated 'office hours', discussion boards and e-mails. Professional support staff provide the first point of contact for a range of queries, including, for example, those concerning assessment submission, late submission/extensions, and other administrative issues.
What will I be expected to read on this module? (SRS 0004) 1) Digital and Microprocessor Fundamentals: Theory and Applications, 4th Ed., William Kleitz, Prentice Hall, 2003. 2) ATmega128 online documents

Northumbria University Library Reading List Service (pleas e 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.

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. • C6: Apply an integrated or systems approach to the solution of complex problems. • C12: Use practical laboratory and workshop skills to investigate 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 two pieces of assessment: Component 1, one written examination, assesses your knowledge and understanding of a microcontroller engineering including analyses of complex problems and application of an integrated or system approach (C2, C6). Component 2, laboratory, is used to evaluate your ability to select and apply appropriate	**Knowledge & Understanding:** • KU1: Evaluate and apply complex knowledge of the scientific and mathematical principles of engineering to solve Real-World problems. • KU2**:** Perform advanced analysis of unfamiliar engineering systems. **Intellectual / Professional skills & abilities:** • IPSA1. Apply advanced approaches to solving unfamiliar real world mechanical engineering problems. • IPSA5. Demonstrate the ability to solve advanced design problems and apply advanced manufacturing systems **Personal Values Attributes** (Global / Cultural awareness, Ethics, Curiosity) (PVA): • PVA2. Critically analyse advanced solutions to complex engineering problems.

	equipment and engineering technologies (C12, C13). Feedback will be provided by returning marked results with comments.	

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	(MSDE 223) Computer Programming (MSDE 240) Electronic Circuits
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.
This course is designed to provide an introduction to microcontroller systems and applications. The internal structure and operation of microcontrollers will be studied in the module. The design methodology for software and hardware applications will be developed through the lectures and labs. The student will be able to integrate these concepts into their electronic designs for other courses where control can be achieved via microcontrollers.

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 introduced to both academic and professional literacies required to perform successfully in higher education and in your future career as a practicing engineer. This module will introduce you to research methodologies and the application of knowledge in Microcontroller Engineering. You will be encouraged to investigate and gain confidence in research and inquisitive thinking through the application of appropriate knowledge and methodologies to tackle well-defined problems within the scope of Microcontroller Engineering. The underlying approach is mainly designed for Research Orientated Learning.

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	50	Lecture		Scheduled	
Seminar				Seminar			
Tutorial				Tutorial			
Project Supervision				Project Supervision			
Demonstration				Demonstration			
Practical classes and workshops	10			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	50	Tutor guided independent learning		Independent	
Student independent learning	50			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**			

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)	Exam (120 min)	80%	☒	☐	☐	☒	☐	☐
002	CW (Coursework)	Laboratory (Report, 5000 words or less)	20%	☐	☒	☐	☒	☐	☐
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	☐

FOR OFFICE USE ONLY

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.	
		Click here to enter a date.	
		Click here to enter a date.	
		Click here to enter a date.	
		Click here to enter a date.	
		Click here to enter a date.	
		Click here to enter a date.	
		Click here to enter a date.	

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:

Mechanical Vibration by Palm (Wiley, 2007)

Vibrations by Balakumar, Balachandran and Edward Magrab (Thomson Books/Cole 2004)