

**Ministry of Higher Education and Scientific Research
Scientific Supervision and Scientific Evaluation Apparatus
Directorate of Quality Assurance and Academic Accreditation
Accreditation Department**



Academic Program and Course Description Guide

2025–2026

Introduction:

The educational program is a well-planned set of courses that include procedures and experiences arranged in the form of an academic syllabus. Its main goal is to improve and build graduates' skills so they are ready for the job market. The program is reviewed and evaluated every year through internal or external audit procedures and programs like the External Examiner Program.

The academic program description is a short summary of the main features of the program and its courses. It shows what skills students are working to develop based on the program's goals. This description is very important because it is the main part of getting the program accredited, and it is written by the teaching staff together under the supervision of scientific committees in the scientific departments.

This guide, in its second version, includes a description of the academic program after updating the subjects and paragraphs of the previous guide in light of the updates and developments of the educational system in Iraq, which included the description of the academic program in its traditional form (annual, quarterly), as well as the adoption of the academic program description circulated according to the letter of the Department of Studies 3/2906 on 3/5/2023 regarding the programs that adopt the Bologna Process as the basis for their work.

In this regard, we can only emphasize the importance of writing an academic programs and course description to ensure the proper functioning of the educational process.

Concepts and terminology:

Academic Program Description: The academic program description provides a brief summary of its vision, mission and objectives, including an accurate description of the targeted learning outcomes according to specific learning strategies.

Course Description: Provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the students to achieve, proving whether they have made the most of the available learning opportunities. It is derived from the program description.

Program Vision: An ambitious picture for the future of the academic program to be sophisticated, inspiring, stimulating, realistic and applicable.

Program Mission: Briefly outlines the objectives and activities necessary to achieve them and defines the program's development paths and directions.

Program Objectives: They are statements that describe what the academic program intends to achieve within a specific period of time and are measurable and observable.

Curriculum Structure: All courses / subjects included in the academic program according to the approved learning system (quarterly, annual, Bologna Process) whether it is a requirement (ministry, university, college and scientific department) with the number of credit hours.

Learning Outcomes: A compatible set of knowledge, skills and values acquired by students after the successful completion of the academic program and must determine the learning outcomes of each course in a way that achieves the objectives of the program.

Teaching and learning strategies: They are the strategies used by the faculty members to develop students' teaching and learning, and they are plans that are followed to reach the learning goals. They describe all classroom and extra-curricular activities to achieve the learning outcomes of the program.

Academic Program Description Form

University Name: Ninevah University

Faculty/Institute: College of Electronics Engineering

Scientific Department: Systems and Control Engineering Department

Academic or Professional Program Name: Bachelor of Systems and Control Engineering

Final Certificate Name: Bachelor of Systems and Control Engineering

Academic System: Courses & Bologna System

Description Preparation Date: 19/11/2025

File Completion Date: 16/03/2026

Signature: 

Head of Department:

Assist. Prof. Abdullah Ibrahim

Abdulah

Date: 17/3/2026

Signature: 

Scientific Associate:

Assist. Prof. Dr. Bilal A. Jaber

Date: 17/3/2026

The file is checked by:

Department of Quality Assurance and University Performance

Director of the Quality Assurance and University Performance Department:

Date: 17/3/2026

Yaser Mohammed Hussein

Signature: 



Approval of the Dean

30/3/2026

1. Program Vision

To attain leadership, excellence and creativity in the field of systems and control engineering and employing capabilities towards modern teaching, scientific research and community service.

2. Program Mission

To provide outstanding education in systems and control engineering topics, preparing students to excel in control, automation and intelligent systems. The department foster industry partnerships, engage in cutting-edge research and develop solutions for society challenges aligning with technological advancements and labor market needs.

3. Program Objectives

1. To graduate specialized engineers in the field of Systems and Control Engineering who possess a strong ethical commitment, are capable of working in both the public and private sectors, and are dedicated to lifelong learning and the pursuit of postgraduate studies.
2. To establish modern engineering practices that meet the needs of society, guided by professional responsibility and ethical standards.
3. To prepare graduates with creative knowledge that enables them to develop problem-solving skills and adapt rapidly to evolving technologies.

4. To develop the self-learning capacities of graduates to ensure continuous educational and professional development.

Objectives of the Systems and Control Engineering Department:

1. To graduate specialized engineers in the field of Systems and Control Engineering who are capable of working in both the public and private sectors.
2. To embrace continuous learning and career growth for students and graduates.
3. To support scientific research and collaboration with industrial partners and key entities.
4. To enhance the leadership aspect among staff and students, and to instill a spirit of collaboration among them.
5. To continuously update the curriculum to meet labor market requirements and achieve accreditation standards.

4. Program Accreditation

Does the program have program accreditation? And from which agency?

NO

5. Other external influences

Is there a sponsor for the program?

Yes, the Ministry of Higher Education and Scientific Research is the sponsoring body of the program.

* This can include notes whether the course is basic or optional.

7. Program Description

Year/Level	Course Code	Course Name	Credit Hours	
			theoretical	practical
1st Stage / 1st Semester	NVEE206	Mathematics I	4	
1st Stage / 1st Semester	NVEE215	DC Circuits Analysis	3	2
1st Stage / 1st Semester	NVEESC301	Physics of Semiconductors	3	2
1st Stage / 1st Semester	NVU10	Computer Skills and AI I	2	2
1st Stage / 1st Semester	NVEESC302	Engineering Mechanics (Statics)	3	
1st Stage / 1st Semester	NVU12	Democracy and Human Rights	2	
1st Stage / 2nd Semester	NVEE207	Mathematics II	4	
1st Stage / 2nd Semester	NVEE216	AC Circuits Analysis	3	2

1st Stage / 2nd Semester	NVEESC303	Engineering Mechanics (Dynamics)	3	
1st Stage / 2nd Semester	NVEESC304	Computer Programming	3	2
1st Stage / 2nd Semester	NVEESC307	Digital Design	3	2
1st Stage / 2nd Semester	NVU11	English I	2	
2nd Stage / 1st Semester	NVEE208	Engineering Analysis I	3	
2nd Stage / 1st Semester	NVEE210	Signals & Systems I	2	2
2nd Stage / 1st Semester	NVEESC305	Control I	3	2
2nd Stage / 1st Semester	NVEESC306	MATLAB Programming	2	2
2nd Stage / 1st Semester	NVEE212	Analog Electronics I	2	2
2nd Stage / 1st Semester	NVU13	Crimes of the Baath regime in Iraq	3	
2nd Stage / 2nd Semester	NVEE209	Engineering Analysis II	3	
2nd Stage / 2nd Semester	NVEESC309	Control II	2	2
2nd Stage / 2nd Semester	NVEE213	Analog Electronics II	2	2
2nd Stage / 2nd Semester	NVEESC311	Measurement and Sensors	2	
2nd Stage / 2nd Semester	NVEESC312	Machines	2	2
2nd Stage / 2nd Semester	NVEE201	Engineering Drawing	2	
2nd Stage / 2nd Semester	NVU16	Arabic I	2	
2nd Stage / 2nd Semester	NVU15	English II	2	
3rd Stage / 1st Semester	NVEESC314	Digital Control	2	2
3rd Stage / 1st Semester	NVEESC315	Mathematical Modelling	3	
3rd Stage / 1st Semester	NVEE204	Digital Signal Processing I	2	2
3rd Stage / 1st Semester	NVEESC316	Thermodynamics	2	
3rd Stage / 1st Semester	NVEESC317	Power Electronics	2	2
3rd Stage / 1st Semester	NVEE202	Industrial Management and Ethics	2	
3rd Stage / 1st Semester	NVU18	Computer Skills and AI II	2	2
3rd Stage / 2nd Semester	NVEE	Numerical Analysis	3	
3rd Stage / 2nd Semester	NVEESC319	PLC	3	2
3rd Stage / 2nd Semester	NVEESC320	Control Systems Design	3	2
3rd Stage / 2nd Semester	NVEE	Statistics and Probability	3	

3rd Stage / 2nd Semester	NVEESC321	Communications	2	
3rd Stage / 2nd Semester	NVEESC322	Microprocessors	2	2
3rd Stage / 2nd Semester	NVU17	Arabic II	2	
4th Stage / 1st Semester	SCE4301	Optimal Control I	2	2
4th Stage / 1st Semester	SCE4302	Robotics I	2	2
4th Stage / 1st Semester	SCE4303	Process Control	4	
4th Stage / 1st Semester	SCE4304	Electronic Design Automation	2	2
4th Stage / 1st Semester	SCE4305	Embedded Systems	2	
4th Stage / 1st Semester	SCE4306	Project Management	2	2
4th Stage / 1st Semester	SCE4307	Computer Networks		2
4th Stage / 2nd Semester	SCE4311	Optimal Control II	2	2
4th Stage / 2nd Semester	SCE4312	Robotics II	2	2
4th Stage / 2nd Semester	SCE4313	Computer Control System	2	
4th Stage / 2nd Semester	SCE4314	Soft Computing	2	
4th Stage / 2nd Semester	SCE4315	Real-Time Systems	2	
4th Stage / 2nd Semester	SCE4316	Advanced Control Systems	2	2
4th Stage / 2nd Semester	SCE4317	Project		2

8. Expected Program Learning Outcomes	
Knowledge	
Learning Outcomes 1	Learning Outcomes Statement 1
- Understanding the fundamental principles of feedback control systems, including mathematical modeling using differential equations, transfer functions, and state–space representations. - Explaining the stability criteria of control systems and analyzing the factors that affect system performance. - Describing the role of feedback mechanisms in	Upon successful completion of this course, the student will be able to: 1. Model Dynamic Systems: Construct mathematical models of physical systems (electrical, mechanical, chemical) using various techniques such as differential equations, transfer functions, and state–space representations.

various engineering disciplines, including electrical, mechanical, and chemical systems. • Demonstrating proficiency in using MATLAB and Simulink for the analysis and design of control systems.	2. Analyze System Stability and Performance: Evaluate the stability of control systems using theoretical criteria (such as Routh–Hurwitz) and analyze system performance through its transient and steady–state responses to identify influencing factors. 3. Assess the Impact of Feedback: Explain the principle, types, and vital applications of feedback in improving the accuracy, stability, and performance of systems across a wide range of engineering applications. 4. Utilize Computer Simulation Tools: Apply practical skills using software like MATLAB and Simulink to simulate, analyze, and design effective control systems that meet required specifications.
Skills	
Learning Outcomes 2	Learning Outcomes Statement 2
The aim of this course is to develop the following practical and personal skills in students: • Skills in design, experimentation, and analysis. • Effective communication skills. • Teamwork skills.	Upon successful completion of this course, the student will be able to: 1. Design, Conduct, and Interpret Experiments: Design appropriate engineering experiments, conduct them practically, collect data, and analyze and interpret it using suitable statistical tools and quality assurance measures to reach sound conclusions. 2. Communicate with Clarity and Effectiveness: Present and defend technical ideas and reports confidently in written and oral forms, using clear and structured language for diverse audiences (peers, supervisors, clients) and different management levels. 3. Collaborate Effectively in Teams: Actively engage as a productive

	member or leader in a work team, participating in setting goals, planning tasks, managing time, and adhering to schedules to achieve shared objectives.
Learning Outcomes 3	Learning Outcomes Statement 3
The aim of this course is to develop the student's capabilities in practical and communicative aspects, including: 1. The ability to design and conduct appropriate experiments, analyze and interpret data, and apply quality assurance principles. 2. The ability to communicate effectively with diverse audiences and across various organizational and managerial levels.	Of course. Here is the professional translation of the provided learning outcomes into English: Upon successful completion of this course, the student will be able to: 1. Design, Conduct Experiments, and Analyze Results: • Design systematic engineering experiments that meet specific objectives. • Apply data collection tools and statistical analysis techniques to accurately interpret results. • Evaluate the quality of outcomes and apply quality assurance standards in technical reports. 2. Communicate Effectively Orally and in Writing: • Formulate clear, well-structured technical reports suitable for diverse audiences (e.g., technical teams, management, clients). • Present ideas and projects orally using persuasive and interactive language, supported by visual aids. • Adapt communication styles according to the organizational level and cultural background of the target audience.
Ethics	
Learning Outcomes 4	Learning Outcomes Statement 4
This course aims to enhance the following professional and social values in students: 1. Commitment to ethical and professional responsibility in engineering practice.	Upon successful completion of this course, the student will be able to: 1. Evaluate the ethical and social implications of engineering projects:

2. Analytical thinking based on scientific and logical foundations. 3. Respect for diverse viewpoints and the promotion of constructive dialogue. 4. Teamwork with a collaborative spirit.	○ Analyze the economic, environmental, and societal consequences of engineering solutions and make balanced decisions. ○ Apply standards of professional and ethical responsibility in practical situations. 2. Adopt critical and analytical thinking: ○ Analyze complex problems using scientific and logical methodologies. ○ Evaluate proposed solutions based on evidence and objective data. 3. Engage in constructive dialogue and respect diversity: ○ Discuss technical ideas objectively while respecting different viewpoints. ○ Support teamwork by expressing opinions confidently and valuing the opinions of others. 4. Collaborate effectively within teams: ○ Contribute to achieving team goals through active participation in group tasks. ○ Adhere to deadlines and assume individual and collective responsibility.
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Learning Outcomes 5	Learning Outcomes Statement 5
This course aims to enhance the student's values related to continuous development and leadership, including: • Commitment to continuous professional development and identifying relevant knowledge. • The ability to work effectively as a team member or leader. • Commitment to meeting deadlines and managing risks and uncertainty.	Upon successful completion of this course, the student will be able to: 1. Engage in Continuous Professional Development: • Identify knowledge gaps and seek out appropriate learning resources to address them. • Effectively and systematically apply new knowledge to engineering projects. 2. Demonstrate Leadership and Teamwork: • Guide a team towards specific and clear goals. • Delegate tasks fairly according to team members' capabilities. • Manage conflicts and foster collaboration among members. 3. Manage Time and Risks: • Develop realistic, actionable plans and adhere to deadlines. • Identify potential risks and formulate strategies to mitigate their impact. • Make quick and effective decisions under conditions of uncertainty.

9. Teaching and Learning Strategies
<i>Teaching strategy</i>

The systems and control engineering department has an educational strategy that can be summarized as follow:

- Presenting the curriculum syllabus to the students at the beginning of the academic year, specifying the study hours that are appropriate for each topic that will be addressed during the semester.
- Assigning the dates for submitting homework and asking for it in an orderly manner.
- Specifying the dates of the quizzes mid and final exams according to the university's calendar
- Provide students with a detailed explanation of the grade they will obtain during the semester.
- Allocating textbook and supporting books that the student can use.

Learning strategy

One of the duties of the department is to follow up on the development of students' learning ability through:

- Motivating the student and highlighting the students' own abilities.
- Using modern means and presenting the lecture in an interesting way to draw the student's attention to the scientific material through illustrations and linking it to practical applications that can be understood by students.
- Involve all students in continuous discussions to make all students engaged in the lecture atmosphere.
- Non-discrimination between male and female students when they are involved in the different education sections.
- Make laboratories working groups of both sexes.
- Using modern means of illustration to enable the student to see things that may be difficult to convey verbally.

- The use of direct speech by the instructor of the lecture, while allowing the students to discuss the subject matter of the lecture.
- Follow up the students' grades through their performance of the various exams to find out the failures that some students suffer from and try to overcome them.
- Strengthening the relationship between the student and the lecturer so that it is not limited to the lecture, as well as providing ample time for students to review the teacher at other times to clarify any problems that students may encounter from not understanding some of the things that may appear during his studies.
- Work to avoid using the method of memorization and indoctrination, but rather focus on stimulating the mental capacity of students by the appropriate method of presentation of the lecture and practical examples that increase the student's focus and expand his perceptions.

10. Evaluation methods

- Participation in physical or online classrooms.
- Submission of laboratory reports.
- Evaluation of practical implementation of experiments.
- Submission of various activities.
- Daily, midterm, and final exams, both in-person and online

11. Faculty

Faculty members

No.	Name/Academic Rank	Specialization		Special Requirements /Skills (if applicable)	Number of the teaching staff	
		General	Special		Staff	Lecture
1	Abdullah Ibrahim Abdullah/Asst. Prof.	Electrical Engineering	Control Engineering		1	

2	Jaafar Ramadan Mohamed/Prof.	Electrical Engineering	Digital Communication Engineering		1	
3	Ibrahim Khalaf Mohammad/Asst. Prof.	Electrical Engineering	Control Engineering		1	
4	Mohammed Abdul Jalil/Asst. Prof.	Electrical Engineering	Control Engineering		1	
5	Ahmed Jamil Abdel Qader/Lecturer	Electrical Engineering	Communicatio n Engineering		1	
6	Hussain Mohammed Hussain/Lecturer	Electronics Engineering	Electronics Engineering		1	
7	Nashwan Zior Hero/Asst. Lec	Electrical Engineering	Communicatio n Engineering		1	
8	Yazen Hudhiafa Shakir/Lecturer	Mechatronics and Robotics Engineering	Mechatronics Engineering		1	
9	Ali Khalil Mahmoud/Lecturer	Mechatronics and Robotics Engineering	Mechatronics Engineering		1	
10	Omar Yaseen Ismael/Asst. Prof.	Mechatronics Engineering	Control systems		1	
11	Muhammad Nusrat Younes/Asst. Prof.	Mechatronics Engineering	Control systems		1	
12	Muhannad Nihad Nouman/Lecturer	Mechatronics and Robotics Engineering	Mechatronics Engineering		1	
13	Salam Ibrahim Khader/Lecturer	Electrical Engineering	Control Engineering		1	
14	Muhammad Abdul	Computer	Computer		1	

	Razzaq Thanoon/Asst. Lec	Engineering artificial intelligent	Engineering			
15	Abdel Hamid Nabil Hamid/Lecturer	Communication s Engineering	Computer networks		1	
16	Thakwan Akram Jawad/Asst. Lec	Computer Engineering	Computer Engineering		1	
17	Awan Nahil Mahmood/Asst. Lec	Computer Engineering	Computer Engineering		1	
18	Ismail Khudair Abdallah/Asst. Lec	Mechanical Engineering	Mechanical Engineering		1	
19	Muhammad Salem Qassem/Lecturer	Mechatronics and Robotics Engineering	Mechatronics Engineering		1	
20	Rafal Raed Mahmood/Asst. Lec	Electronics Engineering	Electronics Engineering		1	
21	Ahmed Mohammed Basheer Ibrahim Al- Hattab	Computer Engineering	Computer Engineering		1	
22	Omar Abdullah Khalaf Ahmed Al- Sabawi	Mechanical Engineering	Mechanical Engineering		1	
23	Ziyad Tareq Shareef Younis Al-Alloush	Communication and Computer Engineering	Communication and Computer Engineering		1	
24	Saif Saad Mahmoud Mohammed Nader Al-Taie	Electrical Engineering	Power Electronics Engineering		1	
25	Abdulrahman Basel Ayoub Rajab Agha	Mechatronics Engineering	Mechatronics Engineering		1	
26	Mariam Abbas Mohammed Saeed Khudair	Physics Science	Physics Science		1	
27	Bahauddin Khudair	History	History		1	

	Atiyah					
28	Saady Al-Sadoon	Electronics Engineering	Electronics Engineering		1	

Professional Development

Mentoring new faculty members

The educational institution offers services and trainings (teaching methods and techniques training) that are suitable for new faculty members, together with a suitable supportive atmosphere and setting for faculty members.

Professional development of faculty members

- The academic institution provides resources for the faculty member to attend conferences, workshops for professional development, and workshops for local, regional, and worldwide training.
- As there is an instruction manual that contains contemporary teaching and learning techniques, there are clear and precise instructions that cover the teaching and methods.
- Scientific prizes are awarded to renowned teachers as one component of faculty member evaluation, and the educational institution operates by implementing guidelines and standards for scientific research, scientific prize awards, and faculty member performance evaluation.
- The department of Systems and Control Engineering maintains connections with most of ministries, in Iraq. Under its direction, several seminars have been held throughout the department's history to benefit the ministries. These relationships give faculty members access to real-world experience.
- Regarding the lecture topic, the department's members arranged numerous workshops covering various aspects of knowledge, which ultimately led to the

acquisition of significant experience. Nearly every member of the department has received training in a variety of pedagogical approaches.

–Since 2014, about seven department members have studied for master's and doctorate degrees inside Iraq and abroad in countries including Malaysia, and Iran. The University and College Continuing Education Center assisted in the department's growth and arranged a number of workshops in various science disciplines.

12. Acceptance Criterion

The conditions for admission to Iraqi universities are subject to the instructions of the Ministry of Higher Education and Scientific Research in accordance with the first chapter of the Guide to Student Affairs Procedures and Admission Controls issued by the Deanship of Studies, Planning, and Education, Monitoring Department. To view the guide, please visit the website below for the any written policies that apply:

<https://www.dirasat-gate.org/assets/documents/daleel-process>

13. The most important sources of information about the program

Comprehensive information about the department's programs can be obtained by visiting the official website of the University of Nineveh and browsing the website of the College of Electronic Engineering:

www.uoninevah.edu.iq

Additional information can be found in the self-evaluation report

14. Program Development Plan

Assessment Methods for Achieving Learning Outcomes in Systems and Control Engineering

1. Introduction to Assessment in Engineering Education

Assessment in **Systems and Control Engineering** is crucial to ensure that students achieve the expected learning outcomes, including **technical proficiency, problem-solving skills, system modeling capabilities, and practical control implementation expertise**. Various assessment methods are used to evaluate different levels of student learning, from foundational knowledge to advanced system design and analysis.

The selection of assessment methods should align with **Bloom's Taxonomy**, covering:

- **Lower-order thinking skills** (knowledge, understanding)
- **Higher-order thinking skills** (application, analysis, synthesis, and evaluation)
- **Professional and practical skills** (design, teamwork, communication, and real-world implementation)

2. Types of Assessment in Systems and Control Engineering

To ensure comprehensive evaluation, diverse assessment strategies are used, including **formative and summative assessments**.

A. Formative Assessment (Continuous Feedback-Oriented)

These methods provide real-time feedback, guiding students toward better understanding and skill development.

1. **Quizzes and Short Tests**
 - Evaluate basic concepts of control theory, system modeling, and stability analysis.
 - Can be conducted online or in-class using multiple-choice questions (MCQs), short-answer questions, or problem-solving exercises.
2. **Homework Assignments**
 - Reinforce learning by applying theoretical concepts to solve real-world control problems.
 - Can include MATLAB simulations, coding exercises, and derivations of system equations.
3. **Classroom Discussions & Peer Assessment**
 - Engages students in problem-solving discussions on control system challenges.
 - Encourages peer feedback on design projects and reports.
4. **Laboratory Experiments & Simulation-Based Exercises**
 - Hands-on assessments using MATLAB/Simulink, LabVIEW, or hardware platforms (Arduino, DSP, FPGA).
 - Evaluate students' ability to implement controllers (e.g., PID, fuzzy logic, adaptive control).
5. **Project-Based Learning (PBL)**
 - Assign real-world engineering problems where students must **design, model, and implement** control systems.
 - Encourages teamwork, critical thinking, and innovation.

B. Summative Assessment (Final Evaluation-Oriented)

Summative assessments are used to measure students' overall achievements at the end of a course or program.

1. **Midterm and Final Examinations**
 - Assess theoretical understanding and problem-solving skills in linear control systems, nonlinear dynamics, and modern control techniques.
 - May include analytical problems, system stability proofs, and controller design questions.

2. Design Projects & Capstone Courses

- Students design, analyze, and optimize control systems for real-world applications (e.g., robotic arms, UAV control, industrial automation).
- Assessed based on **technical correctness, innovation, and implementation success.**

3. Case Studies & Research Reports

- Encourage students to analyze existing control systems in industries like aerospace, automotive, and biomedical engineering.
- Develops technical writing and critical analysis skills.

4. Oral Examinations & Presentations

- Evaluate students' ability to communicate complex engineering solutions effectively.
- Can be used for final-year projects, conference-style presentations, or thesis defenses.

5. Industry-Based Internships & Work-Based Learning

- Real-world experience through internships in industries such as automation, robotics, and process control.
- Evaluated through employer feedback, reports, and practical skill demonstrations.

3. Mapping Assessment Methods to Learning Outcomes

Effective assessment ensures alignment with **ABET (Accreditation Board for Engineering and Technology) criteria** and program-specific learning outcomes. The table below illustrates how different assessments align with specific learning outcomes:

Learning Outcome	Assessment Methods
Knowledge of system modeling & analysis	Exams, quizzes, homework assignments
Ability to design and simulate controllers	Lab exercises, MATLAB projects, capstone projects
Problem-solving in real-world applications	Project-based learning, case studies, design reports
Practical implementation skills	Lab experiments, hardware-based assessments
Communication & teamwork	Oral presentations, peer reviews, collaborative projects

Program Skills Outline															
				Required program Learning outcomes											
Year/ Level	Course Code	Course Name	Basic or optional	Knowledge				Skills				Values			
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4
One	NVEE206	Mathematics I	Basic	*	*	*	*	*	*		*	*	*	*	
	NVEE215	DC Circuits Analysis	Basic	*	*	*		*	*	*	*	*		*	*
	NVEESC301	Physics of Semiconductors	Basic	*		*	*	*	*	*	*	*	*	*	*
	NVU10	Computer Skills and AI I	Basic	*	*	*	*	*	*	*	*		*	*	*
	NVEESC302	Engineering Mechanics (Statics)	Basic	*	*	*	*	*	*	*	*	*	*	*	
	NVU12	Democracy and Human Rights	Basic	*	*	*	*		*	*	*	*	*	*	*

	NVEE207	Mathematics II	Basic	*	*	*		*	*	*	*		*	*	*
	NVEE216	AC Circuits Analysis	Basic		*	*	*	*	*	*	*	*		*	*
	NVEESC303	Engineering Mechanics (Dynamics)	Basic	*	*	*	*	*	*	*	*	*	*	*	*
	NVEESC304	Computer Programming	Basic	*	*	*	*	*	*	*	*	*	*	*	*
	NVEESC307	Digital Design	Basic	*	*	*	*	*	*	*	*	*	*	*	*
	NVU11	English I	Basic	*	*	*	*	*	*	*	*	*	*	*	*
Two	NVEE208	Engineering Analysis I	Basic	*	*	*	*	*	*	*	*	*	*	*	*
	NVEE210	Signals & Systems I	Basic	*	*	*		*	*	*	*	*	*	*	*

	NVEESC305	Control I	Basic	*	*	*	*	*	*	*	*	*	*	*	*
	NVEESC306	MATLAB Programming	Basic	*	*	*	*	*	*	*	*	*	*	*	*
	NVEE212	Analog Electronics I	Basic	*	*	*	*	*		*	*	*	*	*	*
	NVU13	Crimes of the Baath regime in Iraq	Basic	*	*	*	*	*	*	*	*		*	*	*
	NVEE209	Engineering Analysis II	Basic	*	*	*	*	*	*	*	*	*	*	*	*
	NVEESC309	Control II	Basic	*	*	*	*	*	*	*	*		*	*	*
	NVEE213	Analog Electronics II	Basic	*	*	*	*	*	*	*	*	*	*	*	*
	NVEESC311	Measurement and Sensors	Basic	*	*	*	*	*	*	*	*	*	*	*	*

	NVEESC312	Machines	Basic	*	*	*	*	*	*	*	*	*	*	*	*
	NVEE201	Engineering Drawing	Basic	*		*	*	*	*	*	*	*		*	*
	NVU16	Arabic I	Basic	*	*	*	*	*	*	*	*	*	*	*	*
	NVU15	English II	Basic	*	*	*	*	*	*	*	*	*	*	*	*
Third	NVEESC314	Digital Control	Basic	*	*	*	*	*	*	*	*	*	*	*	
	NVEESC315	Mathematical Modelling	Basic	*	*	*	*	*	*	*	*	*	*	*	*
	NVEE204	Digital Signal Processing I	Basic	*		*	*	*	*	*	*	*	*	*	*
	NVEESC316	Thermodynamics	Basic	*	*	*	*	*	*	*	*	*	*	*	*

	NVEESC317	Power Electronics	Basic	*	*	*	*	*	*	*	*	*	*	*	*
	NVEE202	Industrial Management and Ethics	Basic	*	*	*	*	*	*	*	*	*	*	*	*
	NVU18	Computer Skills and AI II	Basic	*	*	*	*	*		*	*	*	*	*	*
	NVEE	Numerical Analysis	Basic	*	*	*	*	*	*	*	*	*	*	*	*
	NVEESC319	PLC	Basic	*	*	*	*	*	*	*	*	*	*	*	*
	NVEESC320	Control Systems Design	Basic	*	*		*	*	*	*	*	*	*	*	*
	NVEE	Statistics and Probability	Basic	*	*	*		*	*	*	*		*	*	*
	NVEESC321	Communications	Basic	*	*	*		*	*	*	*	*	*	*	*

	NVEESC322	Microprocessors	Basic	*	*	*	*	*	*	*	*	*	*	*	*
	NVU17	Arabic II	Basic	*	*	*	*	*		*	*	*	*	*	*
Fourth	SCE4301	Optimal Control I	Basic	*	*	*		*		*	*	*	*	*	
	SCE4302	Robotics I	Basic	*	*	*	*	*		*	*		*	*	*
	SCE4303	Process Control	Basic	*	*	*	*	*	*	*	*	*	*	*	*
	SCE4304	Electronic Design Automation	Basic	*	*	*	*		*	*		*	*	*	*
	SCE4305	Embedded Systems	Basic		*	*		*		*	*	*	*		*
	SCE4306	Project Management	Basic	*	*	*		*	*	*		*	*		*

	SCE4307	Computer Networks	Basic	*	*	*	*	*		*	*	*	*	*	*
	SCE4311	Optimal Control II	Basic	*	*	*		*	*	*		*	*	*	*
	SCE4312	Robotics II	Basic	*	*	*	*	*	*	*		*	*	*	*
	SCE4313	Computer Control System	Basic	*	*	*		*	*	*	*		*	*	*
	SCE4314	Soft Computing	Basic		*	*	*	*	*	*	*	*	*	*	*
	SCE4315	Real-Time Systems	Basic	*	*	*	*	*	*	*	*	*	*	*	*

	SCE4316	Advanced Control Systems	Basic	*	*		*	*	*	*	*	*		*	*
	SCE4317	Project	Basic	*	*	*	*	*	*			*	*	*	*

- Please tick the boxes corresponding to the individual program learning outcomes under evaluation.

Course Descriptions for the Academic Year 2025 – 2026

University of Nineveh

College of Electronics Engineering

Department of Systems and Control Engineering

**First Year
Semester 1**

MODULE DESCRIPTION FORM

Module Information			
Module Title	Mathematics I		Module Delivery
Module Type	Core		☒ Theory ☐ Lecture ☐ Lab ☒ Tutorial ☐ Practical ☐ Seminar
Module Code	NVEE206		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	1	Semester of Delivery	1
Administering Department	SCE	College	EE
Module Leader	Hussein M. Hussein	e-mail	Hussein.hussein@uoninevah.edu.iq
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	Ph.D.
Module Tutor	Shaiemma Kadder Ismaile	e-mail	E-mail
Peer Reviewer Name	Ismael Khudhair Abdullah	e-mail	ismael.abdullah@uoninevah.edu.iq
Scientific Committee Approval Date	01/06/2023	Version Number	1.0

Relation with other Modules			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents	
Module Aims	1. Develop a strong foundation in calculus, including a solid understanding of vector operations, complex numbers, matrices, and determinants. 2. Master differentiation techniques, including the chain rule, implicit differentiation, and higher-order differentiation, for various types of functions. 3. Apply differentiation skills to solve engineering problems, such as finding maxima and minima and curve plotting. 4. Gain proficiency in differentiating trigonometric, exponential, logarithmic, and inverse trigonometric functions. 5. Understand the concept of definite integration and its applications, including finding volumes of revolution, lengths of curves, and surface areas of revolution. 6. Apply calculus principles to solve real-world engineering problems, developing problem-solving skills and the ability to apply calculus concepts to practical situations.
Module Learning Outcomes	1. Demonstrate a solid understanding of vector operations, complex numbers, matrices, and determinants. 2. Apply differentiation techniques, including the chain rule, implicit differentiation, and higher-order differentiation, to various functions and engineering problems. Also, apply definite integration to find areas, volumes, and lengths in engineering applications 3. Solve optimization problems, including finding maxima and minima, using differentiation. Also, solve engineering problems involving differential equations, including first-order linear equations. 4. Differentiate trigonometric, exponential, logarithmic, and inverse trigonometric functions accurately and efficiently. 5. Analyze functions and curves using differentiation and integration, including determining concavity, points of inflection, and intervals of increase and decrease. 6. Develop critical thinking and problem-solving skills by applying calculus principles to practical engineering scenarios. Moreover, Communicate mathematical ideas and solutions clearly and effectively, both orally and in written form. Finally, apply calculus concepts and techniques to model and solve real-world engineering problems.

Indicative Contents	Indicative content includes the following. <u>Review of Vectors:</u> i) Representation of vectors in space (i;j;k) unit vectors. ii) Scalar product iii) Vector product. [4 hrs] <u>Review of Complex Numbers:</u> i) The Argand diagram. ii) Addition; Subtraction; Product; Quotient; power and roots. Iv) Demoiver's Theorem. [4hrs] <u>MATRICES AND DETERMINANTS:</u> i) Definitions ii) Properties. iii) Inverse of a matrix iv) Solution of Equations (Cramer's rule) and Elementary Row Operation. [12hrs] <u>DIFFERENTIATION:</u> Techniques of differentiation; Chain rule; Implicit differentiation; Higher order differentiation; Applications of differentiation; maxima and minima; Curve plotting; Differentiation of trigonometric functions. [12hrs] <u>TRANSCENDENTAL FUNCTIONS:</u> Inverse trigonometric: i) Definitions ii) properties iii) graphs iv) derivatives and integrals, Natural logarithmic: i) Definitions ii) properties iii) graphs iv) derivatives and integrals, Exponential and power: i) Definitions ii) properties iii) graphs iv) derivatives and integrals. [12hrs] <u>Review and Applications of Integral:</u> i) Volumes of revolution. ii) Length of the curve. iii) Surface area of revolution. [12hrs]
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Learning and Teaching Strategies	
Strategies	The main strategy for delivering this module in calculus is to promote active student participation and cultivate critical thinking skills. This will be accomplished through a combination of interactive classes, tutorials, and hands-on experiments. The classes will cover key concepts through lectures and visual aids, encouraging students to engage in discussions and ask questions. Interactive tutorials will provide opportunities for problem-solving and practical application of calculus principles. Additionally, incorporating simple experiments and sampling activities will help students connect theory to real-world scenarios in control engineering. By implementing these strategies, the module aims to create an engaging learning environment that enhances students' understanding of calculus while refining their critical thinking abilities.

Student Workload (SWL)			
Structured SWL (h/sem)	63	Structured SWL (h/w)	4
Unstructured SWL (h/sem)	87	Unstructured SWL (h/w) ¹	6
Total SWL (h/sem)	150		

Module Evaluation					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 11	LO #1, 2, 4 and 6
	Assignments	2	10% (10)	2, 13	LO # 3, 5 and 6
	Report	1	10% (10)	13	LO # 4, 5 and 6
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1, 2, 3, and 6
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Review of Vectors.
Week 2	Review of Complex Numbers.
Week 3	Matrices And Determinants: Definitions, Properties.
Week 4	Inverse of a matrix.
Week 5	Solution of Equations (Cramer's rule) and Elementary Row Operation.
Week 6	Differentiation: Techniques of differentiation; Chain rule; Implicit differentiation.
Week 7	Higher order differentiation; Applications of differentiation; maxima and minima; Curve plotting.
Week 8	Mid-term Exam
Week 9	Differentiation of trigonometric functions.
Week 10	Transcendental Functions: Inverse trigonometric: Definitions, properties, graphs, derivatives and integrals.
Week 11	Natural logarithmic: Definitions, properties, graphs, derivatives and integrals.
Week 12	Exponential and power: Definitions, properties, graphs, derivatives and integrals.
Week 13	Review and Applications of Integral: Volumes of revolution.
Week 14	Length of the curve.
Week 15	Surface area of revolution
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	

Learning and Teaching Resources		
	Text	Available in the Library?
Required Texts	G. B. Thomas Jr., M. D. Weir, J. Hass, and F. R. Giordano, "Thomas' Calculus," 12th ed., Pearson, 2019.	Yes
Recommended Texts	Zill, D. G., Wright, W. S., & Cullen, M. R. (2011). Advanced Engineering Mathematics. Jones & Bartlett Publishers.	Yes
Websites	https://www.coursera.org/learn/introduction-to-calculus	

Grading Scheme			
Group	Grade	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	90 – 100	Outstanding Performance
	B - Very Good	80 – 89	Above average with some errors
	C - Good	70 – 79	Sound work with notable errors
	D - Satisfactory	60 – 69	Fair but with major shortcomings
	E - Sufficient	50 – 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	(45-49)	More work required but credit awarded
	F – Fail	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

Module Information					
Module Title	DC Circuits Analysis		Module Delivery		
Module Type	Core		☒ Theory ☐ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☐ Seminar		
Module Code	NVEE215				
ECTS Credits	7				
SWL (hr/sem)	175				
Module Level		1	Semester of Delivery		1
Administering Department		SCE	College	EE	
Module Leader	Nashwan Z. Hero		e-mail	Nashwan.hero@uoninevah.edu.iq	
Module Leader's Acad. Title		Lecturer	Module Leader's Qualification		M.Sc.
Module Tutor	Name (if available)		e-mail	E-mail	
Peer Reviewer Name		Thakwan Akram jawad	e-mail	thakwan.jawad@uoninevah.edu.iq	
Scientific Committee Approval Date		01/06/2023	Version Number		1.0

Relation with other Modules			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents	
Module Aims	- To develop problem solving skills and understanding of circuit theory through the application of techniques. - To understand voltage, current and power from a given circuit. - This course deals with the basic concept of electrical circuits. - To understand Kirchhoff's current and voltage Laws problems. - To perform mesh and Nodal analysis. - To perform Thevenin's and Norton theorems).
Module Learning Outcomes	- Recognize how electricity works in electrical circuits and list the various terms associated with electrical circuits. Then, summarize what is meant by a basic electric circuit. - Discuss the reaction and involvement of atoms in electric circuits. - Describe electrical power, charge, and current. - Define Ohm's law. - Identify the basic circuit elements and their applications. - Explain the two Kirchhoff's laws used in circuit analysis
Indicative Contents	Indicative content includes the following. Basic Component and Electric Circuits System of units, Charge, current, Voltage, power, Voltage and Current Sources. DC circuits – Current and voltage definitions, Passive sign convention and circuit elements. [15 hrs] Combining resistive elements in series and parallel. Kirchhoff's laws and Ohm's law. Anatomy of a circuit, Network reduction, Introduction to mesh and nodal analysis. [15 hrs] Fundamentals Resistive networks, voltage and current sources, Thevenin and Norton equivalent circuits. [19 hrs] current and voltage division, input resistance, output resistance, maximum power transfer, power dissipation, current limiting and over voltage protection. [19 hrs] Revision problem classes [6 hrs]

Learning and Teaching Strategies	
Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL)			
Structured SWL (h/sem)	92	Structured SWL (h/w) ¹	6
Unstructured SWL (h/sem)	83	Unstructured SWL (h/w)	6
Total SWL (h/sem)	175		

Module Evaluation					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1, 4 and 6
	Assignments	2	10% (10)	2, 12	LO # 2, 4 and 6
	Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 3, 5 and 6
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-4
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Introduction - Difference between Circuit Theory and system of units
Week 2	Basics of Network Elements (voltage and current sources)
Week 3	Resistance and Resistivity, Ohm's Law
Week 4	Series and Parallel connection
Week 5	Voltage and Current division
Week 6	Resistors in series, parallel and Delta-Star conversion
Week 7	Kirchhoff's current law
Week 8	Kirchhoff's voltage law
Week 9	Mid-term Exam
Week 10	Methods of Analysis:(Mesh Circuit analysis and super mesh)
Week 11	Methods of Analysis:(Nodal Circuit analysis and super node)
Week 12	D.C. Circuit Theorems (Linearity and Superposition)
Week 13	D.C. Circuit Theorems (Thevenin's theorems)
Week 14	D.C. Circuit Theorems source transformation
Week 15	Maximum power transfer
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)

	Material Covered
Week 1	Lab 1: Introduction to Agilent VEE and PSPICE
Week 2	Lab 2: Ohm's law
Week 3	Lab 3: Voltage and current division
Week 4	Lab 4: Series and parallel connection
Week 5	Lab 5: Kirchhoff's Laws D.C. Circuit Theorems
Week 6	Lab 6: Kirchhoff's Laws D.C. Circuit Theorems
Week 7	Lab 7: Mesh D.C. Circuit Theorem
Week 8	Lab 8: Mesh D.C. Circuit Theorem
Week 9	Mid-term Exam
Week 10	Lab10: Nodal D.C. Circuit Theorem
Week 11	Lab 11: Nodal D.C. Circuit Theorem
Week 12	Lab 12: Linearity and Superposition
Week 13	Lab 13: Linearity and Superposition
Week 14	Lab 14: Maximum power transfer D.C. Circuit Theorems
Week 15	Lab 15: Maximum power transfer D.C. Circuit Theorems

Learning and Teaching Resources

	Text	Available in the Library?
Required Texts	Fundamentals of Electric Circuits, C.K. Alexander and M.N.O Sadiku, McGraw-Hill Education	Yes
Recommended Texts	DC Electrical Circuit Analysis: A Practical Approach Copyright Year: 2020, dissidents.	No
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

Grading Scheme

Group	Grade	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	90 - 100	Outstanding Performance
	B - Very Good	80 - 89	Above average with some errors
	C - Good	70 - 79	Sound work with notable errors
	D - Satisfactory	60 - 69	Fair but with major shortcomings
	E - Sufficient	50 - 59	Work meets minimum criteria
Fail Group (0 - 49)	FX – Fail	(45-49)	More work required but credit awarded
	F – Fail	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

Module Information					
Module Title	Physics of Semiconductors		Module Delivery		
Module Type	Core		☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar		
Module Code	NVEESC301				
ECTS Credits	6				
SWL (hr/sem)	150				
Module Level		1	Semester of Delivery		1
Administering Department		SCE	College	EE	
Module Leader	Awan Nahil Mahmood		e-mail		
Module Leader's Acad. Title		Lecturer	Module Leader's Qualification		Ph.D.
Module Tutor	Name (if available)		e-mail	E-mail	
Peer Reviewer Name		Maryam Abbas Mohammed	e-mail		
Scientific Committee Approval Date		01/06/2023	Version Number		1.0

Relation with other Modules			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents

Module Aims	1. Understanding Semiconductor Physics: The module aims to familiarize students with the physics of semiconductors, including concepts such as energy band theory, carrier generation, recombination, and transport. Students will gain a deep understanding of how electrons and holes behave in semiconductors and how these principles are applied in electronic devices. 2. Analysis of Electronic Devices: The module aims to introduce students to the operation and characteristics of various electronic devices, such as diodes, transistors, and integrated circuits. Students will learn about the working principles, fabrication techniques, and applications of these devices. They will also gain an understanding of the basic device models and how to analyze and design circuits using these devices. 3. Circuit Analysis and Design: The module aims to develop students' skills in analyzing and designing electronic circuits. Students will learn fundamental circuit analysis techniques, including Kirchhoff's laws, nodal analysis, and mesh analysis. They will also explore different circuit configurations, such as amplifiers, filters, and oscillators, and understand how to design and analyze these circuits using the principles of electronics physics. 4. Introduction to Digital Electronics: The module aims to provide an introduction to digital electronics and the principles of digital logic. Students will learn about binary number systems, Boolean algebra, logic gates, and sequential logic circuits. They will understand the operation of digital devices, such as logic gates and how to design and analyze digital circuits. 5. Practical Skills: The module aims to develop students' practical skills in electronics. Students will have hands-on experience with laboratory experiments, where they will learn to measure and analyze electronic circuits using instruments such as oscilloscopes, function generators, and multimeters. They will also learn basic soldering techniques and circuit construction.
Module Learning Outcomes	1. Knowledge of Semiconductor Physics: Students will demonstrate a comprehensive understanding of semiconductor physics, including concepts such as energy band theory, carrier generation, recombination, and transport in semiconductors. They will be able to explain the behavior of electrons and holes in different semiconductor materials. 2. Understanding of Electronic Devices: Students will be familiar with various electronic devices, such as diodes, transistors, and integrated circuits. They will understand the principles of operation, characteristics, and applications of these devices. Students will be able to analyze and predict the behavior of electronic devices in different circuit configurations. 3. Circuit Analysis and Design Skills: Students will possess the skills to analyze and design electronic circuits. They will be able to apply circuit analysis techniques, such as Kirchhoff's laws and nodal analysis, to solve complex electronic circuits. Students will demonstrate the ability to design basic

	electronic circuits, such as rectifier, clipping, clamping, regulator, amplifiers, filters, using the principles learned in the module. 4. Knowledge of Digital Electronics: Students will have a solid understanding of digital electronics principles, including binary number systems, Boolean algebra and logic gates circuits. They will be able to analyze and design digital circuits using logic gates. Students will be capable of designing combinational logic circuits for various applications. 5. Practical Skills in Electronics: Students will have acquired practical skills in electronics through laboratory experiments and hands-on activities. They will be able to use electronic instruments, such as oscilloscopes, function generators, and multimeters, to measure and analyze electronic circuits. Students will demonstrate proficiency in basic soldering techniques and circuit construction. 6. Problem-Solving and Critical Thinking: Students will develop problem-solving and critical thinking skills in the context of electronics physics. They will be able to apply their knowledge and analytical skills to identify and solve complex electronic circuit problems. Students will also demonstrate the ability to evaluate different design options and make informed decisions based on their understanding of electronics physics principles.
Indicative Contents	1. Introduction to Semiconductor Physics: • Atomic structure and energy bands • Intrinsic and extrinsic semiconductors • Carrier generation, recombination, and transport • PN junction and its characteristics 2. Diodes: • Diode operation and characteristics • Diode models and equivalent circuits • Diode applications: rectifiers, clippers, clamping and limiters • Special types of diodes: Zener diodes, and LEDs 3. Bipolar Junction Transistors (BJTs): • BJT structure and operation • BJT modes: active, cutoff, and saturation • BJT models and amplification principles • Common emitter, common base, and common collector configurations 4. Electronic Circuits Analysis: • Circuit analysis techniques: Kirchhoff's laws and nodal analysis • Amplifier circuits: common emitter, common collector, and common base configurations 5. Laboratory Exercises and Practical Skills:

	• Measurement and characterization of electronic components • Breadboarding and soldering techniques • Oscilloscope operation and waveform analysis • Circuit simulation using software tools
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Learning and Teaching Strategies	
Strategies	1. Lectures: Conduct interactive lectures to introduce and explain the theoretical concepts of electronics physics. Use multimedia presentations, visual aids, and real-life examples to enhance understanding. 2. Demonstrations: Perform live demonstrations of electronic circuits and devices to illustrate their operation and behavior. This can help students visualize abstract concepts and enhance their understanding of practical applications. 3. Problem-solving sessions: Organize regular problem-solving sessions where students can practice solving numerical problems related to electronics physics. Encourage group discussions and provide guidance to help students develop problem-solving skills. 4. Laboratory experiments: Conduct hands-on laboratory experiments to allow students to apply theoretical concepts and gain practical experience. Provide well-equipped lab facilities and clear instructions for conducting experiments safely. 5. Simulations and virtual experiments: Utilize simulation software and virtual lab platforms to supplement practical learning. This allows students to experiment with different circuit configurations and observe the effects in a controlled virtual environment. 6. Group projects and presentations: Assign group projects where students can collaborate to design and build electronic circuits or systems. This promotes teamwork, problem-solving, and communication skills. Encourage students to present their projects to the class, sharing their design process and findings. 7. Case studies and real-world examples: Discuss case studies and real-world examples that demonstrate the applications of electronics physics in various industries and technologies. This helps students understand the relevance and practical implications of the subject. 8. Online resources and self-study materials: Provide access to online resources, such as interactive tutorials, video lectures, and e-books, to facilitate self-study and independent learning. Encourage students to explore additional resources to deepen their understanding. 9. Assessments and feedback: Regularly assess students' understanding through quizzes, tests, and assignments. Provide constructive feedback to help students identify areas for improvement and encourage active engagement with the subject matter. 10. Guest lectures and industry visits: Invite guest speakers from the industry or academia to share their expertise and experiences in the field of electronics physics. Organize visits to relevant industries or research centers to expose students to real-world applications and emerging technologies.

Student Workload (SWL)			
Structured SWL (h/sem)	77	Structured SWL (h/w) ¹	5
Unstructured SWL (h/sem)	73	Unstructured SWL (h/w)	5
Total SWL (h/sem)	150		

Module Evaluation					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1, 2, and 6
	Assignments	2	10% (10)	2, 12	LO # 3, 4, and 6
	Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, and 6
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-6
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	- Introduction to Semiconductor Physics. - Atomic structure and energy bands. - Field effect intensity and potential energy .
Week 2	- The ev units of energy . - Nature of atom and Electronic of structure of elements. - Electronic structure of elements .
Week 3	- Transport Phenomena in semiconductor - Mobility conductivity - Intrinsic and extrinsic semiconductors.
Week 4	- Conductivity modulation. - Generation and recombination of charge and Diffusion current.
Week 5	- PN junction in equilibrium - Volt Ampere characteristic - PN Junction characteristics
Week 6	- Basic theory and analysis of simple diode circuit - Diode operation and characteristics

	• Diode models and equivalent circuits • Types of diodes
Week 7	• Diode applications • Circuit analysis of half wave and full wave rectifiers • Bridge rectifier
Week 8	• Ripple and form factor calculations • Types of filters :C filters, L filter,L.C. filter,PIE filter • Analysis of filter and calculation of ripple and regulation .
Week 9	• Mid-term Exam
Week 10	• Clippers and clamping circuits analysis and applications • limiters circuits analysis and applications • Diode logic gates
Week 11	• Special Diodes • Zener diodes: characteristics and applications • Light-emitting diodes (LEDs): working principles and applications
Week 12	• Bipolar Junction Transistors (BJTs) • BJT structure and operation • Current and voltage analysis
Week 13	• Collector characteristic curves • BJT modes: active, cutoff, and saturation • DC load line
Week 14	• BJT models and amplification principles • Linear Operation.
Week 15	• Voltage Divider Bias • Diode transistor logic gate (DTL).
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)

	Material Covered
Week 1	• Lab safety guidelines and equipment familiarization • Introduction to basic electronic components: resistors, capacitors, and inductors • Measurement of resistance using multimeters

Week 2	Breadboarding and soldering techniques
Week 3	Oscilloscope operation and signal generator
Week 4	- Diode characterization and measurements: forward and reverse bias - Verification of diode IV characteristics
Week 5	Half wave and full wave rectifiers
Week 6	Half wave and full wave rectifiers filters
Week 7	Design power supply
Week 8	Review for mid-term Exam
Week 9	Mid-term Exam
Week 10	Clipping and Clamping circuits
Week 11	Zener diode characterization and measurements: breakdown voltage and regulation
Week 12	Photo diode characterization and measurements.
Week 13	(BJT) Transistor characterization and measurements
Week 14	Review for Final Exam

Learning and Teaching Resources		
	Text	Available in the Library?
Required Texts	1. Integrated Electronics: Analog and Digital Circuits and Systems, By <u>Jacob Millman</u>	
Recommended Texts	2. Electronic Devices and Circuit Theory" by Robert L. Boylestad and Louis Nashelsky - This book provides a thorough introduction to electronic devices and circuit theory, covering topics such as diodes, transistors, amplifiers, and digital circuits. 3. "Electronic Principles" by Albert Malvino and David Bates - This textbook offers a practical approach to understanding electronic principles and their applications, covering topics such as semiconductor devices, amplifiers, oscillators, and digital circuits. 4. "Microelectronic Circuits" by Adel S. Sedra and Kenneth C. Smith - This widely-used textbook covers the analysis and design of microelectronic circuits, including analog and digital integrated circuits and bipolar junction transistors. 5. "Electronics for Dummies" by Cathleen Shamieh - This beginner-friendly book provides an easy-to-understand introduction to electronics, covering topics such as circuits, components, and basic electronic principles.	
Websites	1. Electronics Tutorials (www.electronics-tutorials.ws) - This website offers a wide range of tutorials and resources on electronics, including circuit analysis, components, and practical applications. 2. All About Circuits (www.allaboutcircuits.com) - This online platform provides comprehensive resources, including tutorials, articles, and interactive tools, covering various topics in electronics and circuit design. 3. Khan Academy (www.khanacademy.org) - Khan Academy offers free online courses and tutorials on electronics and electrical engineering, covering topics such as circuit analysis, semiconductors, and digital electronics.	

Grading Scheme			
Group	Grade	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	90 - 100	Outstanding Performance
	B - Very Good	80 - 89	Above average with some errors
	C - Good	70 - 79	Sound work with notable errors
	D - Satisfactory	60 - 69	Fair but with major shortcomings
	E - Sufficient	50 - 59	Work meets minimum criteria
Fail Group (0 - 49)	FX – Fail	(45-49)	More work required but credit awarded
	F – Fail	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

Module Information			
Module Title	Computer I		Module Delivery
Module Type	Basic		☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	NVU10		
ECTS Credits	3		
SWL (hr/sem)	75		
Module Level	1	Semester of Delivery	1
Administering Department	SCE	College	EE
Module Leader	Abdulameed Nabeel Hameed	e-mail	abdulhamed.hameed@uoninevah.edu.iq
Module Leader's Acad. Title	Ass. Lecturer	Module Leader's Qualification	M.Sc.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Mohammed A. Thanon	e-mail	mohammed.alsayed@uoninevah.edu.iq
Scientific Committee Approval Date	01/06/2023	Version Number	1.0

Relation with other Modules			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents	
Module Aims	Build Fundamental Digital Literacy - Equip students with essential computer skills for academic and professional tasks (e.g., document creation, data organization). - Familiarize learners with hardware/software components and basic troubleshooting. Develop Proficiency in Productivity Tools

	○ Enable students to use word processors, spreadsheets, and presentation software effectively. ○ Teach file management and cloud collaboration tools (e.g., Google Workspace). 3. Introduce Internet and Cybersecurity Basics ○ Explain how the internet functions (IP addresses, domains, browsers). ○ Promote safe online practices (email etiquette, data privacy). 4. Provide a Foundational Understanding of AI ○ Define AI and its everyday applications (e.g., virtual assistants, recommendation systems). ○ Highlight ethical implications (bias, privacy) in simple terms.
Module Learning Outcomes	1. Operate Basic Computer Systems ○ Identify hardware/software components and their functions. ○ Perform file management tasks (create, organize, and save documents). 2. Use Productivity Software ○ Create formatted documents (reports, tables) using word processors. ○ Develop simple spreadsheets with formulas and charts. ○ Design multimedia presentations with transitions and templates. 3. Navigate Digital Environments Safely ○ Explain how the internet works (IP addresses, domains, browsers). ○ Demonstrate email etiquette and cloud collaboration (e.g., Google Drive). 4. Understand AI Basics ○ Define artificial intelligence and its everyday applications. ○ Recognize ethical concerns (e.g., data privacy, algorithmic bias).
Indicative Contents	1. Computer Basics • Hardware: CPU, memory, storage, input/output devices • Software: Operating systems (Windows, macOS, Linux), applications • File management: Folders, directories, shortcuts 2. Productivity Tools • Word Processing:

	○ Document creation, formatting, tables, templates ○ Headers/footers, spell check, collaboration features • Spreadsheets: ○ Basic formulas (SUM, AVERAGE), charts, sorting/filtering • Presentations: ○ Slide design, animations, transitions, multimedia insertion 3. Internet & Digital Literacy • How the internet works (IP addresses, DNS, browsers) • Safe browsing, email etiquette, cloud tools (Google Drive, OneDrive) • Basic cybersecurity (passwords, phishing awareness) 4. Introduction to AI • What is AI? History and key concepts (machine learning, NLP) • Everyday AI: Virtual assistants (Siri, Alexa), recommendation systems • Ethical considerations: Bias, privacy, societal impact
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Learning and Teaching Strategies	
Strategies	Guided Hands-On Learning - Step-by-step hardware/software labs - Template-based tasks → Original work progression Gamification - Digital badges for completed modules - Quick interactive quizzes (e.g., Kahoot!) Peer Mentoring "Tech Buddy" system for troubleshooting Micro-Assessments - Weekly 10-minute practical tests

Student Workload (SWL)			
Structured SWL (h/sem)	62	Structured SWL (h/w)	4
Unstructured SWL (h/sem)	13	Unstructured SWL (h/w)	1
Total SWL (h/sem)	75		

Module Evaluation					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 12	LO #1-2
	Assignments	1	10% (10)	14	LO # 1, and 3
	Lab	14	15% (15)	Continuous	
	Report	1	5% (5)	13	LO # 4
Summative assessment	Midterm Exam	4 hr	10% (10)	8	LO # 1-3
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Introduction to Computer Hardware (CPU, RAM, Storage)
Week 2	Operating Systems Basics (Windows/Linux)
Week 3	File Management (Folders, Directories)
Week 4	Word Processing Fundamentals

Week 5	Spreadsheet Basics (Formulas, Functions)
Week 6	Presentation Software (Slides, Transitions)
Week 7	Internet Concepts (IP, DNS, Browsers)
Week 8	Email & Cloud Storage
Week 9	Introduction to AI (Definition, History)
Week 10	AI in Daily Life (Recommendation Systems)
Week 11	Computer Maintenance (Updates, Troubleshooting)
Week 12	Digital Security Basics (Passwords, Privacy)
Week 13	Review & Case Studies
Week 14	Final Project Guidance
Week 15	Portfolio Compilation
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	Identifying Hardware Components
Week 2	GUI Navigation & File Creation
Week 3	Creating Nested Folder Structures
Week 4	Formatting Documents & Inserting Tables
Week 5	Using SUM, AVERAGE Functions
Week 6	Designing a 5-Slide Presentation
Week 7	Browser Settings & Safe Search
Week 8	Email Composition & Attachments
Week 9	Identifying AI-Powered Products
Week 10	Analyzing Recommendation Algorithms
Week 11	Disk Cleanup & Software Updates
Week 12	Password Manager Setup
Week 13	Mock Exam & Skill Reinforcement
Week 14	Group Case Study Analysis
Week 15	Preparatory week before the final Exam

Learning and Teaching Resources		
	Text	Available in the Library?
Required Texts	"Computer Basics Absolute Beginner's Guide" – Michael Miller (8th Edition) - Covers hardware, software, and basic troubleshooting. "Microsoft Office 365 for Beginners" – Joan lamber - Step-by-step guide for Word, Excel, powerpoint	No

	3. "Artificial Intelligence: A Guide for Thinking Humans" – Melanie Mitchell (Ch. 1-3) ○ Simplified introduction to AI concepts.	
Recommended Texts	1. "But How Do It Know?" – J. Clark Scott ○ Explains how computers work in an easy-to-understand way. 2. "The Internet for Dummies" – John R. Levine & Margaret Levine Young ○ Practical guide to internet basics and online safety.	No
Websites	1. GCFGlobal (edu.gcfglobal.org) – Free tutorials on Office tools and basic computing. 2. Code.org (AI for Oceans) – Interactive intro to AI concepts. 3. Google's "Be Internet Awesome" – Digital literacy and safety lessons.	

Grading Schem				
Group	Grade	Marks (%)	Definition	
Success Group (50 - 100)	A - Excellent	90 – 100	Outstanding Performance	
	B - Very Good	80 – 89	Above average with some errors	
	C – Good	70 – 79	Sound work with notable errors	
	D - Satisfactory	60 – 69	Fair but with major shortcomings	
	E - Sufficient	50 – 59	Work meets minimum criteria	
Fail Group (0 – 49)	FX – Fail	(45-49)	More work required but credit awarded	
	F – Fail	(0-44)	Considerable amount of work required	
Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.				

MODULE DESCRIPTION FORM

Module Information				
Module Title	Engineering Mechanics (Statics)		Module Delivery	
Module Type	Core		☒ Theory ☐ Lecture ☐ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	NVEESC302			
ECTS Credits	6			
SWL (hr/sem)	150			
Module Level		1	Semester of Delivery	1
Administering Department		SCE	College	EE
Module Leader	Ismael Khudhair Abdullah Al-Jobury		e-mail	ismael.abdullah@uoninevah.edu.iq
Module Leader's Acad. Title		Lecturer Assistant	Module Leader's Qualification M.Sc.	
Module Tutor			e-mail	
Peer Reviewer Name		Mohanad Nihad Noaman	e-mail	mohanad.noaman@uoninevah.edu.iq
Scientific Committee Approval Date		01/06/2023	Version Number	1.0

Relation with other Modules				
Prerequisite module	None		Semester	
Co-requisites module	None		Semester	

Module Aims, Learning Outcomes and Indicative Contents

Module Aims	1. Understanding and comprehending the laws, theories, and basic concepts related to forces and moments applied on bodies, analyzing them, finding the resultant, and the principles of transferring forces on the line of their action and outside their line of action, and developing the skills of solving problems related to them. 2. Knowing of Newton's laws of motion and gravitation and their universal applications and their applications in public life and industrial life. 3. Knowing of coordinate systems and how to use them in force analysis. 4. Knowing of unit systems used globally and how to convert from one system to another. 5. Detailed knowledge of equilibrium, its conditions, mathematical laws and applications, how to model the effect of forces and construction of free-body diagrams. Know how to derive reaction forces. 6. Learn in detail how to analyze engineering structures in all its branches and learn how to analyze them. 7. Learn about the principles of friction between contacting surfaces, the resulting forces, its importance, applications, types, properties, mathematical laws, and how to find the friction coefficient and apply it in friction equations. 8. Learn how to find the centers of bodies (masses, weights, lengths, areas and volumes), know its importance and applications. 9. Learn how to find the moment of inertia of areas and masses in detail and know the moment of inertia of some planer and solid shapes and some homogeneous masses. 10. The study of static is considered a basic introduction to the study of dynamics, which in turn is a major course in the Department of Systems and Control Engineering, as well as it is a basic introduction to the study of strength of materials.
Module Learning Outcomes	1. Knowing of Newton's laws of motion and gravitation and their universal applications and their applications in public life and industrial life. Learning the coordinate systems and how to use them in force analysis. Also, used globally unit systems and how to convert from one system to another. 2. Understanding and comprehending the laws, theories, and basic concepts related to forces applied on bodies, analyzing them, finding the resultant, and the principles of transferring forces on the line of their action and outside their line of action, and developing the skills of solving problems related to them, and solve some of the related problems to it to enable understanding of the subject. 3. Knowing of moments and their applications, methods and theories specialized in deducing them, finding the resultant of several moments, finding the resultant of moments and forces together, the resultant of non-convergent forces, knowing the couple moment and its general applications, and solve some of the related problems to it to enable understanding of the subject. 4. Detailed knowledge of equilibrium in its two branches (equilibrium of particles and equilibrium of rigid bodies), the conditions of each of them, their mathematical laws and applications, how to model the effect of forces and construction of free-body diagrams. Know how to derive reaction forces, and solve some of the related problems to it to enable understanding of the subject. 5. Learn about the principles of friction between contacting surfaces, the resulting forces, its importance, applications, types, properties, mathematical laws, and how to find the friction coefficient and apply it in friction equations, and solve some of the related problems to it to enable understanding of the subject.

	6. Understanding the centers of bodies and the moment of inertia is essential for analyzing stability, balance, and rotational motion in engineering and physics. This involves calculating the centroids of common geometric shapes and solving related problems to grasp their importance and applications. Additionally, learning about the moment of inertia, its properties, types, units, and methods for transferring it between axes, along with the radius of gyration, enables deeper insights into the behavior of planar and solid shapes, as well as homogeneous masses.
Indicative Contents	- Statics Fundamentals: Engineering mechanics definition and basic concepts, Newton's Fundamental Laws, Coordinates system, System of Units. [4 hrs] - Force Analysis: Scalars and Vectors, Trigonometric relations, Types of Force systems. [4 hrs] - Force Analysis: Principle of Transmissibility, Resultant Forces. [4 hrs] - The Moments: The moment definition and methods of solution, Resultant Moment. [4 hrs] - The Moments: Moment of a couple. [4 hrs] - The Moments: Resultant of nonconcurrent force (Force and Moment). [4 hrs] - Equilibrium: Principle of Equilibrium, Free body diagram construction. [4 hrs] - Equilibrium: Equilibrium of a Particle. [4 hrs] - Equilibrium: Equilibrium of a rigid bodies. [4 hrs] - Friction: Principle of Friction, Applications of Friction. [4 hrs] - Friction: Types of Friction, Characteristics of Friction. [4 hrs] - Centers of Mass and Centroids: Centroids of lines, areas, and volumes. [4 hrs] - The Moment of Inertia: Area Moment of Inertia. [4 hrs] - The Moment of Inertia: Mass Moment of Inertia. [4 hrs]

Learning and Teaching Strategies	
Strategies	The main strategy that will be adopted in introducing this unit is: - Sending the lecture to the students electronically three days before its scheduled date in the form of a (pdf) file with video clips (YouTube) showing the lecture with solutions to a number of related problems. - Giving the lecture and involving the students so that the lecture becomes a discussion to improve the students' skills and increase their understanding of the subject. - Conducting short exams in each lecture to urge students to follow up and increase their interest in the topic of the lecture. - - Conducting an electronic meeting after each lecture if necessary to solve more problems related to the subject of the lecture to increase students' understanding of the subject.

Student Workload (SWL)			
Structured SWL (h/sem) [∪]	63	Structured SWL (h/w) [∥]	4
Unstructured SWL (h/sem)	87	Unstructured SWL (h/w)	6
Total SWL (h/sem)	150		

Module Evaluation					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	10% (20)	3, 6, 9,12 ,13	LO #2,3,4 and 5
	Assignments	2	10% (10)	1, 9	LO # 1 and 6
	Projects / Lab.				
	Report	1	10% (10)	15	LO # 6
Summative assessment	Midterm Exam	2 hr	10% (10)	10	LO # 1-4
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Statics Fundamentals: Engineering mechanics definition and basic concepts, Newton's Fundamental Laws, Coordinates system, System of Units.
Week 2	Force Analysis: Scalars and Vectors, Trigonometric relations, Types of Force systems.
Week 3	Force Analysis: Principle of Transmissibility, Resultant Forces.
Week 4	The Moments: The moment definition and methods of solution, Resultant Moment.
Week 5	The Moments: Moment of a couple.
Week 6	The Moments: Resultant of nonconcurrent force (Force and Moment).
Week 7	Equilibrium: Principle of Equilibrium, Free body diagram construction.
Week 8	Equilibrium: Equilibrium of a Particle.
Week 9	Equilibrium: Equilibrium of a rigid bodies.
Week 10	Mid-term Exam.
Week 11	Friction: Principle of Friction, Applications of Friction.
Week 12	Friction: Types of Friction, Characteristics of Friction.
Week 13	Centers of Mass and Centroids: Centroids of lines, areas, and volumes.
Week 14	The Moment of Inertia: Area Moment of Inertia.
Week 15	The Moment of Inertia: Mass Moment of Inertia.
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)

	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	

Learning and Teaching Resources

	Text	Available in the Library?
Required Texts	Engineering Mechanics – Statics / R. C. Hibbeler.	Yes
Recommended Texts	Engineering Mechanics – Statics / J. L. Meriam , L. G. Kraige.	No
Websites	https://youtube.com/@ismaelal-jobury6914	

Grading Scheme

Group	Grade	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	90 - 100	Outstanding Performance
	B - Very Good	80 - 89	Above average with some errors
	C – Good	70 - 79	Sound work with notable errors
	D - Satisfactory	60 - 69	Fair but with major shortcomings
	E - Sufficient	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	(45-49)	More work required but credit awarded
	F – Fail	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

Module Information					
Module Title	Democracy and Human Rights		Module Delivery		
Module Type	Basic		☒ Theory ☐ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar		
Module Code	NVU12				
ECTS Credits	2				
SWL (hr/sem)	50				
Module Level		1	Semester of Delivery		1
Administering Department		SCE	College	EE	
Module Leader	Husham swadi hashim		e-mail	Husham.hashim@uoninevah.edu.iq	
Module Leader's Acad. Title		Assistant Professor	Module Leader's Qualification		PHD
Module Tutor			e-mail		
Peer Reviewer Name			e-mail		
Scientific Committee Approval Date		01/06/2023	Version Number		1.0

Relation with other Modules			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents

Module Aims	1 - شرح مفهومي حقوق الإنسان والديمقراطية 2 - بيان أهمية حقوق الإنسان في حياتنا العامة وعلى جميع الصعد (الدراسية و الوظيفية و الاجتماعية .. الخ) (3 - بيان أهمية إيجاد مفهوم واعي لمصطلح الديمقراطية ضمن أنظمة الحكم وتأثيرها على الاستقرار السياسي 4 - ضرورة فهم الترابط الوثيق ما بين حقوق وبناء مجتمع ديمقراطي بضمن حقوق الإنسان ن لجميع افرادة حقوقهم ضمن نظام سياسي ديمقراطي
Module Learning Outcomes	1 - ترسيخ قيم الحرية والمساواة في اسس المشاركة الفعلية في بناء المجتمع - حياة حقيقية مستقرة من خلال تطبيق القوانين ضمن مجتمع ديمقراطي 3 - والسعي لتوفير اسس لحماية الافراد ضمن المجتمعات الديمقراطية
Indicative Contents	-القسم الأول:- التطور التاريخي لحقوق الإنسان أول:- المجتمعات البدائية - مرحلة ما قبل التاريخ - الحضارات الشرقية (بالد وادي الرافدين والحضارة الفرعونية نموذجاً) (نموذجاً - الحضارات الغربية (اليونانية والرومانية ثانيا:- الشرائع السماوية - الديانة اليهودية - الديانة المسيحية - الديانة الإسلامية(بصوره أكثر تفصيلاً) ثالثاً:- تطور حقوق الإنسان في القوانين الوضعية نظرية العقد الاجتماعي - -الحروب العالمية وأثرها في حقوق الإنسان - التنظيم الدولي س :- حقوق الإنسان التعريف بها وأنواعها أول- التحديد والتعريف - الحق في الفقه الاسلامي - الحق في الفقه القانوني - تعريف حقوق الإنسان ثانياً- تقسيمات حقوق الإنسان (وتتم بدراسة مفصلة ومقارنة بين القانون والشرعية الإسلامية (الحقوق الجماعية)حق تقرير المصير, حق التنمية, الحق في بيئة مناسبة, حق الإنسان في العيش بسلام الحقوق الفردية (الحقوق الاقتصادية والثقافية, الحقوق المدنية والسياسية الحقوق الصيغة بالشخصية)- القسم الثالث:- ضمانات احترام وحماية حقوق الإنسان أول - الضمانات في الشريعة الإسلامية ثانياً:- الضمانات على الصعيد الوطني ثالثاً:- الضمانات على الصعيد الدولي مفردات ماله الديمقراطية الكورس الاول : يتضمن ماله الحريات العامة بين الشريعة والقانون الكورس الثاني:- يتضمن ماله نظم إدارة الدولة بين الشريعة والقانون

	الحريات العامة (بين الشريعة والقانون) أوال:- المقدمة ثانياً:- التعريف بالحريات العامة - الأصل اللغوي - الأصل التاريخي - الأساس القانوني - الأساس الشرعي ثالثاً:- أسس الحريات العامة - العدالة - المساواة - الحرية إبعاً:- الحريات العامة الو صفة - - حرية الرأي - حرية الفكر - حرية العالم - المساواه خامساً:- الشريعة الإسلامية والحريات العامة - موقف الإسلام من المرأة (الميراث, الزواج, تولي الوظائف) - موقف الإسلام من حرية العقيدة نظم إدارة الدولة أوال:- في تحديد النظم السياسية - فكره النظام السياسي - شرعية النظم السياسية - أنواع النظم السياسية ثانياً:- في النظام الديمقراطي - مقدمة تأصيلية - تعريف الديمقراطية -أركان ومركزات النظام الديمقراطي ثالثاً:- نماذج الديمقراطية - الديمقراطية المباشرة
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Learning and Teaching Strategies	
Strategies	اتباع طريقة التعليم المباشر من خلال عرض المادة وشرحها والاستعانة بالدروات التعليمية لشرحها من خلال توضيح البات المفهوم العلمي لمصطلحي الديمقراطية و حقوق الانسان

Student Workload (SWL)			
Structured SWL (h/sem)ل	33	Structured SWL (h/w)	2
Unstructured SWL (h/sem)	17	Unstructured SWL (h/w)ل	1
Total SWL (h/sem)	50		

Module Evaluation					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	التطور التاريخي لحقوق الإنسان
Week 2	الشرائع السماوية
Week 3	تطور حقوق الإنسان في القوانين الوضعية
Week 4	حقوق الإنسان التعريف بها وأنواعها
Week 5	ضمانات احترام وحماية حقوق الإنسان
Week 6	الضمانات في الشريعة وعلى الصعيدين الوطني والدولي
Week 7	Mid-term Exam
Week 8	مفهوم الديمقراطية
Week 9	الحريات العامة بين الشريعة و القانون
Week 10	التعريف بالحريات العامة و اسس الحريات
Week 11	الشريعة الإسلامية والحريات العامة
Week 12	نظم ادارة الدولة
Week 13	الديمقراطية مقدمة تأصيلية
Week 14	اركان ومركزات النظام الديمقراطي
Week 15	نماذج الديمقراطية
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)

	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	
Week 8	
Week 9	
Week 10	
Week 11	
Week 12	

Learning and Teaching Resources

	Text	Available in the Library?
Required Texts		Yes
Recommended Texts		No
Websites		

Grading Scheme

Group	Grade	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	90 - 100	Outstanding Performance
	B - Very Good	80 - 89	Above average with some errors
	C – Good	70 - 79	Sound work with notable errors
	D - Satisfactory	60 - 69	Fair but with major shortcomings
	E - Sufficient	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	(45-49)	More work required but credit awarded
	F – Fail	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

**First Year
Semester 2**

MODULE DESCRIPTION FORM

Module Information					
Module Title	Mathematics II		Module Delivery		
Module Type	Core		☒ Theory ☐ Lecture ☐ Lab ☒ Tutorial ☐ Practical ☐ Seminar		
Module Code	NVEE207				
ECTS Credits	6				
SWL (hr/sem)	150				
Module Level		1	Semester of Delivery		2
Administering Department		SCE	College	EE	
Module Leader	Hussein M. Hussein		e-mail	Hussein.hussein@uoninevah.edu.iq	
Module Leader's Acad. Title		Lecturer	Module Leader's Qualification		Ph.D.
Module Tutor	Name (if available)		e-mail	E-mail	
Peer Reviewer Name		Ismael Khudhair Abdullah	e-mail	ismael.abdullah@uoninevah.edu.iq	
Scientific Committee Approval Date		01/06/2023	Version Number	1.0	

Relation with other Modules			
Prerequisite module	NVEE206	Semester	1
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents

Module Aims

13. Develop a deep understanding of advanced integration techniques, including trigonometric substitutions, partial fractions, integration by parts, and further substitutions.
14. Comprehend the principles of vector calculus, including the del operator, gradient, divergence, and curl, and their applications in system and control engineering.
15. Familiarize students with polar and cylindrical coordinate systems and their graphical representations.
16. Explore the convergence of sequences and series, including tests for monotonicity and convergence, and the analysis of alternating series.
17. Introduce power series and Taylor series expansions for functions, enabling students to approximate functions and study their properties.
18. Cultivate problem-solving skills and the ability to apply calculus concepts to practical engineering situations in the field of system and control engineering.

Module Learning Outcomes

13. Demonstrate a comprehensive understanding of advanced integration techniques and apply them effectively to solve a variety of integrals. Apply vector calculus principles, such as the del operator, gradient, divergence, and curl, to analyze vector fields in system and control engineering applications.
14. Interpret and manipulate equations in polar and cylindrical coordinates, and graphically represent functions in these coordinate systems. Analyze the convergence properties of sequences and determine convergence or divergence using appropriate tests. Apply various tests for series convergence and divergence, including geometric series, nth partial sum, and alternating series tests.
15. Construct power series representations and Taylor series expansions for functions, enabling accurate function approximation and analysis.
16. Solve engineering problems involving advanced integration techniques, vector calculus, sequences, and series.
17. Utilize mathematical reasoning and critical thinking skills to analyze and interpret mathematical concepts and their applications in system and control engineering. Develop proficiency in mathematical problem-solving, both independently and collaboratively, and communicate solutions effectively.
18. Demonstrate an awareness of the limitations and assumptions involved in using mathematical models and methods in system and control engineering. Reflect on the ethical and professional implications of applying calculus concepts and techniques in engineering contexts.

Indicative Contents	Indicative content includes the following. <u>METHODS OF INTEGRATION:</u> i) Trigonometric Substitutions. ii) Quadratics. iii) Partial fractions. iv) Integration by parts. v) Further Substitutions. [20hrs] <u>VECTOR CALCULUS:</u> i) vector function versus scalar function, ii) Del operator; Gradient; Divergence and Curl. [12 hrs] <u>POLAR COORDINATES:</u> i) The Polar Coordinate system. ii) Graphs of polar equations. [12 hrs] <u>SEQUENCES AND SERIES:</u> i) Sequences: convergence; Test of monotone ii) series: geometric series; nth partial sum; tests of convergence; alternating series. iii) Power and Taylor's series. [12 hrs]
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Learning and Teaching Strategies	
Strategies	he main strategy for delivering this module in System and Control Engineering is to promote active student participation and enhance critical thinking skills. This will be achieved through interactive classes, engaging tutorials, and the inclusion of hands-on experiments and sampling activities that spark student interest. The classes will cover key calculus concepts through lectures, discussions, and visual aids, encouraging students to actively participate and contribute to class discussions. Interactive tutorials will reinforce understanding and problem-solving skills, allowing students to apply calculus principles collaboratively. Simple experiments and sampling activities will provide practical applications of calculus in system and control engineering, fostering a deeper understanding and curiosity for the subject. By implementing these strategies, the module aims to create an engaging learning environment that stimulates student engagement, cultivates critical thinking abilities, and highlights the real-world relevance of calculus in system and control engineering.

Student Workload (SWL)			
Structured SWL (h/sem)	63	Structured SWL (h/w)	4
Unstructured SWL (h/sem)	87	Unstructured SWL (h/w)	6
Total SWL (h/sem)	150		

Module Evaluation					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1, 5 and 6
	Assignments	2	10% (10)	2, 12	LO # 2, 3 and 4
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5 and 6
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1, 5 and 6
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Methods of Integration: Trigonometric Substitutions.
Week 2	Quadratics.
Week 3	Partial fractions.
Week 4	Integration by parts.
Week 5	Further Substitutions.
Week 6	Vector Calculus: Vector Function Versus Scalar Function.
Week 7	Del Operator, Gradient.
Week 8	Divergence and Curl.
Week 9	Mid-Term Exam
Week 10	Polar and Cylindrical Coordinates: The Polar Coordinate System.
Week 11	Graphs Of Polar Equations.
Week 12	Cylindrical Coordinate System.
Week 13	SEQUENCES AND SERIES: Sequences: convergence, Test of monotone.
Week 14	Series: geometric series, nth partial sum, tests of convergence, alternating series.
Week 15	Power and Taylor's series.
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)

	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	

Learning and Teaching Resources		
	Text	Available in the Library?
Required Texts	G. B. Thomas Jr., M. D. Weir, J. Hass, and F. R. Giordano, "Thomas' Calculus," 12th ed., Pearson, 2019.	Yes
Recommended Texts	Zill, D. G., Wright, W. S., & Cullen, M. R. (2011). Advanced Engineering Mathematics. Jones & Bartlett Publishers.	No
Websites	https://www.coursera.org/learn/introduction-to-calculus	

Grading Scheme				
Group	Grade		Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	90 - 100	Outstanding Performance	
	B - Very Good	80 - 89	Above average with some errors	
	C - Good	70 - 79	Sound work with notable errors	
	D - Satisfactory	60 - 69	Fair but with major shortcomings	
	E - Sufficient	50 - 59	Work meets minimum criteria	
Fail Group (0 - 49)	FX - Fail	(45-49)	More work required but credit awarded	
	F - Fail	(0-44)	Considerable amount of work required	

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

Module Information					
Module Title	AC Circuits Analysis		Module Delivery		
Module Type	Core		☒ Theory ☐ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☐ Seminar		
Module Code	NVEE216				
ECTS Credits	7				
SWL (hr/sem)	175				
Module Level		1	Semester of Delivery		2
Administering Department		SCE	College	EE	
Module Leader	Nashwan Z. Hero		e-mail	Nashwan.hero@uoninevah.edu.iq	
Module Leader's Acad. Title		Lecturer	Module Leader's Qualification		
Module Tutor	Name (if available)		e-mail	E-mail	
Peer Reviewer Name		Thakwan Akram jawad	e-mail	thakwan.jawad@uoninevah.edu.iq	
Scientific Committee Approval Date		01/06/2023	Version Number	1.0	

Relation with other Modules			
Prerequisite module	NVEE215	Semester	1
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents	
Module Aims	19. To develop problem solving skills and understanding of circuit theory through the application of techniques. 20. To understand voltage, current and power from a given circuit. 21. This course deals with the basic concept of electrical circuits. 22. This is the basic subject for all electrical and electronic circuits. 23. To understand Kirchhoff's current and voltage Laws problems. 24. To perform mesh and Nodal analysis.
Module Learning Outcomes	19. Recognize how electricity works in electrical circuits. Also, list the various terms associated with electrical circuits. Then summarize what is meant by a basic electric circuit. 20. Discuss the reaction and involvement of atoms in electric circuits and describe electrical power, charge, and current. 21. Define Ohm's law. 22. Identify the basic circuit elements and their applications and discuss the operations of sinusoid and phasors in an electric circuit. Also, discuss the various properties of resistors, capacitors, and inductors. 23. Explain the two Kirchhoff's laws used in circuit analysis. 24. Identify the capacitor and inductor phasor relationship with respect to voltage and current.
Indicative Contents	AC circuits – Time dependent signals, average and RMS values. Capacitance and inductance, energy storage elements, simple AC steady-state sinusoidal analysis. [10 hrs] AC Circuits – Phasor diagrams, definition of complex impedance, AC circuit analysis with complex numbers. [10 hrs] AC Circuits – Combining elements in series and parallel. Kirchhoff's laws and Ohm's law. Anatomy of a circuit, Network reduction, Introduction to mesh and nodal analysis. [20 hrs] Revision problem classes [6 hrs] AC Circuits – Impedance networks, voltage and current sources, Thevenin and Norton equivalent circuits, current and voltage division, input impedance, output impedance, coupling and decoupling capacitors, maximum power transfer, RMS and power dissipation, current limiting and over voltage protection. [15 hrs] RL, RC and RLC circuits - Frequency response of RLC circuits, simple filter and band-pass circuits, resonance and Q-factor, use of Bode plots, use of differential equations and their solutions. Time response (natural and step responses). Introduction to second order circuits. [15 hrs]

Learning and Teaching Strategies

Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.
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Student Workload (SWL)

Structured SWL (h/sem)	92	Structured SWL (h/w)	6
Unstructured SWL (h/sem)	83	Unstructured SWL (h/w)	6
Total SWL (h/sem)	175		

Module Evaluation

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1, 5 and 6
	Assignments	2	10% (10)	2, 12	LO # 1, 2, 3 and 4
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 2, 4 and 5
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-4
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

	Material Covered
Week 1	Alternating Waveforms: Average value and root mean Square(rms) values
Week 2	Phasor Relationships for Circuit Elements
Week 3	Series and Parallel connection (Capacitors and Inductors)
Week 4	Impedance and Admittance
Week 5	Kirchhoff's Laws in Frequency Domain
Week 6	A.C. Circuit Theorems (Mesh Circuit analysis)
Week 7	A.C. Circuit Theorems (Nodal Circuit analysis)
Week 8	A.C. Circuit Theorems (Thevenin's theorems)
Week 9	A.C. Circuit Theorems (Norton theorems)
Week 10	Apparent Power and Power Factor correction
Week 11	R-C Transient: The Storage Phase
Week 12	R-C Transient: The Release Phase
Week 13	R-L Transient: The Storage Phase
Week 14	R-L Transient: The Release Phase

Delivery Plan (Weekly Lab. Syllabus)

	Material Covered
Week 1	Lab 1: Introduction to Agilent VEE and PSPICE
Week 2	Lab 2: Thévenin's / Norton's Theorem and Kirchhoff's Laws
Week 3	Lab 3: First-Order Transient Responses
Week 4	Lab 4: Second-Order Transient Responses
Week 5	Lab 5: Frequency Response of RC Circuits
Week 6	Lab 6: Frequency Response of RL Circuits
Week 7	Lab 7: Filters

Learning and Teaching Resources

	Text	Available in the Library?
Required Texts	Fundamentals of Electric Circuits, C.K. Alexander and M.N.O Sadiku, McGraw-Hill Education	Yes
Recommended Texts	DC Electrical Circuit Analysis: A Practical Approach Copyright Year: 2020, dissidents.	No
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

Grading Scheme

Group	Grade		Marks (%)	Definition
Success Group (50 - 100)	A - Excellent		90 - 100	Outstanding Performance
	B - Very Good		80 - 89	Above average with some errors
	C - Good		70 - 79	Sound work with notable errors
	D - Satisfactory		60 - 69	Fair but with major shortcomings
	E - Sufficient		50 - 59	Work meets minimum criteria
Fail Group (0 - 49)	FX - Fail		(45-49)	More work required but credit awarded
	F - Fail		(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

Module Information					
Module Title	Engineering Mechanics (Dynamics)		Module Delivery		
Module Type	Core		☒ Theory ☐ Lecture ☐ Lab ☒ Tutorial ☐ Practical ☐ Seminar		
Module Code	NVEESC303				
ECTS Credits	4				
SWL (hr/sem)	100				
Module Level		1	Semester of Delivery		2
Administering Department		SCE	College	EE	
Module Leader	Ismael Khudhair Abdullah Al-Jobury		e-mail	ismael.abdullah@uoninevah.edu.iq	
Module Leader's Acad. Title		Lecturer Assistant	Module Leader's Qualification		M.Sc.
Module Tutor			e-mail		
Peer Reviewer Name		Mohanad Nihad Noaman	e-mail	mohanad.noaman@uoninevah.edu.iq	
Scientific Committee Approval Date		01/06/2023	Version Number		1.0

Relation with other Modules				
Prerequisite module	NVEESC302		Semester	1
Co-requisites module	None		Semester	

Module Aims, Learning Outcomes and Indicative Contents

Module Aims	1. Understanding and comprehending the laws and theories related to the motion of bodies by the action of the forces that applied to them, and developing the skills of solving problems related to them. 2. Knowing the types, forms and characteristics of the motions generated on bodies and classifying their vocabulary (location, displacement, distance, velocity, speed, acceleration, time) and knowing their forms and characteristics. 3. Knowing the coordinates through which the motion vocabulary of moving bodies is expressed. 4. Knowing the relationship between the vocabulary of motion and the possibility of representing it graphically. 5. Knowing the relationship between (force, mass, displacement, and velocity) and how to derive (work, energy, power, efficiency, momentum, impulse, and impact). 6. The study of dynamics in its two branches, kinematics and kinetics, is an essential introduction to the study of automation, robotics and systems modeling, which in turn are considered major courses in the Department of Systems and Control Engineering.
Module Learning Outcomes	1. Knowing the science of engineering mechanics and its basic vocabulary, as it is the origin of the dynamic's science. Also, Studying dynamics and its applications and related problems, and knowing its main branches, kinematics and kinetics, and what is the difference between them. 2. Knowledge of linear motion and its applications and knowledge of its main vocabulary (position, displacement, distance, velocity, speed, acceleration, and time) and the study of its forms, characteristics and coordinates that express it, knowing the difference between problems of constant acceleration and variable acceleration, and solve some of the related problems to it to enable understanding of the subject. Furthermore, knowing the relationship between the vocabulary of linear (position, displacement, distance, velocity, speed, acceleration, and time) and representing it graphically, and solve some related problems to enable understanding of the subject. 3. Knowing the motion of projectiles in both the horizontal and vertical directions, and knowing the difference between it and linear motion, and solve some problems related to it. Moreover, knowing of curved motion, its applications, knowing of its main vocabulary (location, displacement, velocity, acceleration, time), knowing of its forms, characteristics and coordinates that express it, and knowing of angular motion and rotational motion, and knowing of the difference between them, and solutions to some related problems to enable understanding of the subject. 4. Knowing the relative motion between moving objects and knowing the difference between it and absolute motion, and solve some related problems to enable understanding of the subject. Understanding the dependent motion between two bodies and how to analyze it, and solve some related problems to enable understanding of the subject. 5. Knowing the relationship between force, mass, and acceleration using Newton's second law, knowing the applications related to that, and solve some related problems to enable understanding of the subject. Together, these concepts enable the study relationship between force, mass, displacement and velocity, studying

	(work, kinetic energy, potential energy, power and efficiency) and knowing the difference between potential energy and kinetic energy and its applications in industrial life, and solve some related problems to enable understanding of the subject. 6. Knowing how to derive momentum and impulse forces, knowing their applications, and solve some problems related to them to enable understanding of the subject. Understand how to derive impact forces, knowing their applications, and solve some problems related to them to enable understanding of the subject.
Indicative Contents	Indicative content includes the following: Introduction to dynamics, Application of dynamics, Dynamics parts. [3 hrs] Part 1 – Kinematics: [32 hrs] - Rectilinear Kinematics: [16 hrs] - Continuous Motion – Changeable acceleration problems. [4 hrs] – Constant acceleration problems. [4 hrs] - Erratic Motion (Graphic representation of the motion). [4 hrs] - Motion of a Projectile. [4 hrs] - Curvilinear motion – Rectangular Components. [4 hrs] – Normal and tangential Components. [4 hrs] - Relative-Motion of Two Particles Using Translating Axes. [4 hrs] - Absolute Dependent Motion Analysis of Two Particles. [4 hrs] Part 1 – Kinetics: [21 hrs] - Force and Acceleration: Newton’s Second Law of Motion (The Equation of Motion). [4 hrs] - Work and Kinetic Energy - Principle of Work and Kinetic Energy. [5 hrs] - Potential Energy. [4 hrs] - Impulse and Momentum - Principle of Linear Impulse and Momentum. [4 hrs] - Impact. [4 hrs]

Learning and Teaching Strategies	
Strategies	The main strategy that will be adopted in introducing this unit is: - Sending the lecture to the students electronically three days before its scheduled date in the form of a (pdf) file with video clips (YouTube) showing the lecture with solutions to a number of related problems. - Giving the lecture and involving the students so that the lecture becomes a discussion to improve the students' skills and increase their understanding of the subject. - Conducting short exams in each lecture to urge students to follow up and increase their interest in the topic of the lecture.

	- Conducting an electronic meeting after each lecture if necessary to solve more problems related to the subject of the lecture to increase students' understanding of the subject.		
Student Workload (SWL)			
Structured SWL (h/sem)	63	Structured SWL (h/w)	4
Unstructured SWL (h/sem)	37	Unstructured SWL (h/w)	2
Total SWL (h/sem)	100		

Module Evaluation					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	10% (20)	3-8, 12-15	LO # 2, 3,...,6
	Assignments	2	10% (10)	5, 10	LO # 3, 6
	Projects / Lab.				
	Report	2	10% (10)	3, 5	LO # 2 and 3
Summative assessment	Midterm Exam	2 hr	10% (10)	10	LO # 1- 4
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)		
	Material Covered	
Week 1	Introduction to dynamics, Application of dynamics, Dynamics parts.	
Week 2	Kinematics	Rectilinear Kinematics: Continuous Motion – Changeable acceleration problems.
Week 3		Rectilinear Kinematics: Continuous Motion – Constant acceleration problems.
Week 4		Rectilinear Kinematics: Erratic Motion (Graphic representation of the motion).
Week 5		Motion of a Projectile.
Week 6		Curvilinear motion: Rectangular Components.
Week 7		Curvilinear motion: Normal and tangential Components.
Week 8		Relative-Motion of Two Particles Using Translating Axes
Week 9		Absolute Dependent Motion Analysis of Two Particles
Week 10	Mid-term Exam	
Week 11	Kinetics	Force and Acceleration: Newton's Second Law of Motion (The Equation of Motion).
Week 12		Work and Kinetic Energy - Principle of Work and Kinetic Energy.
Week 13		Potential Energy.
Week 14		Impulse and Momentum - Principle of Linear Impulse and Momentum.
Week 15		Impact.
Week 16	Preparatory week before the final Exam	

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	

Learning and Teaching Resources		
	Text	Available in the Library?
Required Texts	“Engineering Mechanics (Dynamics) “, By: R.C. Hibbeler.	Yes
Recommended Texts	“Engineering Mechanics (Dynamics) “, By: J.L. Meriam.	No
Websites	https://youtube.com/@ismaelal-jobury6914	

Grading Scheme			
Group	Grade	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	90 - 100	Outstanding Performance
	B - Very Good	80 - 89	Above average with some errors
	C – Good	70 - 79	Sound work with notable errors
	D - Satisfactory	60 - 69	Fair but with major shortcomings
	E - Sufficient	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	(45-49)	More work required but credit awarded
	F – Fail	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

Module Information					
Module Title	Computer Programming		Module Delivery		
Module Type	Core		☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar		
Module Code	NVEESC304				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level		1	Semester of Delivery		2
Administering Department		SCE	College	EE	
Module Leader	Abdulhameed Nabeel Hameed		e-mail	abdulhamed.hameed@uoninevah.edu.iq	
Module Leader's Acad. Title		Ass. Lecturer	Module Leader's Qualification		M.Sc.
Module Tutor	Name (if available)		e-mail	E-mail	
Peer Reviewer Name		Mohammed S. Qasim	e-mail	mohammed.qasim@uoninevah.edu.iq	
Scientific Committee Approval Date		01/06/2023	Version Number		1.0

Relation with other Modules			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents

Module Aims	1- To introduce students to the fundamental concepts of C++ programming, including its syntax, structure, and the key components that make up a C++ program. 2- To understand and implement basic decision-making structures using if, if else and switch statements in C++. 3- To learn how to create and use the for, while, and do-while loop for repetitive tasks. 4- To explore the declaration and initialization of one-dimensional and two-dimensional arrays in C++. 5- To learn the syntax for declaring, defining, and calling functions in C++.
Module Learning Outcomes	1- Understand the Basics of C++ Programming. 2- Implement Control Flow Statements: Decision-making. 3- Apply Looping Structures. 4- Work with Arrays in C++. 5- Understand and Implement Functions in C++.
Indicative Contents	1- Introduction to C++ Programming. 2- Operators in C++. 3- Control Flow Statements: Decision-making. 4- Looping in C++. 5- Arrays in C++. 6- C++ Functions.

Learning and Teaching Strategies

Strategies	1- Lectures and Demonstrations: Introduce key concepts through clear, engaging lectures and live demonstrations of coding techniques. 2- Hands-on Coding Practice: Encourage active participation by having students write and modify code during class to apply what they learn immediately. 3- Pair Programming and Collaborative Learning: Promote peer-to-peer learning by having students work together, solving problems and explaining their code to each other. 4- Guided Problem Solving: Support students in breaking down problems into manageable parts, applying programming concepts like loops, arrays, and functions. 5- Quizzes and Formative Assessments: Regular quizzes help identify knowledge gaps and ensure students are on track. 6- Project-based Learning: Assign small coding projects that require the use of multiple C++ concepts to encourage creativity and practical application.
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Student Workload (SWL)

Structured SWL (h/sem)	77	Structured SWL (h/w)	5
Unstructured SWL (h/sem)	48	Unstructured SWL (h/w)	3
Total SWL (h/sem)	125		

Module Evaluation					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO # 1, and 2
	Assignments	1	10% (10)	12	LO # 3
	Projects / Lab	14	15% (15)	Continuous	
	Report	1	5% (5)	13	LO # 4 , 5
Summative assessment	Midterm Exam	4 hr	10% (10)	8	LO # 1- 4
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Introduction to C++
Week 2	Operators in C++.
Week 3	Control Flow Statements: Decision-making (if single-selection statement).
Week 4	Control Flow Statements: Decision-making (if..else single-selection statement).
Week 5	Control Flow Statements: Decision-making (Nested if..else statement).
Week 7	Control Flow Statements: Decision-making (switch multiple-selection statement).
Week 8	Control Flow Statements: Decision-making (switch, break, and continue).
Week 9	Midterm Exam
Week 10	Looping (for statement).
Week 11	Looping (while statement).
Week 12	Looping (do-while statement).
Week 13	Declaration and initialization of One-dimensional array in C++.
Week 14	Declaration and initialization of Two-dimensional Array in C++.
Week 15	C++ Functions: Function declaration, definition, and calling.
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)

	Material Covered
Week 1	Starting with the Code::Blocks software
Week 2	Starting with C++ Programs
Week 3	Simple programs in C++
Week 4	Operators in C++
Week 5	Decision-making (if statement)
Week 6	Decision-making (if-else statement)
Week 7	Decision-making (switch statement)
Week 8	Control Flow: break and continue
Week 9	Midterm Exam
Week 10	Looping (for statement)
Week 11	Looping (while statement)
Week 12	Looping (do-while statement)
Week 13	Arrays in C++ (One-dimensional)
Week 14	Arrays in C++ (Two-dimensional)
Week 15	Functions in C++ (Declaration, Definition, and Calling)
Week 16	Review and Final Lab Assessment

Learning and Teaching Resources

	Text	Available in the Library?
Required Texts	1- C++ Programming: From Problem Analysis to Program Design" by D. S. Malik. 2- Accelerated C++: Practical Programming by Example.	No
Recommended Texts	"C++: The Complete Reference" by Herbert Schildt	No
Websites	1- Youtube, https://www.youtube.com/watch?v=ZzaPdXTsB8 . 2- Coursera, https://www.coursera.org/specializations/hands-on-cpp .	

Grading Scheme

Group	Grade	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	90 - 100	Outstanding Performance
	B - Very Good	80 - 89	Above average with some errors
	C – Good	70 - 79	Sound work with notable errors
	D - Satisfactory	60 - 69	Fair but with major shortcomings
	E - Sufficient	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	(45-49)	More work required but credit awarded
	F – Fail	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

Module Information			
Module Title	Digital Design		Module Delivery
Module Type	Core		☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	NVEESC331		
ECTS Credits	4		
SWL (hr/sem)	100		
Module Level	1	Semester of Delivery	2
Administering Department	SCE	College	EE
Module Leader	Mohammed A.Thanoon	e-mail	mohammed.alsayed@uoninevah.edu.iq
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	MSc
Module Tutor		e-mail	
Peer Reviewer Name	Mohammed N.Younus	e-mail	mohammed.younus@uoninevah.edu.iq
Scientific Committee Approval Date5	01/06/2023	Version Number	1.0

Relation with other Modules			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents

Module Aims

1. Introduction to Digital Systems: Introduce students to the basic principles of digital systems, including binary number systems, digital representation of data, and Boolean algebra.
2. Logic Gates and Boolean Algebra: Familiarize students with the different types of logic gates and their behavior. Teach Boolean algebra and its application in digital circuit design and analysis.
3. Combinational Logic Design: Enable students to design and analyze combinational logic circuits using various building blocks such as multiplexers, decoders, encoders, and arithmetic circuits.
4. Sequential Logic Design: Introduce students to the concept of sequential circuits, including flip-flops, registers, counters, and memory units. Teach the design and analysis of sequential circuits using state diagrams and state tables.
5. Digital Circuit Simulation: Provide students with hands-on experience in simulating digital circuits using computer-aided design (CAD) tools. Teach the use of simulation software to verify the functionality and performance of digital circuits.
6. Digital Integrated Circuits: Introduce students to the basics of digital integrated circuits (ICs) and their applications. Cover topics such as logic families, IC technologies, and IC packaging.
7. Introduction to Programmable Logic Devices (PLDs): Familiarize students with programmable logic devices such as programmable logic arrays (PLAs) and field-programmable gate arrays (FPGAs). Teach the design and implementation of digital circuits using PLDs.
8. Digital System Testing and Fault Diagnosis: Introduce students to the techniques used for testing and diagnosing faults in digital systems. Cover topics such as fault models, test generation, and fault diagnosis algorithms.
9. Digital System Applications: Explore various applications of digital systems in areas such as data processing, communication, control systems, and embedded systems.

Module Learning Outcomes

1. Demonstrate a thorough understanding of the digital techniques' fundamental principles and concepts.
2. Apply Boolean algebra and logic gates to design and analyze digital circuits.
3. Design and implement digital circuits using appropriate software and hardware tools. Evaluate and troubleshoot digital circuits for correct functionality and performance.
4. Utilize multiplexers, decoders, encoders, and other digital components in circuit design. Explain the principles and techniques of data transmission in digital communication systems.

	5. Analyze and evaluate the performance of digital systems, considering factors such as speed, reliability, and power consumption. Apply critical thinking and problem-solving skills to address challenges in digital circuit design and implementation. 6. Collaborate effectively in team projects, demonstrating good communication and teamwork skills. Stay updated with the latest advancements and trends in digital techniques and apply them to real-world engineering problems.
Indicative Contents	Indicative content includes the following. 1. Introduction to Digital Systems: • Binary number systems and conversions • Digital representation of data • Logic levels and logic states • Digital signals and waveforms 2. Boolean Algebra and Logic Gates: • Boolean algebra fundamentals • Logic gates and their truth tables • Logic gate implementation using basic electronic components. • Logic gate properties and universal gates 3. Combinational Logic Circuits: • Combinational logic design principles • Combinational circuit analysis and simplification • Arithmetic circuits (adders, subtractors) • Multiplexers and demultiplexers • Encoders and decoders 4. Sequential Logic Circuits: • Flip-flops and latches • Analysis and design of sequential circuits • Synchronous and asynchronous sequential circuits • Registers and counters • State machines and state diagrams 5. Digital Integrated Circuits: • Overview of digital integrated circuits (ICs) • Types of ICs: gates, multiplexers, flip-flops, counters, etc.

	• IC technologies: TTL, CMOS, ECL • IC specifications and datasheets
	6. Programmable Logic Devices (PLDs):
	• Introduction to PLDs: PAL, PLA, CPLD, FPGA • Architecture and configuration of PLDs • Designing and programming PLDs • Applications of PLDs in digital systems
	7. Digital Circuit Simulation and Analysis:
	• Introduction to digital circuit simulation tools (e.g., Logisim, Proteus) • Simulation of digital circuits and waveforms • Timing analysis and propagation delay • Troubleshooting and debugging digital circuits
	8. Design Methodologies and Tools:
	• Overview of digital design methodologies (e.g., hierarchical design, top-down design) • Introduction to hardware description languages (HDL) such as VHDL or Verilog • Design entry and synthesis tools • Design verification and testing techniques
	9. Emerging Trends in Digital Techniques:
	• Advanced topics such as low-power design, digital signal processing, hardware/software co-design, etc. • Emerging technologies and future directions in digital systems

Learning and Teaching Strategies	
Strategies	1. Attend Lectures and Take Notes: Actively participate in lectures, listen attentively, and take comprehensive notes. Note down key concepts, examples, and explanations provided by the instructor. Review your notes regularly to reinforce your understanding. 2. Read the Recommended Textbooks: Consult the recommended textbooks for the module. Read the relevant chapters or sections to gain a deeper understanding of the topics covered. Pay attention to explanations, diagrams, and examples provided in the textbooks.

	- Engage in Practical Work: Digital Techniques often involve hands-on practical work. Make use of laboratory sessions or practical assignments to gain practical experience in designing and implementing digital circuits. Experiment with different circuit configurations and observe the outcomes. - Solve Practice Problems: Practice solving problems and exercises related to the topics covered. This helps in reinforcing your understanding and developing problem-solving skills. Look for additional practice problems in textbooks, online resources, or provided by the instructor. - Collaborate with Peers: Form study groups or engage in discussions with your peers. Explaining concepts to others or discussing challenging topics can enhance your understanding. Collaborative learning allows for sharing different perspectives and can help clarify doubts. - Utilize Online Resources: Take advantage of online resources such as tutorials, video lectures, interactive simulations, and online forums. These resources can provide alternative explanations, additional examples, and opportunities for self-paced learning. - Seek Clarification: If you encounter difficulties or have questions, don't hesitate to seek clarification from your instructor or teaching assistants. Attend office hours or ask questions during class to address any confusion and ensure a clear understanding of the concepts. - Review and Revise Regularly: Digital Techniques involves building upon foundational concepts. Regularly review previously covered material to reinforce your understanding and make connections between different topics. Set aside dedicated time for revision before exams or assessments. - Practice Digital Circuit Simulation: Familiarize yourself with digital circuit simulation tools such as Logisim, Proteus, or other software available. Use these tools to simulate and visualize the behavior of digital circuits, verify your designs, and gain hands-on experience. - Stay Updated with Emerging Trends: Keep up with current trends and advancements in digital techniques. Read research papers, articles, and industry publications to stay informed about the latest developments in digital systems design and emerging technologies.
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Student Workload (SWL)			
Structured SWL (h/sem)	77	Structured SWL (h/w)	5
Unstructured SWL (h/sem)	23	Unstructured SWL (h/w)	2
Total SWL (h/sem)	100		

Module Evaluation					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1, 2, and 6
	Assignments	2	10% (10)	2, 12	LO # 3, 4 and 5
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 4, 5 and 6
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-5
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Introduction to Digital Techniques, Number Systems and Binary Arithmetic
Week 2	Boolean Algebra and Logic Gates, Combinational Logic Circuit
Week 3	Combinational Logic Circuits (continued), Multiplexers, and Demultiplexers
Week 4	Sequential Logic Circuits: Latches and Flip-Flops, Sequential Logic Circuits: Counters
Week 5	Sequential Logic Circuits: Shift Registers, State Machines, and Finite State Automata
Week 6	Introduction to Digital Integrated Circuits, Combinational MSI (Medium-Scale Integration) Circuits
Week 7	Mid-term Exam
Week 8	Sequential MSI Circuits, Introduction to Programmable Logic Devices (PLDs)
Week 9	Introduction to Field-Programmable Gate Arrays (FPGAs), Verilog or VHDL Introduction
Week 10	Timing and Clock Signals in Digital Circuits, Synchronous and Asynchronous Sequential Logic
Week 11	Memory Devices: ROM, RAM, and Flash Memory
Week 12	Memory Interfacing and Address Decoding
Week 13	Arithmetic Circuits and Arithmetic Logic Units (ALUs)
Week 14	Introduction to Digital Signal Processing (DSP)
Week 15	Review of Key Concepts
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	Lab 1: Introduction to KL-31001 DIGITAL LOGIC LAB
Week 2	Lab 2: logic Gates
Week 3	Lab 3: NAND, NOR, XOR Gates.
Week 4	Lab 4: AND-OR-INVERTER (A-O-I) Gate Circuits
Week 5	Lab 5: Bit Parity Generator Circuit
Week 6	Lab 6: Comparator Circuit
Week 7	Lab 7: Adder and Subtractor Circuits
Week 8	Lab 8: BCD Adder and 2's Complement Circuit
Week 9	Lab 9: Decoder Circuit
Week 10	Lab 10: Encoder Circuit

Week 11	Lab 11: Multiplexer Circuit
Week 12	Lab 12: Demultiplexer Circuits

Learning and Teaching Resources		
	Text	Available in the Library?
Required Texts	Digital Design" by M. Morris Mano and Michael D. Ciletti: This textbook provides a comprehensive introduction to digital logic and design. It covers topics such as Boolean algebra, combinational and sequential logic circuits, and digital system design. It is widely used in introductory digital design courses.	Yes
Recommended Texts	1. "Digital Design: Principles and Practices" by John F. Wakerly: This book provides a comprehensive introduction to digital design, covering topics such as digital logic, sequential logic, and computer organization. It includes numerous examples, exercises, and design projects. 2. "Digital Fundamentals" by Thomas L. Floyd and R. Fletcher: This textbook covers the basics of digital electronics, including number systems, logic gates, combinational and sequential circuits, and memory devices. It offers clear explanations and includes practical examples and exercises. 3. "Digital Design and Computer Architecture" by David Harris and Sarah Harris: This book combines digital design principles with computer architecture concepts. It covers topics such as Boolean algebra, combinational and sequential circuits, datapath and control unit design, and memory systems. It also includes practical examples and exercises. 4. "Digital Electronics: Principles, Devices, and Applications" by Anil K. Maini: This text provides a comprehensive overview of digital electronics, including digital logic, combinational and sequential circuits, and digital integrated circuits. It covers both theoretical concepts and practical applications. 5. "Digital Systems: Principles and Applications" by Ronald J. Tocci, Neal S. Widmer, and Greg Moss: This book offers a thorough introduction to digital systems, covering topics such as digital logic, memory, programmable logic devices, and microprocessors. It includes numerous examples, exercises, and practical applications. 6. "Digital Electronics: A Practical Approach with VHDL" by William Kleitz: This book combines	No

	theoretical concepts with practical applications of digital electronics. It covers topics such as logic gates, Boolean algebra, combinational and sequential circuits, and VHDL programming. It includes hands-on exercises and design projects. 7. "Introduction to Digital Systems" by Ercegovac and Lang: This textbook provides a comprehensive introduction to digital systems, including digital logic, Boolean algebra, combinational and sequential circuits, and computer arithmetic. It includes numerous examples and exercises.	
Websites	1. All About Circuits (https://www.allaboutcircuits.com/): This website offers comprehensive tutorials, articles, and resources on various topics related to digital circuits, logic gates, and electronics. It covers both theoretical concepts and practical applications. 2. Khan Academy (https://www.khanacademy.org/): Khan Academy provides free online courses and video tutorials on a wide range of subjects, including digital electronics. It covers fundamental concepts, Boolean algebra, logic gates, and more. 3. Electronics Hub (https://www.electronicshub.org/): Electronics Hub is a platform that offers tutorials, projects, and resources for digital electronics and related topics. It includes articles on digital logic, sequential circuits, microcontrollers, and more. 4. Digital Electronics by Tutorials Point (https://www.tutorialspoint.com/digital_electronics/index.htm): Tutorials Point provides an online tutorial on digital electronics, covering topics such as logic gates, flip-flops, counters, and shift registers. It offers clear explanations and examples. 5. Learn.Digilentinc (https://learn.digilentinc.com/): Digilent is a company specializing in educational electronics and provides learning resources on various topics, including digital electronics. Their website offers tutorials, projects, and reference materials for learning digital techniques. 6. Electronics Tutorials (https://www.electronics-tutorials.ws/): Electronics Tutorials provides comprehensive tutorials on digital electronics, covering topics such as number systems, logic gates, sequential circuits, and more. It includes practical examples and interactive simulations. 7. Neso Academy (https://www.youtube.com/user/nesoacademy): Neso Academy's YouTube channel offers video lectures on digital electronics and related subjects. The videos cover a wide range of topics, including logic gates, sequential circuits, and digital system design.	

Grading Scheme				
Group	Grade	Marks (%)	Definition	
Success Group (50 - 100)	A - Excellent	90 - 100	Outstanding Performance	
	B - Very Good	80 - 89	Above average with some errors	
	C – Good	70 - 79	Sound work with notable errors	
	D - Satisfactory	60 - 69	Fair but with major shortcomings	
	E - Sufficient	50 - 59	Work meets minimum criteria	
Fail Group (0 – 49)	FX – Fail	(45-49)	More work required but credit awarded	
	F – Fail	(0-44)	Considerable amount of work required	
Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.				

MODULE DESCRIPTION FORM

Module Information						
Module Title	English I		Module Delivery			
Module Type	Basic		☒ Theory ☐ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar			
Module Code	NVU11					
ECTS Credits	2					
SWL (hr/sem)	50					
Module Level	1	Semester of Delivery	1			
Administering Department	SCE	College	EE			
Module Leader			e-mail			
Module Leader's Acad. Title	Noor Mothafar Hamid	Module Leader's Qualification	MS.D.			
Module Tutor	Name (if available)	e-mail	noorm.hame@duoninevah.edu.iq			
Peer Reviewer Name	Name	e-mail	E-mail			
Scientific Committee Approval Date	01/06/2023	Version Number	1.0			

Relation with other Modules			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents	
Module Aims	25. To develop skills, reading, writing and understanding of English language through the application of teaching techniques. 26. To understand scientific subjects and technical terms through reading and comprehension. 27. This course deals with the basic concepts of scientific subjects. 28. This course handles how to write simple research and how to make a successful presentation. 29. To understand the scientific language in English.
Module Learning Outcomes	25. Recognize parts of speech and tenses in English language and list the various terms associated with scientific texts. 26. Summarize what is meant by a basic electric circuit and discuss Electric currents, series and parallel circuits. 27. Describe electrical power, charge, and current and discuss computers, communication and the future of computers. 28. Identify the basic circuit elements and their applications. Also, explain energy types and forms. 29. Discuss the various properties of radio waves and vacuum tubes and explain modulation. 30. Discuss Electromagnetism.
Indicative Contents	Indicative content includes the following. 1. parts of speech _ verb _ noun _ pronoun 2. Tenses _ Past _ Present _ future 3. Electric currents and circuit _ AC/DC _ parallel, series _ Grounding, fuse, short circuit 4. Radio waves and vacuum tubes 5. Electromagnetism. 6. The future of computers, communication applications. _ fiber optics.

	7. Induction. _ Electric generator _ Electric transformer _ self-induction _ servomechanism 8. Incandescent lamp. 9. Energy. _ types of energy _ forms of energy 10. Introduction to electron and electricity. 11. Electricity and electronics.
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Learning and Teaching Strategies	
Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation by reading, writing and comprehension in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, presentation, interactive tutorials, by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL)			
Structured SWL (h/sem)	33	Structured SWL (h/w)	2
Unstructured SWL (h/sem)	17	Unstructured SWL (h/w)	1
Total SWL (h/sem)	50		

Module Evaluation					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	10% (10)	4,6	LO #1, 2 and 3
	Assignments	2	10% (10)	9, 12	LO # 4, 5 and 6
	Projects / Lab.				
	Report	1	10% (10)	13	LO # 6
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1- 4
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Parts of speech
Week 2	Tenses
Week 3	Electric currents and circuit
Week 4	Radio waves and vacuum tubes
Week 5	The future of computers, communication applications.
Week 6	Induction -Electric generator -Electric transformer
Week 7	Mid-term Exam
Week 8	Induction -Self-induction -Servomechanism
Week 9	Incandescent lamp.
Week 10	Energy. -types of energy -forms of energy
Week 11	Introduction to electron and electricity.
Week 12	Electricity and electronics
Week 13	The cathode ray tube
Week 14	Propagation
Week 15	Modulation
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	

Learning and Teaching Resources		
	Text	Available in the Library?
Required Texts	English in electrical engineering and electronics. The language of electrical and electronic engineering in English.	Yes
Recommended Texts	English for electrical engineering and computing.	No
Websites	https://www.askoxford.com/betterwriting/successfulcv/application/?view=uk	

Grading Scheme			
Group	Grade	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	90 - 100	Outstanding Performance
	B - Very Good	80 - 89	Above average with some errors
	C – Good	70 - 79	Sound work with notable errors
	D - Satisfactory	60 - 69	Fair but with major shortcomings
	E - Sufficient	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	(45-49)	More work required but credit awarded
	F – Fail	(0-44)	Considerable amount of work required
Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.			

MODULE DESCRIPTION FORM

Module Information				
Module Title	Arabic I		Module Delivery	
Module Type	Base		☒ Theory ☐ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	NVU16			
ECTS Credits	2			
SWL (hr/sem)	50			
Module Level		1	Semester of Delivery	2
Administering Department			College	Electronics Engineering
Module Leader	Abdullah Mohammed Qader		e-mail	
Module Leader's Acad. Title		Assistant Lecturer	Module Leader's Qualification	MSc
Module Tutor			e-mail	
Peer Reviewer Name			e-mail	
Scientific Committee Approval Date		Feb. 01, 2025	Version Number	1.0

Relation with other Modules				
Prerequisite module	None		Semester	
Co-requisites module	None		Semester	

Module Aims, Learning Outcomes and Indicative Contents	
Module Aims	تهدف هذه الوحدة إلى تعزيز مهارات اللغة وتنمية التفكير وتمكين الطالب من معرفة القواعد الأساسية للغة العربية ، وكذلك تمكينهم من القدرة على الإلقاء و التحدث باللغة السليمة الخالية من الأخطاء النحوية.
Module Learning Outcomes	من المتوقع أن يكون الطالب قادرين على : 1. تعلم قواعد لغوية مفيدة في حياتهم المهنية مستقل وذلك في صياغة الكتب الرسمية أو نحوها. 2. ان يميز الطالب بين أنواع الكلمات (اسم، فعل، حرف) وتوظيفها في السياقات الصحيحة. 3. أن يستطيع الطالب إعراب الجمل بشكل صحيح وفقاً للقواعد النحوية. 4. أن يتعرف الطالب على الجمل الاسمية والفعلية ويعرف تركيب كل منهما. 5. أن يتقن الطالب القواعد الصرفية مثل تصريف الأفعال حسب الأوزان الصرفية. 6. أن يتمكن الطالب من التعرف على بعض الأساليب البلاغية مثل التشبيه والاستعارة والكناية واستخدامها.
Indicative Contents	يتضمن المحتوى الإرشادي ما يلي: إلى علوم العربية ، والتعرف على أقسام الكلام في اللغة العربية ، والتعرف على الفعل وعالماته و الحرف وعالماته ، وكذلك علامات الإعراب الأصلية و الفرعية ، والتفريق بين الجملتين الاسمية والفعلية ، وكذلك التعرف على شبه الجملة بنوعيهما ، والتعرف على المعرب والمبني ، والميزان الصرفي والمشتقات في اللغة ، والتفريق بين همزتي الوصل والقطع ، والتعرف على ال الشمسية والقمرية ، والضاد والطاء ، والتاء المبسوطة والمربوطة.

Learning and Teaching Strategies	
Strategies	اتباع طريقة التعليم المباشر من خلال عرض المادة وشرحها والاستعانة بالأدوات التعليمية لشرحها من خلال توضيح اليات المفهوم العلمي للغة العربية

Student Workload (SWL)			
Structured SWL (h/sem)	33	Structured SWL (h/w)	2
Unstructured SWL (h/sem)	17	Unstructured SWL (h/w)¹	1
Total SWL (h/sem)	50		

Module Evaluation					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	25% (10)	3, 10	LO #1, and 2
	Assignments	2	25% (10)	5, 12	LO # 1, 6, and 3
	Class work	1	25% (10)	9	LO # 4
	Report	1	10% (10)	14	LO # 5
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO #1 – 4
	Final Exam	2hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	علوم اللغة العربية
Week 2	أقسام الكلام
Week 3	الفعل وعالماته
Week 4	الحرف وعالماته
Week 5	عالمات الإعراب الصلبة
Week 6	عالمات الإعراب الفرعية
Week 7	الجملة الاسمية
Week 8	الجملة الفعلية
Week 9	شبه الجملة
Week 10	المعرب والمبني
Week 11	الميزان الصرفي
Week 12	المشتقات
Week 13	همزة القطع والوصل
Week 14	ال الشمسية والقمرية
Week 15	التاء المفتوحة والمربوطة / الضاد والظاء
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	
Week 8	
Week 9	
Week 10	
Week 11	
Week 12	

Learning and Teaching Resources		
	Text	Available in the Library?
Required Texts	البالغة الواضحة ، علي الجارم و مصطفى أمين النخبة السنية في شرح المقدمة الأجرومية ، محمد محيي الدين عبد الحميد الصرف الواضح ، عبد الجبار علوان النائلة علم العروض والقافية ، عبدالعزيز عتيق	Yes
Recommended Texts		No
Websites		

Grading Scheme			
Group	Grade	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	90 - 100	Outstanding Performance
	B - Very Good	80 - 89	Above average with some errors
	C - Good	70 - 79	Sound work with notable errors
	D - Satisfactory	60 - 69	Fair but with major shortcomings
	E - Sufficient	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	(45-49)	More work required but credit awarded
	F – Fail	(0-44)	Considerable amount of work required
Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.			

Second Year
(First Semester)

MODULE DESCRIPTION FORM

Module Information			
Module Title	Engineering Analysis I		Module Delivery
Module Type	Basic		☒ Theory ☐ Lecture ☐ Lab ☒ Tutorial
Module Code	NVEE208		
ECTS Credits	5		
SWL (hr/sem)	125		
			☐ Practical ☐ Seminar
Module Level	2	Semester of Delivery	3
Administering Department	SCE	College	EE
Module Leader	Abdurahman Basil AYOUB	e-mail	abdurahman.ayoub@uoninevah.edu.iq
Module Leader's Acad. Title	Asst. Lecturer	Module Leader's Qualification	MSc
Module Tutor		e-mail	E-mail
Peer Reviewer Name	Abdulallah I.	e-mail	E-mail
Scientific Committee Approval Date	01/06/2023	Version Number	1.0

Relation with other Modules			
Prerequisite module	NVEE207	Semester	2
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents	
Module Aims	1. Understanding Differential Equations – Learn methods for solving first and second-order differential equations, including exact solutions and numerical approaches. 2. Laplace Transforms – Apply Laplace transforms to simplify and solve differential equations, particularly in engineering and control systems. 3. Matrix Theory – Develop proficiency in matrix operations, which are essential for solving systems of equations and understanding linear transformations. 4. Multiple Integrals – Gain the ability to evaluate double and triple integrals. 5. Applied Problem-Solving – Use mathematical techniques in real-world applications, such as robotics, physics, and engineering mechanics.
Module Learning Outcomes	31. Solve Differential Equations – Apply methods for first and second-order differential equations, including exact solutions and numerical techniques. 32. Use Laplace Transforms – Understand and apply Laplace transforms to simplify and solve differential equations, particularly in engineering contexts. 33. Apply Matrix Theory – Perform matrix operations and use them in solving systems of equations and transformations. 34. Evaluate Multiple Integrals – Compute double and triple integrals. 35. Apply Mathematical Concepts to Engineering – Use differential equations, Laplace transforms, and matrix theory in real-world applications like robotics, control systems, and physics.

Indicative Contents	Differential Equations (40) • Definition and classification of ordinary differential equations (ODEs) • First-order ODEs: Variable separable, homogeneous, linear, exact methods • Second-order ODEs: Undetermined coefficients, variation of parameters • Applications in engineering and physics Laplace Transforms (35) • Definition and fundamental properties • Laplace transforms of elementary functions • Inverse Laplace transforms and their applications • Solving differential equations using Laplace transforms Matrix Theory (25) • Basic operations: Addition, multiplication, inversion • Determinants and eigenvalues • Applications in linear systems and numerical analysis Multiple Integrals (25) • Double and triple integrals • Applications in physics and engineering mechanics
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Learning and Teaching Strategies	
Strategies	Differential Equations 1. Classification First – Identify whether the equation is first-order, second-order, linear, or nonlinear. 2. Choose the Right Method – Use separation of variables, integrating factors, or exact equations for first-order problems. 3. For Second-Order Equations – Apply undetermined coefficients or variation of parameters. 4. Laplace Transform Approach – Convert differential equations into algebraic equations for easier manipulation. Laplace Transforms 1. Use Transform Tables – Recognize common transforms to speed up calculations. 2. Apply Properties – Utilize linearity, shifting, and convolution for complex functions.

	3. Inverse Laplace Transform – Convert back to the time domain using partial fraction decomposition. 4. Engineering Applications – Solve control system equations efficiently. Multiple Integrals 1. Iterated Integration – Break down double and triple integrals into stepwise calculations. 2. Change of Variables – Use polar, cylindrical, or spherical coordinates for simplification. 3. Numerical Methods – Apply Monte Carlo or Riemann sum approximations when analytical solutions are difficult.
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Student Workload (SWL)			
Structured SWL (h/sem)	48	Structured SWL (h/w)	3
Unstructured SWL (h/sem)	77	Unstructured SWL (h/w)	5
Total SWL (h/sem)	125		

Module Evaluation					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	20% (20)	5, 11	LO #1, 3 and 5
	Assignments	2	10% (10)	2, 10	LO # 1, 2 and 5
	Online Assignments	1	5% (5)	7, 9	LO # 1
	Report	1	5% (5)	13	LO # 3
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-3
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Definition of Ordinary Differential Equations, First Order D. Eqs. (Variable Separable, Homogeneous, Linear, Exact.) (Tutorial)
Week 2	Definition of Ordinary Differential Equations, First Order D. Eqs. (Variable Separable, Homogeneous, Linear, Exact.) (Tutorial)
Week 3	Definition of Ordinary Differential Equations, First Order D. Eqs. (Variable Separable, Homogeneous, Linear, Exact.) (Tutorial)
Week 4	Second Order Differential Equations (Undetermined coefficients, Variation of parameters.) (Tutorial)
Week 5	Second Order Differential Equations (Undetermined coefficients, Variation of parameters.) (Tutorial)
Week 6	
Week 7	Properties of Laplace Transform. (Tutorial)
Week 8	Mid-Exam
Week 9	Inverse Laplace Transform. (Tutorial)
Week 10	Applied Laplace Transform to Solve Differential Equations (Tutorial)
Week 11	Applied Laplace Transform to Solve Differential Equations (Tutorial)
Week 12	Matrix Theory Basic operations. (Tutorial)
Week 13	Matrix Theory Basic operations. (Tutorial)
Week 14	Multiple Integral – (Double Integrals)
Week 15	Changing the order of integration in double integrals
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources		
	Text	Available in the Library?
Required Texts	Advanced Engineering Mathematics: By Kreyszig 10 th edition, 2011	No
Recommended Texts	Calculus: By Weir, Hass and Thomas Prentice Hall, 12 th edition 2010	No
Websites	https://www.coursera.org/	

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	

Grading Scheme			
Group	Grade	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	90 - 100	Outstanding Performance
	B - Very Good	80 - 89	Above average with some errors
	C - Good	70 - 79	Sound work with notable errors
	D - Satisfactory	60 - 69	Fair but with major shortcomings
	E - Sufficient	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	(45-49)	More work required but credit awarded
	F – Fail	(0-44)	Considerable amount of work required
Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.			

MODULE DESCRIPTION FORM

Module Information					
Module Title	Signals and Systems I		Module Delivery		
Module Type	Basic		☒ Theory ☐ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☐ Seminar		
Module Code	NVEE210				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level		2	Semester of Delivery		3
Administering Department		SCE	College	EEC	
Module Leader	Ahmed Jameel Abdulqader		e-mail	ahmed.abdulqader@uoninevah.edu.iq	
Module Leader's Acad. Title		Lecturer	Module Leader's Qualification		Ph.D.
Module Tutor			e-mail		
Peer Reviewer Name		Abulhameed Nabeel	e-mail	abdulhamed.hameed@uoninevah.edu.iq	
Scientific Committee Approval Date		01/06/2023	Version Number	1.0	

Relation with other Modules			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents	
Module Aims	30. To introduce the fundamentals of signals and systems 31. To support applied modules in areas such as networks, electromagnetic fields and control theory 32. To provide an introduction to the Laplace transform and the Z-transform as tools for linear systems theory and analysis 33. To develop an awareness and understanding of the use of Fourier Transform, Fourier Series, Convolution and Correlation techniques to the study of signals and linear systems 34. To develop skills in the application of applied numeracy and algebraic techniques
Module Learning Outcomes	36. Describe different types of signals and systems and discuss the limitations of the Laplace transform in the context of engineering problems 37. Explain the implications of sampling signals and the basic theory of the Z-transform. Also, be able to demonstrate an understanding of Fourier Series and Fourier Transform techniques. Moreover, be able to demonstrate an understanding of Convolution and Correlation techniques. Furthermore, be able to explain and use the theorems associated with Fourier Transform techniques 38. Be able to describe the use of Correlation and Convolution techniques to analyze linear time invariant systems 39. Be able to use the Laplace transform in the analysis and characterization of linear, time-invariant systems 40. Be able to compare and contrast the Laplace & Fourier transforms in an engineering context 41. Be able to apply Fourier Transform techniques to describe the characteristics of signals
Indicative Contents	Indicative content includes the following. Signals and Systems: [10 hrs] Basic Definitions, Mathematical Models, Continuous- Time and Discrete-Time systems Signal and System Characteristics and Models [20 hrs] Basic Operations on Signals; Signal Characteristics; System Representations and Models; System Characteristics Continuous- Time Signals and Systems [30 hrs] Time –Domain Representations of Continuous- Time Signals; Sinusoidal and Complex Exponential Signals; Singularity Function Signals; Signal Energy and Power.

	Time Domain Analysis of Continuous-Time Signals [20 hrs] System Equation Solution; System Impulse Response; Zero-State Response of Linear; Time Invariant System; The Superposition Integral; Continuous-Convolution and Properties. Frequency-Domain Representation of Continuous- Time Signal [40 hrs] Spectra and Bandwidth of Continuous- Time Signals; Fourier Series Representations of Signals; Amplitude and Phase Spectra of Periodic signals; Complex Fourier Series Representations of Signals; The Fourier Transform and Spectra of aperiodic Energy Signals; The Fourier Transform and Spectra of Non energy signals. Frequency-Domain Analysis of Continuous- Time System [20 hrs] System Frequency Response; Frequency-Response Determination; Frequency Response of Electric Circuits; Phase Delay and Group Delay; Bode Plots of Amplitude and Phase Responses. Analysis of Continuous- Time System Using the Laplace Transform [10 hrs] The Laplace Transform; Laplace Transform Evaluations and Theorems; Evaluations of Inverse Laplace Transform; System Transfer Function; Frequency Response.
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Learning and Teaching Strategies	
Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL)			
Structured SWL (h/sem)	77	Structured SWL (h/w)	5
Unstructured SWL (h/sem)	48	Unstructured SWL (h/w)	3
Total SWL (h/sem)	125		

Module Evaluation					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1, 3, 6
	Assignments	2	10% (10)	4, 12	LO # 1, 2 and 3
	Lab	3	15% (15)	Continuous	All
	Seminar	1	5% (10)	10	LO # 2, 4 and 6
Summative assessment	Midterm Exam	1 hr	10% (10)	7	LO # 1-3
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Introduction of signals and systems
Week 2	Signal and System Characteristics and Models
Week 3	Signal and System Characteristics and Models
Week 4	Continuous- Time Signals and Systems
Week 5	Continuous- Time Signals and Systems
Week 6	Time Domain Analysis of Continuous-Time Signals
Week 7	Mid-term Exam
Week 8	Time Domain Analysis of Continuous-Time Signals
Week 9	Time Domain Analysis of Continuous-Time Signals
Week 10	Frequency-Domain Analysis of Continuous- Time System
Week 11	Frequency-Domain Analysis of Continuous- Time System
Week 12	Frequency-Domain Analysis of Continuous- Time System
Week 13	Analysis of Continuous- Time System Using the Laplace Transform
Week 14	Analysis of Continuous- Time System Using the Laplace Transform
Week 15	Frequency Response of Electric Circuits
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	Lab 1: Generation of continuous time signals
Week 2	
Week 3	Lab 2: BASIC SIGNAL OPERATIONS
Week 4	
Week 5	Lab 3: System properties
Week 6	
Week 7	Lab 4: Computation of Convolution
Week 8	
Week 9	Lab 5: Fourier series coefficients calculations
Week 10	
Week 11	Lab 6: Fourier Transform Properties
Week 12	
Week 13	Lab 7: Applications I
Week 14	
Week 15	Lab 8: Applications II
Week 16	

Learning and Teaching Resources		
	Text	Available in the Library?
Required Texts	Signals and Systems Edition 4.0 by Michael D. Adams Copyright Year: 2022	No
Recommended Texts	Signals and Systems primer with MATLAB by MATTHEW N. O. SADIKU WARSAME H. ALI Copyright Year: 2016.	No
Websites	https://www.coursera.org	

Grading Scheme			
Group	Grade	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	90 - 100	Outstanding Performance
	B - Very Good	80 - 89	Above average with some errors
	C - Good	70 - 79	Sound work with notable errors
	D - Satisfactory	60 - 69	Fair but with major shortcomings
	E - Sufficient	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	(45-49)	More work required but credit awarded
	F – Fail	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

Module Information					
Module Title	Control I		Module Delivery		
Module Type	Core		☒ Theory ☐ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☐ Seminar		
Module Code	NVEESC305				
ECTS Credits	6				
SWL (hr/sem)	150				
Module Level		2	Semester of Delivery		3
Administering Department		SCE	College	EEC	
Module Leader	Muhammed A. Ibrahim		e-mail	muhammed.ibrahim@uoninevah.edu.iq	
Module Leader's Acad. Title		Assistant Professor	Module Leader's Qualification		Ph.D.
Module Tutor			e-mail	E	
Peer Reviewer Name		Abdullah Ibrahim Abdullah	e-mail	abdullah.abdullah@uoninevah.edu.iq	
Scientific Committee Approval Date		01/06/2023	Version Number	1.0	

Relation with other Modules			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents

Module Aims	The aim of this course: 1) Develop a strong mathematical background: a) Understand and apply fundamental mathematical concepts relevant to control systems. b) Acquire proficiency in algebra, calculus, and linear algebra necessary for control system analysis. 2) Explore control system configurations: a) Examine various control system architectures and their applications. b) Understand the principles and characteristics of open loop and closed-loop control systems. 3) Master block diagram reduction techniques: a) Learn systematic methods to simplify complex block diagrams. b) Apply reduction techniques to analyze and design control systems efficiently. 4) Understand signal flow graphs: a) Gain proficiency in representing control systems using signal flow graphs. b) Analyze and interpret the behavior of control systems through signal flow graph analysis. 5) Analyze the time response of control systems: a) Study the time-domain behavior of control systems. b) Analyze and interpret transient and steady-state responses of control systems. 6) Investigate stability of control systems: a) Understand the concept of stability in control systems. b) Analyze stability using various techniques such as Routh-Hurwitz criterion. 7) Perform root locus analysis: a) Learn the fundamentals of root locus analysis. b) Apply root locus techniques to analyze the behavior and stability of control systems. 8) Integrate theoretical concepts with practical applications: a) Apply the acquired knowledge to practical control system problems. b) Use simulation tools and software to implement and analyze control system designs.
Module Learning Outcomes	Upon successful completion of the module on Control Systems Fundamentals and Analysis, students will be able to: 1- Demonstrate a solid understanding of mathematical concepts relevant to control systems, including Laplace transform, algebra, calculus, and linear algebra, and apply them effectively in control system analysis. 2- Identify and explain various control system configurations, such as open-loop and closed-loop systems, and evaluate their advantages and limitations in different applications. Also, apply block diagram reduction techniques to simplify complex control system diagrams and analyze the overall system behavior. 3- Construct and analyze signal flow graphs to represent and evaluate the behavior of control systems. Also, analyze the time response of control systems, including transient and steady-state responses, and interpret the results in terms of system stability and performance. 4- Assess the stability of control systems using different methods, such as the Routh-Hurwitz criterion, and determine the stability margins of the system.

	5- Perform root locus analysis to analyze and design control systems, and understand the impact of system parameters on stability and performance. 6- Apply theoretical concepts and analytical techniques to practical control system problems. Furthermore, utilize simulation tools and software to implement and analyze control system designs, and interpret simulation results to validate theoretical predictions.
Indicative Contents	1- Mathematical Background: [6 hrs] a. Review of algebraic concepts and manipulations. b. Calculus techniques relevant to control systems, such as differentiation and integration. c. Linear algebra and matrix operations in control system analysis. 2- Control System Configurations: [6 hrs] a. Open loop and closed-loop control systems. b. Feedback and feedforward control architectures. c. Advantages and limitations of different control system configurations. 3- Block Diagram Reduction: [10 hrs] a. Block diagram representation of control systems b. Reduction techniques, including series, parallel, and feedback connections c. Simplification methods for complex block diagrams 4- Signal Flow Graphs: [14hrs] a. Representation of control systems using signal flow graphs. b. Mason's gain formula for analyzing signal flow graphs. c. Determination of overall transfer function from a signal flow graph. 5- Time Response: [14 hrs] a. Analysis of transient and steady state responses of control systems. b. Time-domain specifications, such as rise time, settling time, and overshoot. c. Effects of system parameters on time response characteristics. 6- Stability of Control Systems: [10 hrs] a. Concepts of stability and instability in control systems. b. Routh-Hurwitz stability criterion. 7- Root Locus Analysis: [15 hrs] a. Root locus plots and their interpretation. b. Root locus design techniques for improving system performance and stability.

Learning and Teaching Strategies

Strategies	1- Interactive Lectures: • Incorporate interactive elements within lectures, such as asking questions, conducting polls, or initiating discussions. • Encourage students to actively participate by sharing their insights, answering questions, and engaging in debates related to the lecture topics. 2- Problem-Based Learning: • Present real-world control system problems and challenges that require frequency response analysis. • Divide students into groups and assign them specific problems to solve, allowing them to apply the concepts learned and critically analyze different approaches. 3- Case Studies and Examples: • Provide case studies and examples that demonstrate the practical applications of the response analysis. • Encourage students to analyze and discuss these case studies, applying their critical thinking skills to identify the underlying control system challenges and propose solutions. 4- Hands-on Experiments and Simulations: • Conduct hands-on experiments or simulations using software tools (e.g., MATLAB/Simulink) to explore the system response analysis. • Guide students through the process of setting up experiments, collecting data, and analyzing the response characteristics. 5- Group Projects: • Assign group projects that require students to analyze, and optimize control systems. • Encourage collaboration and critical thinking within the groups, promoting discussions on design decisions, trade-offs, and system performance. 6- Problem-Solving Sessions: • Conduct problem-solving sessions where students can bring their questions or challenges related to the system response analysis. • Guide students in analyzing the problems, identifying relevant concepts, and developing systematic problem-solving strategies.
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Student Workload (SWL)

Structured SWL (h/sem)	77	Structured SWL (h/w)	5
Unstructured SWL (h/sem)	73	Unstructured SWL (h/w)	5
Total SWL (h/sem)	150		

Module Evaluation

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1, 2, 8 and 9
	project	1	5% (5)	12	LO # 3, 4, 6 and 7
	Lab	3	15% (15)	Continuous	All

	H. W.	2	10%(10)	Continuous	LO#1-9
Summative assessment	Midterm Exam	1 hr	10% (10)	7	LO # 1-7
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

	Material Covered
Week 1	Introduction to Control Engineering. (Contents, definitions and basic concepts)
Week 2	Mathematical Background (Laplace Transform, Partial Fraction Expansion and Inverse Laplace)
Week 3	Control System Basics (Control System Configurations, Analysis and Design Objectives, Understanding the Transfer Function (of SISO and MIMO) and the characteristic equation)
Week 4	Block diagram reduction (Typical Elements of Block Diagrams, Common topologies of reduction, Block Diagram Reduction via Familiar Forms, Block Diagram Reduction via Moving Blocks to Create Familiar Forms).
Week 5	Signal flow graph (SFG)- Part 1 - Basic Elements of an SFG, SFG Algebra.
Week 6	Signal flow graph (SFG)- Part 2 - (Mason Gain Rule).
Week 7	Signal flow graph (SFG)- Part 3 - (Finding the system's transfer function using Mason rule)
Week 8	Time response- Part 1 (time response of continuous-data systems, typical test signals for the time response, The unit-step response and time-domain specifications)
Week 9	Time response- Part 2 (Steady-State Error of Linear Continuous-Data Control Systems).
Week 10	Time response- Part 3 (Transient response of 1st order systems, 2 nd and higher order Systems)
Week 11	Stability of control Systems (Routh Hurwitz Stability Criterion, basic Routh table)
Week 12	Stability of control Systems (Routh special cases)
Week 13	Root Locus Analysis- Part 1 (Define a root locus, State the properties of a root locus)
Week 14	Root Locus Analysis- Part 2 (Root locus plot, General rules of constructing)
Week 15	Root Locus Analysis- Part 3 (Root locus plot refining)
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)

	Material Covered
Week 1	Lab 1: LAB Introduction to the control engineering by Using Matlab Programming.
Week 2	Lab 2: LAB Study of finding the Transfer Function By Matlab Programming Part 1.
Week 3	Lab 3: LAB Study of finding the Transfer Function By Matlab Programming Part 2.
Week 4	Lab.4 Plot the pole-zero configuration in s-plane for the given transfer function using MATLAB.
Week 5	Lab 5: LAB Study of plotting the block diagram reduction By Matlab Programming.

Week 6	Lab 6: LAB study of applying the Mason rule using Matlab Programming
Week 7	Lab 7: LAB study of finding the transient response of 1 st order system.
Week 8	Lab 8: LAB study of finding the transient response of 2 nd order system.
Week 9	Lab 9,10: Determine the time response of the given system subjected to any arbitrary input
Week 10	
Week 11	Lab 11,12: LAB study of finding the steady state error.
Week 12	
Week 13	Lab 13,14: Plotting of the root locus.
Week 14	
Week 15	Lab 15: Frequency Response Analysis

Learning and Teaching Resources

	Text	Available in the Library?
Required Texts	Katsuhiko Ogata "Modern Control Engineering" 5th Edition	Yes
Recommended Texts	B. Kuo, "Automatic Control System," 2010, 9 th edition	No
Websites	https://www.youtube.com/@MATLAB/playlists	

Grading Scheme

Group	Grade	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	90 - 100	Outstanding Performance
	B - Very Good	80 - 89	Above average with some errors
	C - Good	70 - 79	Sound work with notable errors
	D - Satisfactory	60 - 69	Fair but with major shortcomings
	E - Sufficient	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	(45-49)	More work required but credit awarded
	F – Fail	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

Module Information					
Module Title	Matlab Programming		Module Delivery		
Module Type	Core		☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar		
Module Code	NVEESC306				
ECTS Credits	3				
SWL (hr/sem)	75				
Module Level		2	Semester of Delivery		3
Administering Department		SCE	College	EEC	
Module Leader	Zeyad Tariq Shareef		e-mail	Zeyad.tariq@uoninevah.edu.iq	
Module Leader's Acad. Title		Assistant Lecturer	Module Leader's Qualification		MSc
Module Tutor	None		e-mail	None	
Peer Reviewer Name		Abulhameed Nabeel	e-mail	abdulhamed.hameed@uoninevah.edu.iq	
Scientific Committee Approval Date		01/06/2023	Version Number		1.0

Relation with other Modules			
Prerequisite module	NVEESC304	Semester	2
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents	
Module Aims	35. To learn how to use/interact with Matlab GUI effectively and look for help from inside the Matlab. 36. To learn how to create Matlab scripts and make/manipulate Matlab variables. 37. To understand Matlab plot. 38. To learn vector and matrix indexing. 39. To learn how write efficient Matlab code, Vectorization. 40. To learn program flow control. 41. To learn Matlab user-defined functions. 42. To learn how read and write data to txt, excel, etc. 43. To learn cell arrays and structures. 44. To learn SIMULINK basics.
Module Learning Outcomes	42. Undertake arithmetic on scalars, vectors and matrices. 43. Create 2D and 3D plots of mathematical functions and data. 44. Solve mechanical electrical engineering problems using Matlab scripts. 45. Write Matlab functions to solve engineering problems. 46. Read and analyze data from in txt, xls and other formats. 47. Use MATLAB and its SIMULINK tool for physical systems modelling and simulation.
Indicative Contents	Indicative content includes the following: (hours for only SSWL) Introduction to Matlab GUI, how to look for help in Matlab, Matlab scripts. [4hrs] Making and manipulating variables. [4hrs] Automatic initialization and vector indexing. [4hrs] Matrix indexing. [4hrs] Writing an efficient code, Vectorization. [4hrs] Introduction to Matlab plot. [4hrs] Flow control: conditions and loops. [4hrs] User-defined functions. [4hrs] User-defined functions variable input and output arguments. [4hrs] Global and persistent variables. [4hrs] Read and write data to txt and excel files. [4hrs] Cell arrays and structures. [4hrs] Introduction to MATLAB GUI and SIMULINK. [8hrs]

Learning and Teaching Strategies

Strategies	hands-on exercises and programming assignments throughout the course. This will allow students to apply their knowledge, practice programming, and reinforce their understanding of MATLAB. Real-world examples to demonstrate how MATLAB can be used in practical applications. This can help students connect theoretical concepts to real-world scenarios and increase their motivation. Interactive learning which Includes activities such as group discussions, case studies, and problem-solving exercises that require students to actively engage with the material. providing feedback on student assignments and projects. Constructive feedback helps students understand their strengths and areas for improvement, fostering their growth and learning. Sharing additional resources, such as online tutorials, textbooks, and MATLAB documentation, to supplement the course material. This will allow students to explore further on their own and deepen their understanding of MATLAB.
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Student Workload (SWL)

Structured SWL (h/sem)	62	Structured SWL (h/w)	4
Unstructured SWL (h/sem)	13	Unstructured SWL (h/w)	1
Total SWL (h/sem)	75		

Module Evaluation

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	15% (10)	3, 5, 10	LO #1, 2, 3 and 4
	Assignments	1	5% (10)	12	LO # 1-5
	Lab sessions	3	15% (10)	Continuous	LO # 1-6
	Seminar	1	5% (10)	14	LO # 1-6
Summative assessment	Midterm Exam	1 hour	10% (10)	7	LO # 1-3
	Final Exam	2 hrs.	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Introduction to MATLAB environment, how to look for help in Matlab, Matlab scripts.
Week 2	Making and manipulating variables.
Week 3	Automatic initialization and vector indexing.
Week 4	Matrix indexing.
Week 5	Writing an efficient code, Vectorization.
Week 6	Introduction to Matlab plot.
Week 7	Mid-term Exam.
Week 8	Flow control: conditions and loops.
Week 9	User-defined functions.
Week 10	User-defined functions variable input and output arguments.
Week 11	Global and persistent variables.
Week 12	Read and write data to txt and excel files.
Week 13	Cell arrays and structures.
Week 14	Introduction to MATLAB GUI.
Week 15	Introduction to MATLAB SIMULINK.
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1 to Week 3	MATLAB Built-in functions
Week 4 to Week 5	Manipulation matrices in MATLAB
Week 6 to Week 7	Plotting
Week 8 to Week 9	User-Defined Functions and User-Controlled Input/Output
Week 10 to Week 11	Logical Functions, Selection Structures and Repetition
Week 12 to Week 13	MATLAB GUI basics
Week 14 to Week 15	Use SIMULINK to model some basic systems
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources		
	Text	Available in the Library?
Required Texts	- Holly Moore, "MATLAB for Engineers", Pearson, 4th Edition, 2015. - Introduction to Programming in MATLAB® by Sourav Dey Danilo Šćepanović, Ankit Patel, Patrick Ho.	No
Recommended Texts	- What Every Engineer Should Know About MATLAB and Simulink by Adrian B. Biran, Moshe M.G. Breiner. - Stormy Attaway, "MATLAB: A practical Introduction to Programming and Problem Solving", Butterworth-Heinemann, 3rd Edition, 2013 - Steven T. Karis, "Introduction to Simulink with Engineering Applications", Orchard Publications, 3rd Edition, 2011	No
Websites	https://www.mathworks.com/help/matlab/getting-started-with-matlab.html	

Grading Scheme			
Group	Grade	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	90 - 100	Outstanding Performance
	B - Very Good	80 - 89	Above average with some errors
	C - Good	70 - 79	Sound work with notable errors
	D - Satisfactory	60 - 69	Fair but with major shortcomings
	E - Sufficient	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	(45-49)	More work required but credit awarded
	F – Fail	(0-44)	Considerable amount of work required
Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.			

MODULE DESCRIPTION FORM

Module Information					
Module Title	Analog Electronics I		Module Delivery		
Module Type	Basic		☒ Theory ☐ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☐ Seminar		
Module Code	NVEE212				
ECTS Credits	6				
SWL (hr/sem)	150				
Module Level		2	Semester of Delivery		3
Administering Department		SCE	College	EEC	
Module Leader	Rafal Alshaker		e-mail	rafal.mahmod@uoninevah.edu.iq	
Module Leader's Acad. Title		Assistant Lecturer	Module Leader's Qualification		M.Sc.
Module Tutor			e-mail		
Peer Reviewer Name		Nashwan Z. Hero	e-mail	Nashwan.hero@uoninevah.edu.iq	
Scientific Committee Approval Date		01/06/2023	Version Number	1.0	

Relation with other Modules			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents	
Module Aims	45. Be able to apply the proper biasing to insure operation in the active region. 46. Understand how to measure the important voltage levels of a BJT transistor configuration and use them to determine whether the network is operating properly. 47. Be able to perform a load-line analysis of the most common BJT configurations. 48. Become familiar with the r_e, hybrid, and hybrid π models for the BJT transistor. 49. Understand the effects of a source resistance and load resistor on the overall gain and characteristics of an amplifier. 50. Become acquainted with the frequency response of a BJT amplifier. 51. Be able to find the Miller effect capacitance at the input and output of an amplifier due to a feedback capacitor.
Module Learning Outcomes	1. Understand the fundamental operation of BJT Transistors. Also, analyze BJT characteristics and parameters. 2. Perform D.C. analysis for various biasing configurations. 3. Understand and model BJT behavior using small-signal models. 4. Conduct A.C. analysis for the common-emitter configuration, the common-base configuration and common-collector (emitter-follower) configurations. 5. Analyze multistage amplifiers 6. Perform low-frequency analysis of amplifier circuits and analyze high-frequency response of amplifier circuits.
Indicative Contents	Indicative content includes the following. TRANSISTOR CONSTRUCTION, transistor operation, common-base configuration common-emitter configuration, The common-collector configuration. [15 hrs] operating point:, The circuit, The emitter-bias, The voltage-divider bias configuration, collector feedback configuration, miscellaneous bias configuration and emitter-follower configuration. [15 hrs] AMPLIFICATION IN THE AC DOMAIN: The equivalent circuit for the common-emitter configuration, common-base equivalent circuit and common-collector configuration. [15 hrs] LOW-FREQUENCY ANALYSIS—BODE PLOT, impact of the R_i, R_S, C_i, C_E and C_o on the low-frequency response. [15 hrs] HIGH-FREQUENCY ANALYSIS—BODE PLOT, impact of the R_i, R_S, C_{be}, C_{ce}, C_{bc} and the Miller capacitance C_{Mi} on the high-frequency response. [15 hrs]

Learning and Teaching Strategies	
Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL)			
Structured SWL (h/sem)	77	Structured SWL (h/w)	5
Unstructured SWL (h/sem)	73	Unstructured SWL (h/w)	5
Total SWL (h/sem)	150		

Module Evaluation					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	6, 10	LO # 2 and 4
	Assignments	2	10% (10)	Continuous	LO # 1-6
	Lab	2	10% (10)	Continuous	LO # 1-6
	Online Assignment	2	10% (10)	Continuous	LO # 1-6
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-3
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Introduction – BJT Transistor
Week 2	Transistor Characteristics and Parameters
Week 3	D.C analysis of fixed-bias configuration
Week 4	D.C analysis of emitter-bias configuration
Week 5	D.C analysis of voltage-divider -bias configuration and emitter-follower configuration.
Week 6	D.C analysis of collector feedback -bias configuration
Week 7	BJT Transistor Modeling
Week 8	A.C analysis for the common-emitter configuration
Week 9	A.C analysis for the common-base configuration
Week 10	A.C analysis for the common-collector configuration
Week 11	Multistage Amplifiers
Week 12	LOW-FREQUENCY ANALYSIS for critical points frequency

Week 13	LOW-FREQUENCY ANALYSIS for critical points frequency
Week 14	HIGH-FREQUENCY ANALYSIS for critical points frequency
Week 15	HIGH-FREQUENCY ANALYSIS for critical points frequency
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)	
Week	Material Covered
Week 1	Lab 1: Input and output characteristics
Week 2	
Week 3	Lab 2: D.C load line and Q-point
Week 4	
Week 5	Lab 3: common-emitter Amplifier
Week 6	
Week 7	Lab 4: common- base Amplifier
Week 8	
Week 9	Lab 5: common- collector Amplifier
Week 10	
Week 11	Lab 6: Two stage amplifier
Week 12	
Week 13	Lab 7: Frequency Response
Week 14	
Week 15	Preparatory week before the final Exam
Week 16	

Learning and Teaching Resources		
	Text	Available in the Library?
Required Texts	Electronic Devices and Circuit Theory, Eleventh Edition Robert L. Boylestad Louis Nashelsky Electronic-devices-9-th-edition-thomas-floyd	Yes
Recommended Texts	Hughes, E. et al. (2008) <i>Electrical and Electronic Technology</i> , 10th Edn., Prentice-Hall.	No
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

Grading Scheme			
Group	Grade	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	90 - 100	Outstanding Performance
	B - Very Good	80 - 89	Above average with some errors
	C - Good	70 - 79	Sound work with notable errors
	D - Satisfactory	60 - 69	Fair but with major shortcomings

	E - Sufficient	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	(45-49)	More work required but credit awarded
	F – Fail	(0-44)	Considerable amount of work required
Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.			

Second year
(second semester)

MODULE DESCRIPTION FORM

Module Information					
Module Title	Computer II		Module Delivery		
Module Type	Basic		☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar		
Module Code	NVU18				
ECTS Credits	3				
SWL (hr/sem)	75				
Module Level		2	Semester of Delivery		3
Administering Department		SEC	College	EEC	
Module Leader			e-mail		
Module Leader's Acad. Title				Module Leader's Qualification	
Module Tutor			e-mail		
Peer Reviewer Name				e-mail	
Scientific Committee Approval Date				Version Number	1.0

Relation with other Modules			
Prerequisite module	NVU10	Semester	1
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents	
Module Aims	Enhance Technical Problem-Solving Skills - Teach networking fundamentals (LAN/WAN) and cybersecurity threats. - Develop troubleshooting skills for hardware/software issues. Explore Digital Economy Tools - Cover e-commerce, digital banking, and cloud services (e.g., Office 365). - Demonstrate how technology streamlines business processes. Deepen AI Knowledge with Real-World Applications - Explain core AI techniques (machine learning, NLP) and their use in industries like healthcare and finance. - Analyze AI's role in smartphones (e.g., adaptive apps, real-time translation). Critically Evaluate AI's Societal Impact - Discuss ethical dilemmas (job displacement, surveillance). - Encourage debate on future trends (autonomous systems, smart cities).
Module Learning Outcomes	Troubleshoot Technical Issues Diagnose common hardware/software problems and apply fixes. Configure basic network settings and identify security threats. Leverage Digital Tools for Professional Tasks Use advanced spreadsheet functions (pivot tables, data validation). Implement e-commerce principles (online banking, digital payments). Analyze AI Technologies Compare AI techniques (e.g., machine learning vs. rule-based systems). Evaluate AI applications in sectors like healthcare or finance. Debate AI's Societal Impact Critique ethical dilemmas (job displacement, surveillance). Propose solutions for responsible AI use in modern contexts.
Indicative Contents	Networking & Security Network types (LAN/WAN), components (routers, switches) Cybersecurity: Threats (malware, hacking), prevention (firewalls, encryption) Troubleshooting: Diagnosing connectivity issues Advanced Digital Tools Spreadsheets:

	○ Pivot tables, data validation, advanced functions (VLOOKUP) • E-Commerce: ○ Online banking, digital payments (mobile wallets, cryptocurrencies) • Cloud Computing: ○ Collaborative tools (Google Workspace, Microsoft Teams) 3. AI Technologies & Applications • Core Techniques: ○ Machine learning (supervised/unsupervised), neural networks ○ Computer vision, natural language processing (NLP) • Industry Applications: ○ Healthcare (diagnostic tools, robotics) ○ Finance (fraud detection, chatbots) ○ Smartphones (facial recognition, real-time translation) 4. AI Ethics & Future Trends • Ethical challenges: Job displacement, surveillance, bias in algorithms • Future directions: Autonomous vehicles, smart cities, AI in education • Debate topics: "Should AI replace human jobs?" • o)
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Learning and Teaching Strategies	
Strategies	Case-Based Learning ○ Analyze real AI applications (healthcare, finance) ○ Small-group ethics debates Project-Based Challenges ○ Network setup simulations ○ No-code AI model building Socratic Discussions ○ Critical debates on AI bias/impact Reflective Portfolios ○ Screenshots + essays documenting progress

Student Workload (SWL)			
Structured SWL (h/sem)	62	Structured SWL (h/w)	4
Unstructured SWL (h/sem)	13	Unstructured SWL (h/w)	1
Total SWL (h/sem)	75		

Module Evaluation					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO # 2, and 3
	Assignments	2	10% (10)	2, 12	LO # 1, and 4
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 3
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1 - 3
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Network Fundamentals (LAN/WAN, Topologies)
Week 2	Cybersecurity Threats (Malware, Phishing)
Week 3	Advanced Spreadsheets (Pivot Tables, VLOOKUP)
Week 4	E-Commerce Systems (Payment Gateways)
Week 5	Cloud Computing (Collaboration Tools)
Week 6	Machine Learning Basics
Week 7	Natural Language Processing (NLP)
Week 8	Computer Vision (Image Recognition)
Week 9	AI in Healthcare (Diagnostic Tools)
Week 10	AI in Finance (Fraud Detection)
Week 11	AI in Smartphones (Voice Assistants)
Week 12	AI Ethics (Bias, Privacy)
Week 13	Future AI Trends (Autonomous Systems)
Week 14	Capstone Project Planning
Week 15	AI Solution Prototyping
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	Image Classifier (Teachable Machine)
Week 2	Basic Chatbot Design
Week 3	Image Recognition Demo
Week 4	AI Diagnostic Tools Study
Week 5	Fraud Detection Pattern Analysis
Week 6	Voice Assistant API Exploration
Week 7	Bias Detection in AI Models

Learning and Teaching Resources		
	Text	Available in the Library?
Required Texts	"Networking Essentials" – Jeffrey S. Beasley (6th Edition) - Covers LAN/WAN, security, and troubleshooting. "AI Superpowers" – Kai-Fu Lee (Ch. 1-5) - Examines real-world AI applications and ethics. "Hands-On Machine Learning with Scikit-Learn & TensorFlow" – Aurélien Géron (2nd Ed., Ch. 1-4) - Practical ML foundations (simplified for non-specialists).	No
Recommended Texts	"The Ethical Algorithm" – Michael Kearns & Aaron Roth - Discusses bias, privacy, and AI ethics. "Futureproof: 9 Rules for Humans in the Age of Automation" – Kevin Roose - Explores AI's societal impact.	no
Websites	Cisco Networking Academy (SkillsForAll.com) – Free networking labs. Google AI Experiments (experiments.withgoogle.com/ai) – Interactive AI demos. Kaggle (kaggle.com/learn/intro-to-ai) – Beginner-friendly AI courses.	

Grading Scheme				
Group	Grade	Marks (%)	Definition	
Success Group (50 - 100)	A - Excellent	90 - 100	Outstanding Performance	
	B - Very Good	80 - 89	Above average with some errors	
	C - Good	70 - 79	Sound work with notable errors	
	D - Satisfactory	60 - 69	Fair but with major shortcomings	
	E - Sufficient	50 - 59	Work meets minimum criteria	
Fail Group (0 – 49)	FX – Fail	(45-49)	More work required but credit awarded	
	F – Fail	(0-44)	Considerable amount of work required	
Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.				

MODULE DESCRIPTION FORM

Module Information					
Module Title	Engineering Analysis II		Module Delivery		
Module Type	Basic		☒ Theory ☐ Lecture ☐ Lab ☒ Tutorial ☐ Practical ☐ Seminar		
Module Code	NVEE209				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level		2	Semester of Delivery		4
Administering Department		SCE	College	EE	
Module Leader	Abdulrahman Basil AYOUB		e-mail	abdulrahman.ayoub@uoninevah.edu.iq	
Module Leader's Acad. Title		Asst. Lecturer	Module Leader's Qualification		MSc
Module Tutor	Name (if available)		e-mail	E-mail	
Peer Reviewer Name		Abdulallah I.	e-mail	E-mail	
Scientific Committee Approval Date		01/06/2023	Version Number	1.0	

Relation with other Modules			
Prerequisite module	NVEE208	Semester	3
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents	
Module Aims	52. Develop Analytical Skills: Enhance your ability to solve differential equations, both ordinary and partial, using various methods like power series, Frobenius method, and special functions (e.g., Legendre and Bessel equations). 53. Master Multiple Integrals: Build proficiency in evaluating double and triple integrals, including changing the order of integration and using polar coordinates. 54. Understand Special Functions: Explore the properties and applications of Legendre polynomials and Bessel functions in real-world scenarios. 55. Apply Mathematical Techniques: Use these methods to address practical problems in robotics, control systems, and engineering mechanics. 56. Prepare for Advanced Topics: Lay a strong foundation for further studies in numerical analysis, integral transforms, and advanced PDEs.

Module Learning Outcomes	1. Solve Complex Differential Equations: ○ Apply methods like power series, Frobenius method, and special functions (Legendre and Bessel equations) to solve ordinary differential equations. ○ Classify and solve partial differential equations using techniques like separation of variables. 2. Evaluate Multiple Integrals: ○ Compute double integrals in polar coordinates and change the order of integration for complex regions. ○ Apply these techniques in physics and engineering contexts. 3. Understand Special Functions: ○ Explore the properties and applications of Legendre polynomials and Bessel functions in real-world scenarios. 4. Apply Mathematical Techniques: ○ Use these methods to address practical problems in robotics, control systems, and engineering mechanics. 5. Develop Analytical Reasoning: ○ Enhance problem-solving skills and logical reasoning through structured approaches to mathematical challenges.
Indicative Contents	1. Multiple Integrals • Double integrals in Cartesian and polar coordinates. • Changing the order of integration for complex regions. • Applications in physics and engineering, such as calculating areas and volumes. 2. Power Series Solutions

- Solving differential equations using power series expansions.
- Radius and interval of convergence.
- Applications in approximating solutions for equations with variable coefficients.

3. Frobenius Method

- Solving differential equations near singular points.
- Recurrence relations for coefficients.
- Applications in engineering and physics.

4. Special Functions

- Legendre's equations and Legendre polynomials.
- Bessel's equations and Bessel functions.
- Applications in spherical and cylindrical coordinate systems.

5. Partial Differential Equations (PDEs)

- Classification of PDEs: elliptic, parabolic, and hyperbolic.
- Solving PDEs using separation of variables.
- Applications in heat transfer, wave propagation, and fluid dynamics.

Learning and Teaching Strategies

Strategies

1. Multiple Integrals

- **Visualize the Region:** Sketch the region of integration to understand the limits and simplify the setup.
- **Change Coordinates:** Use polar, cylindrical, or spherical coordinates for symmetry or complex regions.
- **Practice Changing Order:** Work on problems that require changing the order of integration to build intuition.

2. Power Series Solutions

- **Understand Convergence:** Familiarize yourself with the radius and interval of convergence for series solutions.
- **Work Through Recurrence Relations:** Practice deriving and solving recurrence relations for coefficients.
- **Start with Simple Examples:** Begin with straightforward differential equations to build confidence.

3. Frobenius Method

- **Identify Singular Points:** Learn to classify singular points as regular or irregular.
- **Master Recurrence Relations:** Focus on solving the relations that arise from the Frobenius method.
- **Compare with Power Series:** Understand how Frobenius extends the power series method.

4. Special Functions (Legendre and Bessel Equations)

- **Study Properties:** Learn the orthogonality and recurrence relations of Legendre polynomials and Bessel functions.
- **Explore Applications:** Apply these functions to problems in physics, such as wave equations and heat conduction.
- **Use Graphical Tools:** Visualize these functions to understand their behavior.

5. Partial Differential Equations (PDEs)

- **Classify PDEs:** Practice identifying PDEs as elliptic, parabolic, or hyperbolic.
- **Separation of Variables:** Solve problems step-by-step using this technique.
- **Boundary Conditions:** Pay attention to initial and boundary conditions, as they guide the solution.

General Tips

- **Work on Examples:** Solve a variety of problems to reinforce concepts.
- **Use Resources:** Refer to textbooks, online tutorials, and lecture notes for additional practice.
- **Collaborate:** Discuss problems with peers or instructors to gain new insights.

Student Workload (SWL)			
Structured SWL (h/sem)	47	Structured SWL (h/w) ¹	3
Unstructured SWL (h/sem)	78	Unstructured SWL (h/w)	5
Total SWL (h/sem)	125		

Module Evaluation					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	10% (10)	3, 9, 13	LO #
	Assignments	2	10% (10)	2, 8	LO #
	Seminar	1	10% (10)	Continuous	
	Report	1	10% (10)	11	LO #
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO #
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Double Integrals in Polar Coordinates
Week 2	Multiple Integral – (Triple Integral)
Week 3	Solution of differential equation by power series
Week 4	Solution of differential equation by power series
Week 5	Solution of differential equation by FROBENIUS method
Week 6	Solution of differential equation by FROBENIUS method
Week 7	Solution of differential equation by LEGENDRE'S equation
Week 8	Mid-exam
Week 9	Solution of differential equation by LEGENDRE'S equation
Week 10	Solution of differential equation by BESSEL'S equations
Week 11	Solution of differential equation by BESSEL'S equations
Week 12	Partial differential equation (Classification of PDEs)
Week 13	Solving PDEs by (Separation of Variables Technique)
Week 14	Solving PDEs by (Separation of Variables Technique)
Week 15	Review Lecture
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	Rank, Eigen values, Eigenvectors. (Tutorial)
Week 2	Cayley-Hamilton Theorem. (Tutorial)
Week 3	Definition of double integral (Integration Limits are Constants, Integration Limits are Variables, Reversing the order of Integration). (Tutorial)
Week 4	Definition of double integral (Integration Limits are Constants, Integration Limits are Variables, Reversing the order of Integration). (Tutorial)
Week 5	Change to Polar Coordinates (Tutorial)
Week 6	Triple Integrals (Tutorial)
Week 7	Surface Area (Tutorial)

Learning and Teaching Resources		
	Text	Available in the Library?
Required Texts		
Recommended Texts		
Websites		

Grading Scheme			
Group	Grade	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	90 - 100	Outstanding Performance
	B - Very Good	80 - 89	Above average with some errors
	C - Good	70 - 79	Sound work with notable errors
	D - Satisfactory	60 - 69	Fair but with major shortcomings
	E - Sufficient	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	(45-49)	More work required but credit awarded
	F – Fail	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

Module Information					
Module Title	Control II		Module Delivery		
Module Type	Core		☒ Theory ☐ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☐ Seminar		
Module Code	NVEESC309				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level		2	Semester of Delivery		4
Administering Department		SCE	College	EEC	
Module Leader	Ali Khaleel Mahmood		e-mail	ali.mahmood@uoninevah.edu.iq	
Module Leader's Acad. Title		Lecturer	Module Leader's Qualification		M.Sc.
Module Tutor			e-mail		
Peer Reviewer Name		Abdullah Ibrahim Abdullah	e-mail	abdullah.abdullah@uoninevah.edu.iq	
Scientific Committee Approval Date		01/06/2023	Version Number	1.0	

Relation with other Modules			
Prerequisite module	NVEESC305	Semester	3
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents	
Module Aims	The aim of this course is to give the students the ability to analyze any control system by using different methods. This includes the analyses of the transient response, steady state response and most importantly the stability. In addition, they will have the ability to represent systems using different methods such as the transfer function and state space then choose the most related one. By the end of this course, students will be able to make full analysis for control systems and be ready for the design of the control systems in the next year.
Module Learning Outcomes	48. Recognize the principles of Analog control system analysis. Also, list the various terms associated with frequency response. 49. Summarize what is meant by frequency response analysis. 50. Discuss the reaction and involvement of gain and phase shift in frequency response analysis. Add to that study the methods used to describe the frequency response. 51. Define the Bode plot, its analysis, rules, and sketching steps and discuss the Bode plot Tabulation method and its plotting steps. 52. Discuss the Bode plot Analytical method and its plotting steps. 53. Discuss the Frequency domain specifications and explain the stability criteria, find the gain margin, and phase margin.
Indicative Contents	Indicative content includes the following. - Introduction to Control Systems and Frequency Response [12 hrs] ❖ Overview of control systems and their importance. ❖ Introduction to frequency response analysis and its relevance. ❖ Basic concepts of transfer functions and Laplace transforms. - Frequency Response Characteristics. [12 hrs] ❖ Magnitude response: gain, resonant frequencies and bandwidth. ❖ Phase response: phase shift, phase margin, phase crossover frequency. ❖ Gain/Phase margins: definition, significance, interpretation. - Bode plots [18 hrs] ❖ Introduction to Bode plots as a graphical representation of frequency response. ❖ Construction of Bode plots from transfer functions. ❖ Interpreting Bode plots for gain, phase, and stability analysis. - Frequency Response Analysis Techniques [16 hrs] ❖ Analytical methods: evaluating frequency response using algebraic manipulation. ❖ Numerical methods: using MATLAB for frequency response analysis. ❖ Experimental methods: measuring frequency response using experimental setups - Stability Analysis using Frequency Response [16 hrs] ❖ Stability criteria based on frequency response: gain and phase margins, stability bounds ❖ Relationship between frequency response and stability analysis.

Learning and Teaching Strategies	
Strategies	7- Interactive Lectures: • Incorporate interactive elements within lectures, such as asking questions, conducting polls, or initiating discussions. • Encourage students to actively participate by sharing their insights, answering questions, and engaging in debates related to the lecture topics. 8- Problem-Based Learning: • Present real-world control system problems and challenges that require frequency response analysis. • Divide students into groups and assign them specific problems to solve, allowing them to apply the concepts learned and critically analyze different approaches. 9- Case Studies and Examples: • Provide case studies and examples that demonstrate the practical applications of frequency response analysis. • Encourage students to analyze and discuss these case studies, applying their critical thinking skills to identify the underlying control system challenges and propose solutions. 10- Hands-on Experiments and Simulations: • Conduct hands-on experiments or simulations using software tools (e.g., MATLAB/Simulink) to explore frequency response analysis. • Guide students through the process of setting up experiments, collecting data, and analyzing the frequency response characteristics. 11- Group Projects: • Assign group projects that require students to analyze, and optimize control systems using frequency response techniques. • Encourage collaboration and critical thinking within the groups, promoting discussions on design decisions, trade-offs, and system performance. 12- Problem-Solving Sessions: • Conduct problem-solving sessions where students can bring their questions or challenges related to frequency response analysis. • Guide students in analyzing the problems, identifying relevant concepts, and developing systematic problem-solving strategies.

Student Workload (SWL)			
Structured SWL (h/sem) ¹	77	Structured SWL (h/w)	5
Unstructured SWL (h/sem)	48	Unstructured SWL (h/w)	3
Total SWL (h/sem)	125		

Module Evaluation					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1, and 6
	Assignments	2	10% (10)	2, 12	LO # 2, and 4
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 3, 5 and 6
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1- 4
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Introduction of Frequency Response.
Week 2	Review about some basic skills [(Trigonometry& Sinusoidal), Lows of Logarithms, Log-log and log-linear (semi log) scales.
Week 3	Introduction to Bode Plot.
Week 4	Bode analysis.
Week 5	Rules and steps of sketching Bode plot.
Week 6	Bode plot using Tabulation method- Part 1
Week 7	Bode plot using Tabulation method- Part 2
Week 8	Bode plot using Tabulation method- Part 3
Week 9	Bode plot using Analytical method- Part 1
Week 10	Bode plot using Analytical method- Part 2
Week 11	Bode plot using Analytical method- Part 3
Week 12	Frequency domain specifications.
Week 13	Frequency response stability.
Week 14	Finding the gain margin and phase margin from the system's transfer function.
Week 15	Finding the gain margin and phase margin from the plot of the Bode.
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)

	Material Covered
Week 1	Lab 1: LAB Introduction to frequency response by Using Matlab Programming.
Week 2	Lab 2: LAB Study of finding the log values By Matlab Programming.
Week 3	Lab 3: LAB Study of plotting the Bode plot By Matlab Programming.
Week 4	Lab 4: LAB study of finding Bode plot for different systems using Matlab Programming
Week 5	Lab 5: Tutorial
Week 6	Lab 6: LAB study of finding Gain Margin and Phase Margin using Matlab Programming
Week 7	Lab 7: Pre-test preparation.

Learning and Teaching Resources

	Text	Available in the Library?
Required Texts	N. Nise “Control Systems Engineering”, 2011 6th edition.	No
Recommended Texts	B. Kuo, “Automatic Control System,” 2010, 9 th edition	No
Websites	https://www.youtube.com/@MATLAB/playlists	

Grading Scheme

Group	Grade		Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	90 - 100	Outstanding Performance	
	B - Very Good	80 - 89	Above average with some errors	
	C – Good	70 - 79	Sound work with notable errors	
	D - Satisfactory	60 - 69	Fair but with major shortcomings	
	E - Sufficient	50 - 59	Work meets minimum criteria	
Fail Group (0 – 49)	FX – Fail	(45-49)	More work required but credit awarded	
	F – Fail	(0-44)	Considerable amount of work required	

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

Module Information					
Module Title	Analog Electronics II		Module Delivery		
Module Type	Core		☒ Theory ☐ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☐ Seminar		
Module Code	NVEE213				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level		2	Semester of Delivery		4
Administering Department		SEC	College	EEC	
Module Leader	Nashwan Z. Hero		e-mail	Nashwan.hero@uoninevah.edu.iq	
Module Leader's Acad. Title		Assistant Lecturer	Module Leader's Qualification		M.Sc.
Module Tutor			e-mail		
Peer Reviewer Name		Rafal Alshaker	e-mail	rafal.mahmod@uoninevah.edu.iq	
Scientific Committee Approval Date		01/06/2023	Version Number	1.0	

Relation with other Modules			
Prerequisite module	NVEE212	Semester	3
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents	
Module Aims	57. Be able to apply the proper biasing to insure operation in the active region. 58. Understand how to measure the important voltage levels of a FET transistor configuration and use them to determine whether the network is operating properly. 59. Be able to perform a load-line analysis of the most common FET and MosFET configurations. 60. Become familiar with the r_e, hybrid, and hybrid π models for the FET and MosFET transistor. 61. Understand the effects of a source resistance and load resistor on the overall gain and characteristics of an amplifier. 62. Become acquainted with the frequency response of a FET and MosFET amplifier. 63. Be able to find the Miller effect capacitance at the input and output of an amplifier due to a feedback capacitor.
Module Learning Outcomes	1. Analyze and compare the performance of fundamental analogue circuits. 2. Produce designs for simple analogue circuits. 3. Use computer modeling techniques and practical experiments to verify and assess theoretical predictions.
Indicative Contents	Indicative content includes the following. TRANSISTOR CONSTRUCTION, transistor operation, common-gate configuration common-drain configuration, The common-source configuration. [15 hrs] AMPLIFICATION IN THE DC DOMAIN: operating point:, The fixed-bias circuit, The self-bias, The voltage-divider bias configuration.[15 hrs] AMPLIFICATION IN THE AC DOMAIN: The equivalent circuit for the common-gate configuration, common-drain circuit and common-source configuration. [15 hrs] LOW-FREQUENCY ANALYSIS—BODE PLOT, impact of the R_l, R_s, C_i, C_s and C_o on the low-frequency response. [15 hrs] HIGH-FREQUENCY ANALYSIS—BODE PLOT, impact of the R_l, R_s, C_{gs}, C_{gd}, C_{ds} and the Miller capacitance C_{Mi} on the high-frequency response. [15 hrs]

Learning and Teaching Strategies	
Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL)			
Structured SWL (h/sem)	77	Structured SWL (h/w)	5
Unstructured SWL (h/sem)	48	Unstructured SWL (h/w)	3
Total SWL (h/sem)	125		

Module Evaluation					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1, and 2
	Assignments	2	10% (10)	2, 12	LO # 1, and 2
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 2 and 3
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-3
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Introduction -
Week 2	FET Transistor regions
Week 3	D.C load line and Q-point
Week 4	D.C analysis of fixed-bias configuration
Week 5	D.C analysis of self-bias configuration
Week 6	D.C analysis of voltage-divider -bias configuration
Week 7	D.C analysis of MosFET amplifier.
Week 8	A.C analysis for the common-source configuration
Week 9	A.C analysis for the common-gate configuration
Week 10	A.C analysis for the common-drain configuration
Week 11	Two stage amplifier
Week 12	LOW-FREQUENCY ANALYSIS for critical points frequency
Week 13	LOW-FREQUENCY ANALYSIS for critical points frequency

Week 14	HIGH-FREQUENCY ANALYSIS for critical points frequency
Week 15	HIGH-FREQUENCY ANALYSIS for critical points frequency
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	Lab 1: Input and output characteristics
Week 2	Lab 2: common-source Amplifier of FET
Week 3	Lab 3: common-drain Amplifier of FET
Week 4	Lab 4: common-gate Amplifier of FET
Week 5	Lab 5: common-drain Amplifier of MosFET
Week 6	Lab 6: common-source Amplifier of MosFET
Week 7	Lab 7: Frequency Response

Learning and Teaching Resources		
	Text	Available in the Library?
Required Texts	Electronic Devices and Circuit Theory, Eleventh Edition Robert L. Boylestad Louis Nashelsky	Yes
Recommended Texts	Hughes, E. et al. (2008) <i>Electrical and Electronic Technology</i> , 10th Edn., Prentice-Hall.	No
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

Grading Scheme			
Group	Grade	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	90 - 100	Outstanding Performance
	B - Very Good	80 - 89	Above average with some errors
	C - Good	70 - 79	Sound work with notable errors
	D - Satisfactory	60 - 69	Fair but with major shortcomings
	E - Sufficient	50 - 59	Work meets minimum criteria
Fail Group (0 - 49)	FX – Fail	(45-49)	More work required but credit awarded
	F – Fail	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

Module Information					
Module Title	Measurement and Sensors		Module Delivery		
Module Type	Core		☒ Theory ☐ Lecture ☐ Lab ☒ Tutorial ☐ Practical ☐ Seminar		
Module Code	NVEESC311				
ECTS Credits	4				
SWL (hr/sem)	100				
Module Level		2	Semester of Delivery		4
Administering Department		SCE	College	EE	
Module Leader	Mohammed Nussrat Younus		e-mail	Mohammed.younus@uoninevah.edu.iq	
Module Leader's Acad. Title		Lecturer	Module Leader's Qualification		MSc.
Module Tutor			e-mail		
Peer Reviewer Name		Yazen H. Shaker	e-mail	Yazen.shaker@uoninevah.edu.iq	
Scientific Committee Approval Date		01/06/2023	Version Number	1.0	

Relation with other Modules			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents	
Module Aims	64. To develop an awareness of the principles of measurement and instrument characteristics. 65. To become familiar with the operation and use of a variety of filters. 66. To realize the operation principle of several sensors and recognize the key issues in selecting the right instrument. 67. To be acquainted with several types of actuators 68. To understand modern signal transmission techniques and relevant standards. 69. To become aware of the sampling theorem, ADC and DAC.
Module Learning Outcomes	Intended Knowledge Outcomes At the end of this module students should be able to have 1. Knowledge of instrumentation technology, including characteristics, standards and operation principle. Familiarity with filtration and op amp circuits 2. Understanding the design concepts and operation of a broad range of electro-mechanical actuator devices. 3. Awareness of modern signal acquisition and transmitting technology 4. Recognize both static and dynamic requirements of instrumentation and measurement systems. 5. Specify and select appropriate sensors for a wide range of systems and applications. 6. Apply acquired knowledge to the design and modelling of measurement systems. Also, develop and implement data acquisition and signal transmitting strategies using DAQ devices, transmitter and controller.
Indicative Contents	Indicative content includes the following. Introduction to measurement system [8 hrs.] • General architecture • Static characteristics (Range, Span, Accuracy, Precision, Resolution, Sensitivity, Linearity, Hysteresis, Repeatability and Reproducibility) Passive filters [4 hrs.] • Basic components • Low Pass filter • High pass filter • Band pass filter Operation Amplifier (Op amp) [12 hrs.] • Inverting amplifier

	• Non-inverting amplifier • Voltage follower • Summing amplifier • Comparator • Differential amplifier • Integrator amplifier • Differentiator amplifier • Instrumentation amplifier Sensors [16 hrs.] • Position measurement - o Limit switch - o Proximity sensors - o Potentiometer - o LVDT - o Encoders • Stress & strain measurement - o Strain gauge • Temperature measurement - o Metal strip - o RTD - o Thermistor - o Thermocouple • Acceleration & vibration measurements • Pressure measurement • Speed measurement Actuators [4 hrs.] • Dc motor • Servo motor • Stepper motor • Solenoid Transmitters [4 hrs.] • 2-wire / 3-wire transmitters • Current transmitter 0-20 / 4-20 • Voltage transmitter 0-10 / -10-10 Analog & Digital interfaces [8 hrs.] • Sampling theorem • ADC • DAC
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Learning and Teaching Strategies	
Strategies	The main strategy that will be adopted in delivering this module is interactive learning through the visualization via flow charts, graphic and pictures that helps students to receive the information in a simpler, clear and systematic way. Also, depending on group work by dividing student into small groups of mixed abilities. By doing so, those who have more knowledge of the subject can share their knowledge and help their peers understand the topic better. Adapt Inquiry-Based learning to Encouraging learners to ask a lot of questions that does not only motivate students to think more practically but also helps them to become independent learners.

Student Workload (SWL)			
Structured SWL (h/sem)	48	Structured SWL (h/w)	3
Unstructured SWL (h/sem)	52	Unstructured SWL (h/w)	3
Total SWL (h/sem)	100		

Module Evaluation					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	3,7,10	LO #2,4, and 6
	Assignments	1	10% (10)	12	LO # 1, 2, 3, and 6
	Lab.	1	10% (10)	Continuous	All
	Report	1	5% (10)	13	LO # 4, and 6
Summative assessment	Midterm Exam	2 hrs.	15% (10)	11	LO # 1-4
	Final Exam	3 hrs.	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
Week	Material Covered
Week 1	Introduction to measurement system / General architecture / Static characteristics (Range, Span, Accuracy, Precision, Resolution)
Week 2	Static characteristics (Sensitivity, Linearity, Hysteresis, Repeatability and Reproducibility)
Week 3	Passive filters • Basic components • Low Pass filter • High pass filter • Band pass filter
Week 4	Operation Amplifier (Op amp) • Inverting amplifier • Non-inverting amplifier

	Voltage follower
Week 5	Operation Amplifier (Op amp) - Summing amplifier - Comparator - Differential amplifier
Week 6	Operation Amplifier (Op amp) - Integrator amplifier - Differentiator amplifier - Instrumentation amplifier
Week 7	Sensors - Limit switch - Proximity sensors - Potentiometer - LVDT
Week 8	Sensors - Encoders - Strain gauge
Week 9	Sensors - Metal strip - RTD - Thermistor - Thermocouple
Week 10	Sensors - Pressure measurement - Speed measurement
Week 11	Mid-term Exam
Week 12	Actuators - Dc motor - Servo motor - Stepper motor - Solenoid
Week 13	Transmitters 2-wire / 3-wire transmitters - Current transmitter 0-20 / 4-20 - Voltage transmitter 0-10 / -10-10
Week 14	Analog & Digital interfaces - Sampling theorem - ADC
Week 15	Analog & Digital interfaces DAC
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)

	Material Covered
Week 1	Introduction to measurement lab
Week 2	Read and test the static characteristics of several sensor
Week 3	Passive filters • Low Pass filter • High pass filter • Band pass filter
Week 4	Operation Amplifier (Op amp) • Inverting amplifier • Non-inverting amplifier • Voltage follower
Week 5	Operation Amplifier (Op amp) • Summing amplifier • Comparator • Differential amplifier
Week 6	Operation Amplifier (Op amp) • Integrator amplifier • Differentiator amplifier
Week 7	Sensors • Limit switch • Proximity sensors • Potentiometer
Week 8	Sensors • Encoders • Strain gauge
Week 9	Sensors • RTD • Thermocouple
Week 10	Sensors • Pressure sensor • Tachometer
Week 11	Mid-term lab Exam
Week 12	Actuators • Dc motor • Servo motor • Stepper motor • Solenoid
Week 13	• Current transmitter • Voltage transmitter

Week 14	• ADC
Week 15	• DAC
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources		
	Text	Available in the Library?
Required Texts	1. Introduction to Instrumentation and Measurements, Third Edition, Robert B. Northrop. 2. Introduction to Mechatronics and Measurement Systems, Fourth Edition, David G. Alciatore and Michael B. Hstand.	No
Recommended Texts	Measurement, Instrumentation and Sensors Handbook.	No
Websites	https://www.udemy.com/course/sensors-sensor-fundamentals/	

Grading Scheme			
Group	Grade	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	90 - 100	Outstanding Performance
	B - Very Good	80 - 89	Above average with some errors
	C - Good	70 - 79	Sound work with notable errors
	D - Satisfactory	60 - 69	Fair but with major shortcomings
	E - Sufficient	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	(45-49)	More work required but credit awarded
	F – Fail	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

Module Information					
Module Title	Machines		Module Delivery		
Module Type	Core		☒ Theory ☐ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☐ Seminar		
Module Code	NVEESC312				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level		2	Semester of Delivery		4
Administering Department		SCE	College	EEC	
Module Leader	Saif Saad Mahmood		e-mail	Saif.mahmood@uoninevah.edu.iq	
Module Leader's Acad. Title		Asist.Lecturer	Module Leader's Qualification		M.Sc.
Module Tutor			e-mail		
Peer Reviewer Name			e-mail		
Scientific Committee Approval Date			Version Number		

Relation with other Modules			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents	
Module Aims	Understanding Electrical Machines Principle Analyzing Electrical Machines Behavior Control Strategies System Integration Practical Applications Problem-Solving Skills Laboratory Skills Teamwork and Communication Professional Development
Module Learning Outcomes	54. Understand how voltage is induced in a rotating loop and how curved pole faces contribute to a constant flux, and thus more constant output voltages. 55. Understand the power flow diagram for de machines, and know the types of de motors in general use. Understand the equivalent circuit of a de motor. 56. Understand how to derive the torque-speed characteristics of separately excited, shunt, series, and compounded de motors. 57. Understand how to control the speed of different types of de motors. 58. Understand the special characteristics of series de motors, and the applications. Also, understand the methods of starting dc motors safely, and the equivalent circuit of a dc generator. 59. Understand the purpose of a transformer in a power system. Add to that, how real transformers approximate the operation of an ideal transformer, where be able to explain how copper losses, leakage flux, hysteresis, and eddy currents are modeled in transformer equivalent circuits.

Indicative Contents	Introduction - A Simple Rotating Loop between Curved Pole Faces. The Voltage Induced in a Rotating Loop / Getting DC Voltage Out of the Rotating Loop / The Induced Torque in the rotating loop.(2 hrs.). Commutation and Armature Construction in Real DC Machine. .(2 hrs.). Power Flow and Losses in DC Machines. .(2 hrs.). Introduction to DC Motors. The Equivalent Circuit of a DC Motor. The Magnetization Curve of a DC Machine. Separately Excited and Shunt DC Motors.(2 hrs.). Permanent-Magnet DC Motor. The Series DC Motor. The Compounded DC Motor. .(2 hrs.). Motor Starters. Solid-State Speed Controllers. .(2 hrs.). DC Motor Efficiency Calculations. .(2 hrs.). Mid-term Exam. .(2 hrs.). Introduction to DC Generators. The Separately Excited Generator. .(2 hrs.). The Shunt DC Generator. The Series DC Generator.(2 hrs.). The Cumulatively Compounded DC Generator. The Differentially Compounded DC Generator. .(2 hrs.). Types and Construction of Transformers. The Ideal Transformer. .(2 hrs.). Theory of Operation of Real Single-Phase Transformers. The Equivalent Circuit of a Transformer. .(2 hrs.). Transformer Voltage Regulation and Efficiency. .(2 hrs.). Instrument Transformers. .(2 hrs.).
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Learning and Teaching Strategies	
Strategies	Visual Aids Problem-Solving Exercises Real-World Applications Group Projects Simulations and Virtual Labs Multimedia Resources Real-Life Examples

Student Workload (SWL)			
Structured SWL (h/sem)	77	Structured SWL (h/w)	5
Unstructured SWL (h/sem)	48	Unstructured SWL (h/w)	3
Total SWL (h/sem)	125		

Module Evaluation					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1, 2, and 3
	Assignments	2	10% (10)	2, 12	LO # 3, and 4
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 4, 5 and 6
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1 – 4
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Introduction - A Simple Rotating Loop between Curved Pole Faces. The Voltage Induced in a Rotating Loop / Getting DC Voltage Out of the Rotating Loop / The Induced Torque in the rotating loop.
Week 2	Commutation and Armature Construction in Real DC Machine.
Week 3	Power Flow and Losses in DC Machines.
Week 4	Introduction to DC Motors. The Equivalent Circuit of a DC Motor. The Magnetization Curve of a DC Machine. Separately Excited and Shunt DC Motors
Week 5	Permanent-Magnet DC Motor. The Series DC Motor. The Compounded DC Motor.
Week 6	Motor Starters. Solid-State Speed Controllers.
Week 7	DC Motor Efficiency Calculations.
Week 8	Mid-term Exam.
Week 9	Introduction to DC Generators. The Separately Excited Generator.
Week 10	The Shunt DC Generator. The Series DC Generator
Week 11	The Cumulatively Compounded DC Generator. The Differentially Compounded DC Generator.
Week 12	Types and Construction of Transformers. The Ideal Transformer.
Week 13	Theory of Operation of Real Single-Phase Transformers. The Equivalent Circuit of a Transformer.
Week 14	Transformer Voltage Regulation and Efficiency.
Week 15	Instrument Transformers.
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)

	Material Covered
Week 1	Lab 1: THE CONSTRUCTION OF DC MACHINE
Week 2	Lab 2: Simulation of DC Machines
Week 3	Lab 3: POWER FLOW AND LOSSES IN DC MACHINES
Week 4	Lab 4: DC separated excited motor speed characteristic with the variation of supply voltage
Week 5	Lab 5: Relationship between speed and induced voltage for separately excited DC generator
Week 6	Lab 6: Simulation of Permanent Magnet DC Machines with starter
Week 7	Lab 7: Simulation of single-phase transformer

Learning and Teaching Resources

	Text	Available in the Library?
Required Texts	Electrical Machinery Fundamentals” edited by Stephen J. Chapman.	Yes
Recommended Texts	Theraia Bl, Theraia Ak "ELECTRICAL TECHNOLOGY"	yes
Websites	https://www.coursera.org	

Grading Scheme

Group	Grade	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	90 - 100	Outstanding Performance
	B - Very Good	80 - 89	Above average with some errors
	C - Good	70 - 79	Sound work with notable errors
	D - Satisfactory	60 - 69	Fair but with major shortcomings
	E - Sufficient	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	(45-49)	More work required but credit awarded
	F – Fail	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

Module Information				
Module Title	Engineering Drawing		Module Delivery	
Module Type	Basic		☒ Theory ☐ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	NVEE201			
ECTS Credits	2			
SWL (hr/sem)	50			
Module Level	2	Semester of Delivery	4	
Administering Department	SCE		College	EE
Module Leader	Yazen Hudhaifa Shakir		e-mail	yazen.shakir@uoninevah.edu.iq
Module Leader's Acad. Title	Lecturer		Module Leader's Qualification	MSc.
Module Tutor			e-mail	E-mail
Peer Reviewer Name	Ismail Khudhair , Ahmed Nidham Mohammed		e-mail	ismael.Khudhair@uoninevah.edu Ahmed.Nidham@uoninevah.edu
Scientific Committee Approval Date	01/06/2023	Version Number	1.0	

Relation with other Modules				
Prerequisite module	None		Semester	
Co-requisites module	None		Semester	

Third year
First semester

MODULE DESCRIPTION FORM

Module Information					
Module Title	Numerical Analysis		Module Delivery		
Module Type	Basic		☒ Theory ☐ Lecture ☐ Lab		
Module Code	NVEE				
ECTS Credits	6				
SWL (hr/sem)	150				
			☒ Tutorial ☐ Practical ☐ Seminar		
Module Level		3	Semester of Delivery		5
Administering Department		SCE	College	EE	
Module Leader	Abdurahman Basil AYOUB		e-mail	abdurahman.ayoub@uoninevah.edu.iq	
Module Leader's Acad. Title		Asst. Lecturer	Module Leader's Qualification		MSc
Module Tutor			e-mail	E-mail	
Peer Reviewer Name		Abdulallah I.	e-mail	E-mail	
Scientific Committee Approval Date		01/06/2023	Version Number		1.0

Relation with other Modules			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents	
Module Aims	• Understanding Numerical Methods: Developing a solid grasp of iterative techniques for root finding, including Fixed Point Iteration, Newton-Raphson, Bisection, and False Position methods. • Solving Differential Equations Numerically: Applying numerical approaches like Euler's Method and Runge-Kutta to approximate solutions for ordinary differential equations. • Integrating Functions Numerically: Exploring integral approximation methods, such as the Trapezoidal Rule and Simpson's Rule, to compute definite integrals in cases where analytical solutions are impractical. • Enhancing Computational Skills: Strengthening problem-solving abilities by implementing these numerical methods in practical engineering and mathematical contexts. • Connecting Theory to Applications: Recognizing real-world applications of numerical techniques, particularly in control systems, robotics, and engineering mechanics.
Module Learning Outcomes	1. Root Finding Techniques: Demonstrate proficiency in numerical methods for solving single-variable equations, including Fixed Point Iteration, Newton-Raphson, Bisection, and False Position methods. 2. Numerical Solutions for Differential Equations: Apply Euler's Method and Runge-Kutta techniques to approximate solutions for ordinary differential equations. 3. Numerical Integration Skills: Utilize numerical approaches like the Trapezoidal Rule and Simpson's Rule to approximate definite integrals. 4. Computational Thinking: Develop problem-solving strategies by implementing these numerical methods in engineering and applied mathematics contexts. 5. Algorithmic Implementation: Gain hands-on experience with coding or algorithm development to apply numerical techniques in computational environments. 6. Application in Engineering and Robotics: Recognize how these methods contribute to engineering mechanics, control systems, and assistive technologies like smart wheelchair systems.

Indicative Contents	Section 1: Root-Finding Methods - Fixed-Point Iteration: Principles and convergence criteria - Newton-Raphson Method: Implementation, advantages, and limitations - Bisection Method: Stepwise approach and error estimation - False Position Method: Comparative analysis with bisection Section 2: Numerical Solutions of Ordinary Differential Equations (ODEs) - Euler's Method: Forward, backward, and modified Euler techniques - Runge-Kutta Methods: Higher-order approximations and their efficiency - Stability and Error Analysis: Evaluating numerical accuracy in ODE solutions Section 3: Numerical Integration Techniques - Trapezoidal Rule: Application in definite integrals and approximation errors - Simpson's Rule: Quadratic interpolation and accuracy comparisons - Adaptive Integration: Refining results using iterative methods Section 4: Computational Applications - Algorithm Design and Implementation in Engineering Contexts - Applications in Control Systems, Robotics, and Assistive Technologies - Case Studies: Real-world examples of numerical techniques in practice
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Learning and Teaching Strategies	
Strategies	1. Understanding Core Concepts Thoroughly - Develop a strong foundation in numerical methods by reviewing theory before diving into problem-solving. - Compare different root-finding techniques (e.g., Newton-Raphson vs. Bisection) by analyzing their efficiency and convergence properties. 2. Practical Application & Problem-Solving - Work through numerical examples step by step to reinforce algorithm implementation. - Apply methods like Runge-Kutta in real-world contexts such as control systems or robotics. 3. Computational Implementation - Utilize programming tools (such as MATLAB or Python) to experiment with numerical techniques. - Write small scripts to automate computations and visualize solutions dynamically.

	4. Error Analysis & Optimization • Pay attention to accuracy, stability, and computational cost of each method. • Compare numerical vs. analytical solutions to understand limitations. 5. Connecting Topics Across Engineering Domains • Relate numerical techniques to robotics, assistive technologies, and control system optimization. • Explore case studies that highlight practical applications of integration and differential equation solutions.
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Student Workload (SWL)			
Structured SWL (h/sem)	48	Structured SWL (h/w)	3
Unstructured SWL (h/sem)	102	Unstructured SWL (h/w) ¹	7
Total SWL (h/sem)	150		

Module Evaluation					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	20% (20)	5, 11	LO # 2, 3 and 5
	Assignments	2	10% (10)	2, 10	LO # 1
	Online Assignments	1	5% (5)	7, 9	LO # 1
	Report	1	5% (5)	13	LO # 2
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-4
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Roots of Single Equations (Fixed point Iteration)
Week 2	Roots of Single Equations (Newton-Raphson Method)
Week 3	Roots of Single Equations (Bisection Technique)
Week 4	Roots of Single Equations (secant Method)
Week 5	Roots of Single Equations (False Position Method)
Week 6	Numerical Solution of Ordinary Differential Equations (ODE) using Euler Method
Week 7	Numerical Solution of Ordinary Differential Equations (ODE) using Euler Method
Week 8	Mid – Exam
Week 9	Numerical Solution of Ordinary Differential Equations (ODE) using Euler Method
Week 10	Numerical Solution of Ordinary Differential Equations (ODE) using Runge-Kutta
Week 11	Numerical Solution of Ordinary Differential Equations (ODE) using Runge-Kutta
Week 12	Numerical Solution of integral using trapezoidal rule.
Week 13	Numerical Solution of integral using trapezoidal rule.
Week 14	Numerical Solution of integral using Simpson’s rule
Week 15	Numerical Solution of integral using Simpson’s rule
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources		
	Text	Available in the Library?
Required Texts	NUMERICAL METHODS FOR ENGINEERS, SEVENTH EDITION – 2015	No
Recommended Texts	Numerical Analysis – 9 th edition – 2011	No
Websites		

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	

Grading Scheme			
Group	Grade	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	90 - 100	Outstanding Performance
	B - Very Good	80 - 89	Above average with some errors
	C - Good	70 - 79	Sound work with notable errors
	D - Satisfactory	60 - 69	Fair but with major shortcomings
	E - Sufficient	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	(45-49)	More work required but credit awarded
	F – Fail	(0-44)	Considerable amount of work required
Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.			

MODULE DESCRIPTION FORM

Module Information		
Module Title	Digital Control	Module Delivery
Module Type	Core	☒ Theory ☐ Lecture ☒ Lab ☒ Tutorial
Module Code	NVEESC307	
ECTS Credits	5	
SWL (hr/sem)	125	

		☐ Practical ☐ Seminar	
Module Level	3	Semester of Delivery	5
Administering Department	SCE	College	EE
Module Leader	Abdullah Ibrahim Abdullah	e-mail	Abdullah.abdullah@uoninevah.edu.iq
Module Leader's Acad. Title	Assistant Professor	Module Leader's Qualification	M.Sc.
Module Tutor	/	e-mail	/
Peer Reviewer Name	/	e-mail	/
Scientific Committee Approval Date	01/06/2023	Version Number	1

Relation with other Modules			
Prerequisite module	NVEESC309	Semester	4
Co-requisites module	None	Semester	None

Module Aims, Learning Outcomes and Indicative Contents	
Module Aims	To present the basic concepts on analysis and design of sampled data control system and to apply these concepts to typical physical processes.
Module Learning Outcomes	Upon the successful completion of the course, students will be able to: 1. Understand fundamentals of discrete-data systems by applying principles of engineering and mathematics. 2. Study the discrete-time system operation based on Z-transform 3. Design and analyze digital control systems for different engineering applications using MATLAB.
Indicative Contents	1-Introduction to discrete time control system [5 hours] Concepts of discrete control systems, Sampling theory, why digital control? quantization and quantization error, Analog to digital and digital to analog conversion, Examples digital control systems. 2-Z-transform [15 hours] Fundamentals of Z-Transform, Definition, Z-Transform Using Partial Fraction, Z Transform Using Residue Method, Properties of the z transform, Inversion of the Z transform, Power series, long division, partial fractions, Residue Method, Z-transform method for solving difference equation. 3-Modeling of digital control systems [10 hours] Discrete-time Block Diagrams, The ZOH Transfer Function, Pulse transfer function, Pulse transfer function of closed loop system. 4-Time Response [10 hours] Long division method, Difference Equations, Partial-fraction Expansion 5-Stability of Discrete Systems [15 hours] Mapping of s-plane to z-plane, Factorization Method, Jury Test, Routh–Hurwitz criterion 6-Steady State Error [5 hours] Step Function input, Ramp Function input, Parabolic Function input 7- Root Locus in the z-plane [10 hours] Rules for Drawing Root Locus, Root Locus without Zero Order Hold, Root Locus with Zero Order Hold, Discrete PID controller, Discrete PID Controller Tuning

Learning and Teaching Strategies	
Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL)			
Structured SWL (h/sem)	77	Structured SWL (h/w)	5
Unstructured SWL (h/sem)	48	Unstructured SWL (h/w)	3
Total SWL (h/sem)	125		

Module Evaluation					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO # 1, 2,3
	Assignments	2	10% (10)	2, 12	LO # 1,2
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 1,2
Summative assessment	Midterm Exam	2 hr	10% (10)	8	LO # 1,2
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Introduction to discrete time control system Concepts of discrete control systems, Sampling theory, why digital control? quantization, and quantization error, Analog to digital and digital to analog conversion Examples of digital control systems.
Week 2	Z-transform Fundamentals of Z-Transform, Definition, Z-Transform Using Partial Fraction
Week 3	Z-Transform Using Residue Method ,Properties of the z transform,
Week 4	Inversion of the Z-transform, Power series, long division, partial fractions, Z-transform method for solving difference equation
Week 5	Modeling of digital control systems Discrete-time Block Diagrams, The ZOH Transfer Function, Pulse transfer function
Week 6	Pulse transfer function of closed loop system
Week 7	Time Response Long division method, Difference Equations
Week 8	Partial-fraction Expansion.
Week 9	Mid exam
Week 10	Stability of Discrete Systems Mapping of s-plane to z-plane, Factorization Method
Week 11	Jury Test
Week 12	Routh–Hurwitz criterion
Week 13	Steady State Error Step Function input, Ramp Function input, Parabolic Function input
Week 14	Root Locus in the z-plane Rules for Drawing Root Locus, Root Locus without Zero Order Hold
Week 15	Root Locus with Zero Order Hold , Discrete PID controller, Discrete PID Controller Tuning.
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	Lab 1 Introduction to DC Lap.
Week 2	Lab 2: Sampling and quantization (ADC)
Week 3	Lab 3: Zero Order Hold (DAC)
Week 4	Lab 4: Familiarization with Digital Control System Toolbox
Week 5	Lab 5: Determination of z-Transform, Inverse z-Transform
Week 6	Lab 6: Step Response of a Discrete Time System and Effect of Sampling Time on System Response
Week 7	Lab 7: Region of Convergence (ROC) & Pole Zero Map of Discrete Systems
Week 8	Lab 8: Stability of Discrete Control Systems
Week 9	Mid exam
Week 10	Lab 9: System Stability –Jury test
Week 11	Lab 10: System Stability Routh–Hurwitz criterion
Week 12	Lab 11: System Stability Routh–Hurwitz criterion
Week 13	Lab 12: Discrete PI Controller
Week 14	Lab 13: Discrete PD Controller
Week 15	Lab 14: Discrete PID Controller
Week 16	Final exam

Learning and Teaching Resources		
	Text	Available in the Library?
Required Texts	M. Sami Fadali, Antonio Visioli "Digital Control Engineering Analysis and Design" Second Edition, 2013	Yes
Recommended Texts	Philips, Nagle Fourth Edition "Digital Control System analysis and design", 2015	Yes
Websites		

Grading Scheme			
Group	Grade	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	90 - 100	Outstanding Performance
	B - Very Good	80 - 89	Above average with some errors
	C – Good	70 - 79	Sound work with notable errors
	D - Satisfactory	60 - 69	Fair but with major shortcomings
	E - Sufficient	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	(45-49)	More work required but credit awarded
	F – Fail	(0-44)	Considerable amount of work required
Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.			

MODULE DESCRIPTION FORM

Module Information					
Module Title	Digital Signal Processing I		Module Delivery		
Module Type	Basic		☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar		
Module Code	NVEE204				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level		3	Semester of Delivery		5
Administering Department		SCE	College	EEC	
Module Leader	Ahmed Jameel Abdulqader		e-mail	ahmed.abdulqader@uoninevah.edu.iq	
Module Leader's Acad. Title		Lecturer	Module Leader's Qualification		Ph.D.
Module Tutor			e-mail		
Peer Reviewer Name		Abdulrahman	e-mail		
Scientific Committee Approval Date		01/06/2023	Version Number	1.0	

Relation with other Modules			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents	
Module Aims	70. To develop problem solving skills and understanding of digital signal processing through the analysis of application techniques. 71. To understand analysis, synthesis and implementation of a given signal and system. 72. This course deals with the basic concept of DSP. 73. This is the basic subject for all digital signal and its application. 74. To perform digital filter design and its analysis.
Module Learning Outcomes	After successful completion of this module, students will: 60. Be able to apply the discrete Fourier series for analysis of a range of signals. 61. Be able to apply the discrete Fourier transform for analysis of a range of signals. 62. Be able to apply the discrete Z transform for analysis of a range of signals. 63. Be able to design a digital filter based on a given specification. 64. Be able to design and implement a variety of DSP algorithms in MATLAB.
Indicative Contents	Indicative content includes the following. Introduction [20 hrs] Basic elements of Digital Signal Processing, Need of Digital Signal Processing over Analog Signal Processing, A/D and D/A conversion, Sampling continuous signals and spectral properties of sampled signals Discrete-time Signals and System [30 hrs] Elementary discrete-time signals, Linearity, Shift invariance, Causality of discrete systems, Recursive and Non-recursive discrete-time systems, Convolution sum and impulse response, Linear Time-invariant systems characterized by constant coefficient difference equations, Stability of LTI systems, Implementation of LTI system Discrete Fourier Transform [40 hrs] Definition and applications, Frequency domain sampling and for reconstruction, Forward and Reverse transforms, Relationship of the DFT to other transforms, Properties of the Discrete Fourier Transform: Periodicity, Linearity and Symmetry Properties, Multiplication of two DFTs and Circular Convolution, Time reversal, Circular time shift and Multiplication of two sequences circular frequency shift, Circular correlation and Parseval's Theorem, Efficient computation of the DFT: Algorithm, applications, Applications of FFT Algorithms. Z-Transform [30 hrs] Definition of the z-transform, One-side and two-side transforms, ROC, Left-side, Right-sided and two-sided sequences, Region of convergence, Relationship to causality, Inverse z-transform-by long division, by partial fraction expansion, Z-transform properties-delay advance, Convolution, Parseval's theorem, Z-transform function $H(z)$-transient and steady state sinusoidal response, pole-zero relationship stability Convolution and Correlation [10 hrs]

	Transfer Functions and Frequency Response [10 hrs] Vector Interpretation of Frequency Response [10 hrs]
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Learning and Teaching Strategies	
Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL)			
Structured SWL (h/sem)	77	Structured SWL (h/w)	5
Unstructured SWL (h/sem)	48	Unstructured SWL (h/w)	3
Total SWL (h/sem)	125		

Module Evaluation					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1, and 3
	Assignments	2	10% (10)	2, 12	LO # 2, 4, and 5
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5
Summative assessment	Midterm Exam	2 hr	10% (10)	9	LO # 1-4
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Basic elements of digital signal Processing:
Week 2	Sampling Theorem
Week 3	Classification of Discrete Time systems
Week 4	Discrete Fourier Series: Spectra of periodic digital signals.
Week 5	Discrete Fourier Series: Properties of series.
Week 6	Discrete Fourier Transform: Properties.
Week 7	Discrete Fourier Transform: Frequency response of LTI systems.
Week 8	Convolution and Correlation
Week 9	Mid-term Exam
Week 10	Discrete and fast Fourier Transform
Week 11	Z- Transform: Review.
Week 12	Z- Transform: Z-plane poles and zeros.
Week 13	System Analysis Using Z-Transform
Week 14	Transfer Functions and Frequency Response
Week 15	Vector Interpretation of Frequency Response
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)

	Material Covered
Week 1	Lab 1: Representation of Basic Signals in Digital Signal Processing
Week 2	Lab 2: Verification of Sampling Theorem
Week 3	Lab 3: Impulse Response of LTI Systems
Week 4	Lab 4: Discrete Fourier Series
Week 5	Lab 5: Discrete Fourier Series: Properties of series
Week 6	Lab 6: Discrete Fourier Transform
Week 7	Lab 7: Discrete Fourier Transform: Frequency response of LTI systems.
Week 8	Lab 8: Convolution and Correlation
Week 9	Mid-term Exam
Week 10	Lab 10: Discrete and fast Fourier Transform
Week 11	Lab 11: Z- Transform: Review.
Week 12	Lab 12: Z- Transform: Z-plane poles and zeros.
Week 13	Lab 13: Z transform Commands and Pole Zero Plotting in Z plane
Week 14	Lab 14: System Analysis Using Z-Transform
Week 15	Lab 15: Transfer Functions and Frequency Response
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources

	Text	Available in the Library?
Required Texts	J.G. Proakis and D.G. Manolakis, Digital Signal Processing, Prentice Hall of India. 2009	No
Recommended Texts	A.V. Oppenheim, Discrete-Time Signal Processing, Prentice Hall, 2009.	No
Recommended Texts	S.K. Mitra, Digital Signal Processing, A Computer-based Approach, McGraw Hill, 2008	No
Websites	https://www.coursera.org	

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Group	Grade	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	90 - 100	Outstanding Performance
	B - Very Good	80 - 89	Above average with some errors
	C – Good	70 - 79	Sound work with notable errors
	D - Satisfactory	60 - 69	Fair but with major shortcomings
	E - Sufficient	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	(45-49)	More work required but credit awarded
	F – Fail	(0-44)	Considerable amount of work required
Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.			

MODULE DESCRIPTION FORM

Module Information				
Module Title	Thermodynamics		Module Delivery	
Module Type	Core		☒ Theory ☐ Lecture ☐ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	NVEESC314			
ECTS Credits	4			
SWL (hr/sem)	100			
Module Level	3	Semester of Delivery	5	
Administering Department	SCE	College	EE	
Module Leader	Mohammed Nussrat Younus	e-mail	Mohammed.younus@uoninevah.edu.iq	
Module Leader's Acad. Title	Assistant Prof.	Module Leader's Qualification	MSc.	
Module Tutor		e-mail		
Peer Reviewer Name	Ismael Khudhair	e-mail	ismael.Khudhair@uoninevah.edu	
Scientific Committee Approval Date	01/04/2025	Version Number	1.0	

Relation with other Modules			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents	
Module Aims	75. To develop an awareness of the principles of 1st law of thermodynamics. 76. To become familiar with variable thermodynamics processes and cycles. 77. To analysis the operation principle of several steady flow devices. 78. To understand the concepts behind 2nd law of thermodynamics. 79. To become aware of irreversibility and thermodynamic efficiency.
Module Learning Outcomes	Intended Knowledge Outcomes At the end of this module students should be able to 7. Explain the fundamental concepts of thermodynamics, including systems, surroundings, state functions, and the laws of thermodynamics. 8. Apply the First Law of Thermodynamics to analyze energy conservation in closed and open systems, including work, heat, and internal energy changes. 9. Utilize the Second Law of Thermodynamics to evaluate entropy changes, reversibility, and the efficiency of heat engines and refrigerators. 10. Analyze thermodynamic cycles (e.g., Carnot, Rankine, Brayton) to determine performance metrics such as thermal efficiency and coefficient of performance. 11. Use thermodynamic property tables and equations of state to solve problems involving enthalpy and internal energy of ideal gases
Indicative Contents	Indicative content includes the following. Introduction to Thermodynamics Concepts and Definitions of Systems, Properties of Systems, Process and States, Ideal Gas Law, Zeroth Law of Thermodynamic. Energy, Forms of Energy, Energy Transfer by Heat, Energy Transfer by Work, Internal Energy, 1st Law of Thermodynamics, Specific Heat and Heat Capacity, Change of Phase and Heat Latent. 1st Law of Thermodynamics Applied to Close System, Thermodynamics process: Isobaric Process, Isometric Process, Isothermal Process, Polytropic Process, Adiabatic Process, Thermodynamics Cycles. 1st Law of Thermodynamics Applied to Control Volume, Enthalpy, Energy Analysis of Steady Flow Devices: Nozzles and Diffusers, Turbines and Compressors, Heat Exchangers, Mixing Chambers. 2nd Law of Thermodynamics, Thermal Energy Reservoirs, Heat Engines, Thermal Efficiency, Refrigerators, Coefficient of Performance (COP), Carnot cycle, Reversible and Irreversible processes, Entropy, Isentropic Process, Isentropic Efficiency, Power Cycles

Learning and Teaching Strategies	
Strategies	The main strategy that will be adopted in delivering this module is interactive learning through the visualization via flow charts, graphic and pictures that helps students to receive the information in a simpler, clear and systematic way. Also, depending on group work by dividing student into small groups of mixed abilities. By doing so, those who have more knowledge of the subject can share their knowledge and help their peers understand the topic better. Adapt Inquiry-Based learning to Encouraging learners to ask a lot of questions that does not only motivate students to think more practically but also helps them to become independent learners.

Student Workload (SWL)			
Structured SWL (h/sem)	48	Structured SWL (h/w)	3
Unstructured SWL (h/sem)	52	Unstructured SWL (h/w)	3
Total SWL (h/sem)	100		

Module Evaluation					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	24% (10)	3,7,10	All
	Homework	1	5% (10)	12	LO # 1,3, 4,
	Project	1	5% (10)	Continuous	1,2,3
	Seminar	1	6% (10)	13	All
Summative assessment	Midterm Exam	1 hr.	10% (10)	11	LO # 1-4
	Final Exam	2 hrs.	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

Week	Material Covered
Week 1	Introduction to Thermodynamics, Concepts and Definitions of Systems, Properties of Systems, Process and States, Ideal Gas Law, Zeroth Law of Thermodynamic
Week 2	Energy, Forms of Energy, Energy Transfer by Heat, Energy Transfer by Work, Internal Energy
Week 3	1st Law of Thermodynamics, Specific Heat and Heat Capacity, Change of Phase & Heat Latent
Week 4	1st Law of Thermodynamics to Close System, Thermodynamics process: Isobaric Process,
Week 5	Isometric Process, Isothermal Process
Week 6	Polytropic Process, Adiabatic Process
Week 7	Thermodynamics Cycles
Week 8	1st Law of Thermodynamics Applied to Control Volume, Enthalpy, Energy Analysis of Steady Flow Devices:
Week 9	Nozzles and Diffusers, Turbines and Compressors
Week 10	Heat Exchangers, Mixing Chambers
Week 11	Mid-term Exam
Week 12	2nd Law of Thermodynamics, Thermal Energy Reservoirs, Heat Engines,
Week 13	Thermal Efficiency, Refrigerators, Coefficient of Performance (COP), Carnot cycle, Reversible and Irreversible processes
Week 14	Entropy, Isentropic Process, Isentropic Efficiency
Week 15	Rankine and Brayton Power Cycles
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)

	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	
Week 8	

Week 9	
Week 10	
Week 11	
Week 12	
Week 13	
Week 14	
Week 15	

Learning and Teaching Resources

	Text	Available in the Library?
Required Texts	1. Thermodynamics: an Engineering Approach 7th Edition by Yunus A. Cengel 2. Fundamental of Engineering Thermodynamics 5th Edition by Michael J. Moran and Howard N. Shapiro	No
Recommended Texts	1. Fundamentals of Thermodynamics 6th Edition by e. Sonntag, C. borgnakke and G. vanwylen	No
Websites	https://www.udemy.com/course/Thermodynamics	

Grading Scheme

Group	Grade	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	90 - 100	Outstanding Performance
	B - Very Good	80 - 89	Above average with some errors
	C – Good	70 - 79	Sound work with notable errors
	D - Satisfactory	60 - 69	Fair but with major shortcomings
	E - Sufficient	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	(45-49)	More work required but credit awarded
	F – Fail	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Third year
Second semester

MODULE DESCRIPTION FORM

Module Information					
Module Title	Control Systems Design			Module Delivery	
Module Type	Core			☒ Theory ☐ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	NVEESC315				
ECTS Credits	6				
SWL (hr/sem)	150				
Module Level		3	Semester of Delivery		5
Administering Department		SCE	College	EE	
Module Leader	Mr. Salam Ibrahim		e-mail	salam.khather@uoninevah.edu.iq	
Module Leader's Acad. Title		Lecturer	Module Leader's Qualification		MSc
Module Tutor	/		e-mail	/	
Peer Reviewer Name		/	e-mail	/	
Scientific Committee Approval Date		1/6/2023	Version Number	1	

Relation with other Modules			
Prerequisite module	NVEESC309	Semester	4
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents

Module Aims	80. The objective of control system design is to construct a system that has a desirable response to standard inputs. 81. A desirable transient response is one that is sufficiently fast without excessive oscillations. 82. A desirable steady-state response is one that follows the desired output with sufficient accuracy. 83. Performance Specifications. 84. System Compensation. 85. Design Procedures of control systems. 86. Discusses the root-locus analysis and design of control systems, including positive feedback systems and conditionally stable systems Plotting root loci with MATLAB is discussed in detail. Design of lead, lag, and lag-lead compensators with the root-locus method is included. 87. Discusses the frequency-response analysis and design of control systems. The stability criterion is presented in an easily understandable manner. The Bode diagram approach to the design of lead, lag, and lag-lead compensators is discussed. 88. Deals with basic PID controllers. Computational approaches for obtaining optimal parameter values for PID controllers are discussed in detail, particularly with respect to satisfying requirements for step-response characteristics.
Module Learning Outcomes	65. Treats the root-locus method of analysis and design of control systems. The design process, from modeling to specification of the control problem and controller design will be emphasized. 66. Design by Root-Locus Method including design of lead, lag, and lag-lead compensators. 67. Parallel Compensation Technique. 68. Treats the frequency-response method of analysis and design of control systems. Design by the Frequency-Response Method (Bode Diagrams) including design of lead, lag, and lag-lead compensators. 69. Tuning of PID controllers and discusses PID controllers. Also, using Ziegler–Nichols Rules for Tuning PID Controllers 70. Design of PID Controllers with Frequency-Response approach.

Indicative Contents	Indicative content includes the following. <u>The Root-Locus Method:</u> Treats the root-locus method of analysis and design of control systems. The design process, from modeling to specification of the control problem and controller design will be emphasized. Design by Root-Locus Method including design of lead, lag, and lag-lead compensators. Parallel Compensation Technique. [25 hrs] <u>The Frequency-Response Method:</u> Treats the frequency-response method of analysis and design of control systems. Design by the Frequency-Response Method (Bode Diagrams) including design of lead, lag, and lag-lead compensators. [30 hrs] <u>PID controllers:</u> Tuning of PID controllers. Discusses PID controllers. Ziegler–Nichols Rules for Tuning PID Controllers and design of PID Controllers with Frequency-Response approach. [15 hrs]
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Learning and Teaching Strategies	
Strategies	This course will introduce important concepts in the design of control systems. Special effort will be made to provide example problems at strategic points so that the students will have a clear understanding of the subject matter discussed. Learning control implies that the control system contains sufficient computational ability so that it can develop representations of the mathematical model of the system being controlled and can modify its own operation to take advantage of this newly developed knowledge.

Student Workload (SWL)			
Structured SWL (h/sem)	92	Structured SWL (h/w)	6
Unstructured SWL (h/sem)	58	Unstructured SWL (h/w)	4
Total SWL (h/sem)	150		

Module Evaluation					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1, 5 and 6
	Assignments	2	10% (10)	2, 12	LO # 2, 3, and 4
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 4, 5 and 6
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1 - 5
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Introduction to design.
Week 2	Introduction to Root-Locus.
Week 3	Design by Root-Locus Method including design of lead compensators.
Week 4	Design by Root-Locus Method including design of lag compensators.
Week 5	Design by Root-Locus Method including design of lag-lead compensators.
Week 6	Parallel Compensation Technique.
Week 7	Mid-term Exam
Week 8	Introduction to the Frequency-Response Method (Bode Diagrams).
Week 9	Design by the Frequency-Response Method including design of lead compensators.
Week 10	Design by the Frequency-Response Method including design of lag compensators.
Week 11	Design by the Frequency-Response Method including design of lag-lead compensators.
Week 12	PID Controllers.
Week 13	Ziegler–Nichols Rules for Tuning PID Controllers.
Week 14	Design of PID Controllers with Frequency-Response.
Week 15	Example Problems.
Week 16	Preparatory week before the final Exam.

Delivery Plan (Weekly Lab. Syllabus)

	Material Covered
Week 1	Lab 1: Brief Overview of Matlab Programming.
Week 2	Lab 2: The use of MATLAB for obtaining responses of control systems.
Week 3	Lab 3: Lead Compensation Techniques Based on the Root-Locus Approach.
Week 4	Lab 4: Lag Compensation Techniques Based on the Root-Locus Approach.
Week 5	Lab 5: LAG–LEAD COMPENSATION Techniques Based on the Root-Locus Approach
Week 6	Lab 6: Parallel Compensation Based on the Root-Locus Approach.
Week 7	Midterm Lab Exam
Week 8	Lab 7: Example Problems.
Week 9	Lab 8: Basic Characteristics of Lead Compensation by frequency-response approach.
Week 10	Lab 9: Basic Characteristics of Lag Compensation by frequency-response approach.
Week 11	Lab 10: Basic Characteristics of Lag- Lead Compensation by frequency-response approach.
Week 12	Lab 11: Obtain the unit-step response curve of PID-controlled system designed by use of the Ziegler–Nichols tuning rule.
Week 13	Lab 12: Tuning PID Controllers.
Week 14	Lab 13: Design of PID Controllers with Frequency-Response.
Week 15	Lab 14: Example Problems.
Week 16	Preparatory week before the final Exam.

Learning and Teaching Resources

	Text	Available in the Library?
Required Texts	Modern Control Engineering By Katsuhiko Ogata.	Yes
Recommended Texts	Control Systems Engineering By Norman S. Nise.	Yes
Websites	/	

Grading Scheme

Group	Grade	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	90 - 100	Outstanding Performance
	B - Very Good	80 - 89	Above average with some errors
	C - Good	70 - 79	Sound work with notable errors
	D - Satisfactory	60 - 69	Fair but with major shortcomings
	E - Sufficient	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	(45-49)	More work required but credit awarded
	F – Fail	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

Module Information					
Module Title	Industrial Management and Ethics		Module Delivery		
Module Type	Basic		☒ Theory ☐ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar		
Module Code	NVEE202				
ECTS Credits	4				
SWL (hr/sem)	100				
Module Level		3	Semester of Delivery		5
Administering Department		SCE	College	EE	
Module Leader	Thabit H. Thabit		e-mail	Thabit.thabit@uoninevah.edu.iq	
Module Leader's Acad. Title		Lecturer	Module Leader's Qualification		MSc
Module Tutor	/		e-mail	/	
Peer Reviewer Name		Moatasem H. M. Salih	e-mail	Moatasem.hood@uoninevah.edu.iq	
Scientific Committee Approval Date		1/6/2023	Version Number		1

Relation with other Modules			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents

Module Aims	89. التركيز على القضايا المهنية المرتبطة بالتصميم والإنتاج والاستخدام الآمن للتقنية في المنظمة وتأثير الهندسة على المجتمع والبيئة. 90. تعزيز التفكير الخلاق لدى الطالب وتطوير قدراتهم في اتخاذ القرارات الخلاقية في سياق العمل الهندسي 91. تعزيز الوعي بالمسؤولية الاجتماعية للمهندسين ودورهم في تحقيق التنمية المستدامة وحماية البيئة وتعزيز التكنولوجيا التي تلبي احتياجات المجتمع. 92. تطوير قدرات الطالب على العمل الجماعي والتعاون الخلاق مع زملائهم في الهندسة من خلال التواصل الفعال وحل المشكلات المشتركة وتعزيز قيم الاحترام والتعاطف في بيئة العمل. 93. تزويد الطالب بالأدوات والمفاهيم الخلاقية اللازمة لاتخاذ القرارات الهندسية المناسبة من خلال تعريفهم على كيفية تحليل المشكلات الإدارية والمالية والخلاقية في الممارسة الهندسية واتخاذ القرارات المستدامة المناسبة باختصار، تهدف المادة إلى تزويد طالب الأقسام الهندسية بالمعرفة والمهارات الخلاقية اللازمة لممارسة مهنة الهندسة بشكل أخلاقي ومسؤول، وتوفير الإطار الأخلاقي لاتخاذ القرارات الهندسية المناسبة وتعزيز التعاون والمسؤولية الاجتماعية في المجال الهندسي.
Module Learning Outcomes	1. إكتساب الطالب فهماً عميقاً للقضايا الخلاقية المرتبطة بالعمل الهندسي، بما في ذلك التصميم والإنتاج والاستخدام الآمن للتقنية. حيث يمكن للطلاب التعرف على التحديات الخلاقية الفريدة التي تنشأ في سياق الهندسة والتفكير في كيفية التعامل معها بشكل فعال. 2. إكتساب الطالب المهارات اللازمة لاتخاذ القرارات الإدارية والمالية والخلاقية في سياق العمل الهندسي حيث سيتعلم الطالب كيفية تحليل المشاكل التي تواجههم في المنظمة أو المشروع، وتقييم البدائل الممكنة واتخاذ القرارات المسؤولة والمستدامة. 3. يتوقع أن يصبح الطالب على دراية بدورهم ومسؤولياتهم الاجتماعية كمهندسين. حيث سيكتسب الطالب فهماً لأهمية التوازن بين الاحتياجات التكنولوجية والاهتمامات الاجتماعية والبيئية وسيتعلمون كيفية تطبيق المبادئ الإدارية والمالية والخلاقية في تصميم وتنفيذ الحلول الهندسية. 4. نمو قدرة الطالب على التعاون والتواصل الفعال مع زملائهم في المجال المنظمي وإكتسابهم المهارات اللازمة للعمل الجماعي وحل المشكلات المشتركة بطريقة أخلاقية ومسؤولة. 5. المساهمة في تطوير الطالب كأشخاص ومهنيين. حيث يمكن للطلاب تطوير قدراتهم في التفكير النقدي وحل المشكلات واتخاذ القرارات المدروسة، والتعامل بشكل فعال مع التحديات الخلاقية والمهنية في الهندسة. مجال باختصار، من المتوقع أن تمنح مادة طالب الأقسام الهندسية المعرفة والمهارات الخلاقية والمهنية الضرورية لممارسة الهندسة بطريقة أخلاقية ومسؤولة، والتعامل مع التحديات الخلاقية المرتبطة بالمجال الهندسي.
Indicative Contents	

Student Workload (SWL)			
Structured SWL (h/sem)	33	Structured SWL (h/w)	2
Unstructured SWL (h/sem)	67	Unstructured SWL (h/w)	4
Total SWL (h/sem)	100		

Module Evaluation					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	20% (10)	5, 10	LO #1, and 2
	Assignments	2	10% (10)	2, 12	LO # 3, and 4
	Report	1	10% (10)	13	LO # 3 and 2
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-4
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	مقدمة حول الإدارة الصناعية والتوجهات الحالية لها: (تعريف ونطاق الإدارة الصناعية, أهمية الإدارة الصناعية للمهندسين المهنيين, التطور التاريخي والتجاهات الحالية في الإدارة الصناعية)
Week 2	الهيكل التنظيمي وتصميم المنظمة: (أنواع الهياكل التنظيمية, مبادئ واعتبارات التصميم التنظيمي, دور المهندسين في التصميم التنظيمي)
Week 3	القيادة وإدارة الفريق: (أساليب القيادة وإمكانية تطبيقها في البيئات الهندسية, بناء فرق هندسية فعالة, تحفيز وإدارة الفرق الهندسية)
Week 4	إدارة العمليات: (نظرة عامة على مبادئ إدارة العمليات, تصميم العملية وتحسينها في المنظمات الهندسية)
Week 5	إدارة سلسلة التوريد والعمليات اللوجستية
Week 6	إدارة مشروع: (تخطيط المشروع والجدولة والتحكم, إدارة المخاطر في المشاريع الهندسية, تقنيات التواصل والتعاون الفعال في المشروع)
Week 7	إمتحان منتصف الكورس
Week 8	إدارة الجودة: (أساسيات إدارة الجودة في السياقات الهندسية, تقنيات ضبط وضمان الجودة, مبادئ Six-Sigma والصناعة الرشيدة في العمليات الهندسية)
Week 9	إدارة الابتكار والتكنولوجيا: (إدارة التغيير التكنولوجي في المنظمات الهندسية, استراتيجيات لتعزيز الابتكار والإبداع, حقوق الملكية الفكرية وحماية الابتكار)
Week 10	التحليل المالي واتخاذ القرار في المنظمات الهندسية
Week 11	مبادئ موازنة المشروع ومراقبة التكاليف
Week 12	الاعتبارات الأخلاقية والاجتماعية: (القضايا الأخلاقية في الإدارة الصناعية, الاستدامة البيئية والمسؤولية الاجتماعية للشركات, الخالق المهنية للمهندسين)
Week 13	دراسات الحالة: الحالة التطبيقية الأولى – دولياً
Week 14	دراسات الحالة: الحالة التطبيقية الثانية – محلياً
Week 15	مناقشة مشاريع الطلبة
Week 16	الامتحان النهائي

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	
Week 8	
Week 9	
Week 10	
Week 11	
Week 12	
Week 13	
Week 14	
Week 15	
Week 16	

Learning and Teaching Resources		
	Text	Available in the Library?
Required Texts	Qi, E., Shen, J., and Dou, R. (2014). Industrial Engineering and Engineering Management: Theory and Apply of Industrial Management, Springer Berlin, Heidelberg.	Yes
Recommended Texts	Eilon, S., Hall, R., and King, J. (1966). Exercises in Industrial Management: A Series of Case Studies, Macmillan, St. Martin's Press, New York.	Yes
Websites	/	

Grading Scheme			
Group	Grade	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	90 - 100	Outstanding Performance
	B - Very Good	80 - 89	Above average with some errors
	C - Good	70 - 79	Sound work with notable errors
	D - Satisfactory	60 - 69	Fair but with major shortcomings
	E - Sufficient	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	(45-49)	More work required but credit awarded
	F – Fail	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

Module Information				
Module Title	Digital Signal Processing II		Module Delivery	
Module Type	Basic		☒ Theory ☐ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	NVEE205			
ECTS Credits	5			
SWL (hr/sem)	125			
Module Level	3	Semester of Delivery	6	
Administering Department	SCE		College	EE
Module Leader	Ahmed Jameel Abdulqader		e-mail	ahmed.abdulqader@uoninevah.edu.iq
Module Leader's Acad. Title	Lecturer		Module Leader's Qualification	Ph.D.
Module Tutor			e-mail	
Peer Reviewer Name			e-mail	
Scientific Committee Approval Date	01/06/2023	Version Number	1.0	

Relation with other Modules			
Prerequisite module	NVEE204	Semester	5
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Content	
Module Aims	94. To develop problem solving skills and understanding of digital signal processing through the analysis of application techniques. 95. To understand analysis, synthesis and implementation of a given signal and system. 96. This course deals with the basic concept of DSP. 97. This is the basic subject for all digital signal and its application. 98. To perform digital filter design and its analysis.
Module Learning Outcomes	1. Apply application of DFT for the analysis of digital signals and systems. 2. Design different types of IIR and FIR filters. 3. Characterize the effects of finite precision representation on digital filters. 4. Design multirate filters. 5. Apply different types of adaptive filters appropriately in practical systems
Indicative Contents	Indicative content includes the following. Characteristics of practical frequency selective filters. characteristics of commonly used analog filters - Butterworth filters, Chebyshev filters. Design of IIR filters from analog filters (LPF, HPF, BPF, BRF) - Approximation of derivatives, Impulse invariance method, Bilinear transformation. Frequency 81 transformation in the analog domain. [16 hrs] Structure of IIR filter - direct form I, direct form II, Cascade, parallel realizations. Design of FIR filters - symmetric and Anti-symmetric FIR filters - design of linear phase FIR filters using Fourier series method - FIR filter design using windows (Rectangular, Hamming and Hanning window), Frequency sampling method. FIR filter structures - linear phase structure, direct form realizations. [16 hrs] Introduction to Adaptive Filters like LMS [4 hrs] Introduction to Adaptive Filters like RLS [4 hrs] Circular Convolution [4 hrs] Applications of Filter Banks in Audio Processing [4 hrs] Applications of Filter Banks in Image Processing [4 hrs] Other applications [4 hrs]

Learning and Teaching Strategies	
Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL)			
Structured SWL (h/sem)	77	Structured SWL (h/w)	5
Unstructured SWL (h/sem)	48	Unstructured SWL (h/w)	3
Total SWL (h/sem)	125		

Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1, 2, and 4
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 5
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-4
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Non-recursive & Recursive Systems
Week 2	Analysis of Discrete Time Linear Shift Invariant Systems
Week 3	Discrete Time Systems Described by Difference Equations.
Week 4	Framework for Digital Filter Design
Week 5	Finite Impulse Response Digital Filter Design
Week 6	Infinite Impulse Response Digital Filter Design
Week 7	Mid-term Exam
Week 8	Butterworth Filter Design System Analysis
Week 9	Chebyshev Filter Design System Analysis
Week 10	Introduction to Adaptive Filters like LMS
Week 11	Introduction to Adaptive Filters like RLS
Week 12	Circular Convolution
Week 13	Applications of Filter Banks in Audio Processing
Week 14	Applications of Filter Banks in Image Processing
Week 15	Other applications
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	Lab 1: Non-recursive & Recursive Systems
Week 2	Lab 2: Analysis of Discrete Time Linear Shift Invariant Systems
Week 3	Lab 3: Discrete Time Systems Described by Difference Equations.
Week 4	Lab 4: Framework for Digital Filter Design
Week 5	Lab 5: Finite Impulse Response Digital Filter Design
Week 6	Lab 6: Infinite Impulse Response Digital Filter Design
Week 7	Mid-term Exam
Week 8	Lab 8: Butterworth Filter Design System Analysis
Week 9	Lab 9: Chebyshev Filter Design System Analysis
Week 10	Lab 10: Introduction to Adaptive Filters like LMS
Week 11	Lab 11: Introduction to Adaptive Filters like RLS
Week 12	Lab 12: Circular Convolution
Week 13	Lab 13: Applications of Filter Banks in Audio Processing
Week 14	Lab 14: Applications of Filter Banks in Image Processing
Week 15	Lab 15: Other applications
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources		
	Text	Available in the Library?
Required Texts	J.G. Proakis and D.G. Manolakis, Digital Signal Processing, Prentice Hall of India. 2009	No
Recommended Texts	A.V. Oppenheim, Discrete-Time Signal Processing, Prentice Hall, 2009.	No
Recommended Texts	S.K. Mitra, Digital Signal Processing, A Computer-based Approach, McGraw Hill, 2008	No
Websites	https://www.coursera.org	

Grading Scheme			
Group	Grade	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	90 - 100	Outstanding Performance
	B - Very Good	80 - 89	Above average with some errors
	C – Good	70 - 79	Sound work with notable errors
	D - Satisfactory	60 - 69	Fair but with major shortcomings
	E - Sufficient	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	(45-49)	More work required but credit awarded
	F – Fail	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

Module Information					
Module Title	Industrial Networks		Module Delivery		
Module Type	Core		☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar		
Module Code	NVEESC316				
ECTS Credits	4				
SWL (hr/sem)	100				
Module Level		3	Semester of Delivery		6
Administering Department		SCE	College	EE	
Module Leader	Abdulhameed Nabeel Hameed		e-mail	abdulhamed.hameed@uoninevah.edu.iq	
Module Leader's Acad. Title		Ass. Lecturer	Module Leader's Qualification		M.Sc.
Module Tutor	Name (if available)		e-mail	E-mail	
Peer Reviewer Name		Yazen H. Shakir	e-mail	Yazen.shakir@uoninevah.edu.iq	
Scientific Committee Approval Date		01/06/2023	Version Number	1.0	

Relation with other Modules			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents

Module Aims	1. Understanding Network Fundamentals: The module aims to introduce students to the basic concepts of computer networks, including network architectures, types of networks, network topologies, and network layering models. 2. Understanding Data Transmission Medium: The module aims to introduce students to the types of transmission mediums such as shielded twisted pair cable, coaxial cable, fiber optical cable Wi-Fi, and Bluetooth. 3. Exploring Network Devices: The module aims to familiarize students with various network devices, such as routers, switches, and hubs. Students will learn about their functionalities, configurations, and how they contribute to network connectivity. 4. Exploring Network Addressing: The module aims to explore and analyze network addressing, including IPv4 addressing, Address Mask, and Glassful Addressing. 5. Understanding different network architectures commonly used in industrial networks, such as fieldbus systems (e.g., Profibus, DeviceNet), and Ethernet-based networks (e.g., EtherNet/IP, PROFINET). 6. Knowledge of Network Protocols: Students can gain knowledge about various protocols used in industrial networks, such as Modbus, CAN (Controller Area Network), and others. They can learn about the features, functions, and usage scenarios of these protocols. 7. Troubleshooting and Maintenance: Students can develop skills in troubleshooting industrial network issues, such as network connectivity problems, device configuration errors, signal interference, and data transmission failures. 8. Industrial Internet of Things (IIoT): Students can explore the role of industrial networks in the context of the Industrial Internet of Things.
Module Learning Outcomes	Upon successful completion of this module, students will be able to: 71. Understand the fundamental concepts and principles of computer networks, including network architectures, types of networks (such as LAN, WAN, and MAN), network topologies, TCP/IP (Transmission Control Protocol/Internet Protocol) suite, and network topologies. 72. Explain the basics and types of guided data transmission media such as Unshielded Twisted Pair (UTP) Cable., Shielded Twisted Pair (STP) Cable., Coaxial Cable, fiber optical cable Wi-Fi, and Bluetooth. 73. Demonstrate knowledge of network architecture, components, and their functionalities, such as routers, switches, and hubs. Evaluate and compare different network architectures, such as client-server and peer-to-peer models, and their advantages and disadvantages. 74. Understand and analyze network addressing, including IPv4 addressing, Address Mask, Glassful Addressing (Class A, B, C, and D), and IPv4 types. 75. Explain the fundamental principles and concepts of industrial networks. Also, identify and compare different types of industrial network topologies and communication protocols. 76. Design and configure industrial networks based on specific requirements and

	constraints, and Integrate industrial networks with IoT and cloud computing platforms.
Indicative Contents	Indicative content includes the following. <u>Part A - Introduction to Computer Networks:</u> Definitions and basic concepts – network architectures, types of networks, network topologies, Protocols, Standards, and Standard organizations. [10 hrs] Network architectures and models – Principles of Protocol Layering, OSI Protocol Layering Model, TCP/IP Protocol Suite, Encapsulation and Decapsulation. [5 hrs] Transmission Media and Networking Devices – Unshielded Twisted Pair (UTP) Cable, Shielded Twisted Pair (STP) Cable, Coaxial Cable, and Optical Fiber. Wireless transmission media, Wi-Fi, and Bluetooth. NICs, Hubs, Repeaters, Bridges and Switches, and Routers. [10 hrs] IP Addressing – Introduction to IPv4 addressing, Address Mask, and Classful addressing, IPv4 addressing types. [10 hrs] <u>Part B – Industrial Networks</u> Introduction to Industrial Networks - Overview of industrial networks, components of industrial networks (field devices, controllers, switches, and routers). [5 hrs] Industrial Communication Standards: Serial data communication interface standards - (RS 232, 422, 485 standards). [5 hrs] Industrial Communication Protocols - Introduction to industrial communication protocols such as (Profibus, Modbus, EtherNet/IP, and DeviceNet), the characteristics, advantages, and limitations of these protocols. [10 hrs] Fieldbus-Based Industrial Networks - Introduction to fieldbus systems and their applications, Types of fieldbus protocols (Profibus, DeviceNet, CANbus), Fieldbus network architecture and components, Configuration and addressing in fieldbus networks. [5 hrs] Industrial IoT - Overview of the Industrial Internet of Things (IIoT), Integration of industrial networks with IoT devices and cloud platforms, Industrial Network Design and Implementation. [10 hrs]

Learning and Teaching Strategies	
Strategies	The main strategy that will be adopted in delivering this module is: 1- Understand the fundamentals: Start by building a solid foundation of knowledge about industrial networks. Familiarize yourself with the basic concepts, protocols, and architectures commonly used in industrial environments. This will help you grasp more advanced topics later on. 2- Engage in hands-on learning: Industrial networks are best understood through practical experience. Try to get access to real-world industrial equipment, such as programmable logic controllers (PLCs) or industrial routers, and practice configuring and troubleshooting network setups. If physical equipment is not readily available, consider using simulation software to simulate industrial network environments. 3- Take advantage of online resources: The internet offers a wealth of resources for learning about industrial networks. Look for online tutorials, video courses, and educational websites that provide in-depth explanations and demonstrations of industrial network concepts. Websites like Cisco Learning Network,

	Rockwell Automation, and Siemens Industry Online Support are great starting points.
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Student Workload (SWL)			
Structured SWL (h/sem)	62	Structured SWL (h/w)	4
Unstructured SWL (h/sem)	38	Unstructured SWL (h/w)	2
Total SWL (h/sem)	100		

Module Evaluation					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO # 1 – 6
	Assignments	1	10% (10)	12	LO # 5 and 6
	Lab	7	10% (10)	Continuous	
	Report	1	5% (5)	13	LO # 3, 5 and 6
Summative assessment	Midterm Exam	4 hr	15% (15)	7	LO # 1-5
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Introduction and Definitions: Introduction to Data Communication, Networks, Protocols, Standards, and Standard organizations.
Week 2	Basic Concepts: Overview of Line configuration, Topology, Categories of networks, and Communication modes.
Week 3	Network Models: - Principles of Protocol Layering. - OSI Protocol Layering Model. - TCP/IP Protocol Suite - Encapsulation and Decapsulation.
Week 4	Transmission media: - Wired transmission media: Unshielded Twisted Pair (UTP) Cable, Shielded Twisted Pair (STP) Cable, Coaxial Cable, and Optical Fiber. - Wireless transmission media: Wi-Fi, and Bluetooth.
Week 5	Networking and Internetworking Devices: Networking devices: NICs, Hubs, Repeaters, Bridges and Switches., Internetworking devices: Routers.
Week 6	Internet Protocol (IPv4) 1: Introduction to IPv4 addressing, Address Mask, and Glassful addressing.

Week 7	Internet Protocol (IPv4) 2: IPv4 addressing types.
Week 8	Midterm Exam
Week 9	Introduction to Industrial Networks: - Overview of industrial networks and their importance in industrial automation - Key components of industrial networks: field devices, controllers, switches, and routers.
Week 10	Industrial Communication Standards: Serial data communication interface standards (RS 232,422,485 standards)
Week 11	Industrial Communication Protocols 1: Introduction to various industrial communication protocols such as Profibus, Modbus, EtherNet/IP, and DeviceNet.
Week 12	Industrial Communication Protocols 2: Understanding the characteristics, advantages, and limitations of different protocols
Week 13	Fieldbus-Based Industrial Networks - Introduction to fieldbus systems and their applications - Types of fieldbus protocols (e.g., Profibus, DeviceNet, CANbus) - Fieldbus network architecture and components - Configuration and addressing in fieldbus networks
Week 14	Industrial IoT: - Overview of the Industrial Internet of Things (IIoT) - Integration of industrial networks with IoT devices and cloud platforms - Edge computing in industrial networks.
Week 15	Industrial Network Design and Implementation: - Guidelines for designing and implementing industrial networks based on specific requirements - Design considerations for scalability, reliability, and fault tolerance
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	Introduction to CISCO Packet Tracer network simulator
Week 2	Building networks using different network topologies
Week 3	Data capturing in Packet Tracer
Week 4	Cabling twisted pair cables using RJ 45 connectors
Week 5	Building and Configuring small networks
Week 6	Configuring and testing network connectivity
Week 7	Assignment IP addressing information to network devices
Week 8	Midterm Exam
Week 9	Using Packet Tracer in industrial networks
Week 10	Designing and configuring industrial networks 1
Week 11	Designing and configuring industrial networks 2
Week 12	Designing and configuring wireless industrial network 1
Week 13	Designing and configuring wireless industrial network 2
Week 14	Building industrial IoT networks (IIoT networks) 1
Week 15	Building industrial IoT networks (IIoT networks) 2
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources		
	Text	Available in the Library?
Required Texts	1- "Introduction to Data Comm. And Networking" (5th edition), by Pehrouz Forouzan. 2- "Industrial Network Basics: Practical Guides for the Industrial Technician" by Cisco Networking Academy.	No
Recommended Texts	Industrial Network Security: Securing Critical Infrastructure Networks for Smart Grid.	No
Websites	1- Coursera: Coursera provides courses on industrial networking and automation. 2- YouTube: YouTube has a wealth of tutorial videos on industrial networking.	

Grading Scheme				
Group	Grade	Marks (%)	Definition	
Success Group (50 - 100)	A - Excellent	90 - 100	Outstanding Performance	
	B - Very Good	80 - 89	Above average with some errors	
	C – Good	70 - 79	Sound work with notable errors	
	D - Satisfactory	60 - 69	Fair but with major shortcomings	
	E - Sufficient	50 - 59	Work meets minimum criteria	
Fail Group (0 – 49)	FX – Fail	(45-49)	More work required but credit awarded	
	F – Fail	(0-44)	Considerable amount of work required	
Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.				

MODULE DESCRIPTION FORM

Module Information					
Module Title	PLC			Module Delivery	
Module Type	Core			☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	NVEESC317				
ECTS Credits	4				
SWL (hr/sem)	100				
Module Level		3	Semester of Delivery		6
Administering Department		SCE	College	EE	
Module Leader	Yazen Hudhaifa Shakir		e-mail	yazen.shakir@uoninevah.edu.iq	
Module Leader's Acad. Title		Lecturer	Module Leader's Qualification		MSc
Module Tutor	Abdurrahman Basil		e-mail	E-mail	
Peer Reviewer Name		Mohammed N. Younis	e-mail	Mohammed.younus@uoninevah.edu.iq	
Scientific Committee Approval Date		01/06/2023	Version Number		1.0

Relation with other Modules			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents

Module Aims	Aims 77. Understanding Relay-Based Control: Classic control theory aims to provide an understanding of how relays can be used for motor control. This involves studying the principles of relay operation, such as ON/OFF switching based on threshold values, and their application in controlling motor behavior. 78. Motor Start/Stop Control: Classic control theory focuses on designing relay-based control strategies for motor start/stop operations. The aim is to develop control algorithms that utilize relays to control the motor's power supply and enable smooth and controlled starting and stopping of the motor. 79. To study the classification of industrial control systems. 80. What they control and how they control 81. Possess knowledge and familiarity with both IEC and NEMA standards. 82. To study the main components of Programmable Logic Controller 83. To study Basic Functions of Ladder Diagram as a Programming language 84. To study the on-off control of industrial applications. 85. To study Programmable Logical Controllers (PLCs) with industrial applications. 86. To study data types and data flow compatibility using PLCs
Module Learning Outcomes	1. Understanding the history, context and components of industrial control systems. Also, understanding the classical circuits for Motor control (three phase and single phase). Moreover, understanding practical on-off control systems with the use of PLCs. 2. Understanding practical PLCs with their application to Solve tasks. Outstanding of PLC programming Languages and Reading electrical schematic diagrams. 3. Understand the fundamentals of ladder diagram programming: Demonstrate a solid understanding of ladder diagram programming as a graphical language used in programmable logic controllers (PLCs), including the basic symbols, elements, and structure. 4. Apply basic control logic concepts: Apply fundamental control logic concepts in ladder diagram programming, such as series and parallel circuits, branching, and decision-making using conditional instructions. 5. Design and implement basic control systems: Design and implement ladder diagram programs to control basic industrial processes, including motor control, conveyor systems, and simple logic operations. 6. Utilize timers and counters effectively: Understand the functionality and usage of timers and counters in ladder logic programming and apply them appropriately in control systems to achieve desired timing and counting operations. Troubleshoot ladder logic programs: Identify and resolve common programming errors and faults in ladder logic programs using effective troubleshooting techniques, including online monitoring and debugging tools.

Indicative Contents	Indicative content includes the following. <u>Part A – Classic Control Industrial Panel Components [8 hrs.]</u> key components of the typical industrial control panel that you need to be familiar with: Power Circuit. Control Circuit. Switches. Terminal Blocks. Contactors. Motor Drives. Transformers. Overcurrent Protection Devices. <u>Part B – Schematic Electrical Standards IEC and NEMA [8 hrs.]</u> These standards provides rules for the composition of designations and names for the identification of signals and signal connections. Includes the designation of power supply circuits... <u>Part C- Ladder diagram [20 hrs.]</u> - Power Flow Indicators in LAD - Generic Instructions in LAD (Generic instructions provide a quick, keyboard method for picking and placing instructions in LAD.) - Symbol Table / Global Variable Table - Understanding the Timer Instructions for SIEMENS and Delta PLCs (On-Delay Timer (TON) for timing a single interval, Retentive On-Delay Timer (TONR) for accumulating a number of timed intervals, Off-Delay Timer (TOF) for extending time past an off (or false condition), such as for cooling a motor after it is turned off.) - Bit Logic operation, Ladder diagram – Integer Math operations, Compare operations <u>Part D- Practical examples wiring I/Os [20 hrs.]</u> - Describe the I/O section of a programmable controller, Identify DIP switches, Describe the proper wiring connections for input and output devices and their corresponding module - Sinking and Sourcing connections - Practical examples and Assignments
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Learning and Teaching Strategies	
Strategies	- Hands-on Laboratory Exercises: Practical exercises using real or simulated PLC hardware allow students to apply theoretical knowledge and gain hands-on experience. This includes wiring and configuring PLC systems, creating ladder logic programs, and testing their functionality.

	- Case Studies and Real-world Applications: Presenting real-world examples and case studies helps students understand how PLCs are used in various industries. Analyzing and discussing these applications enhances their problem-solving abilities and exposes them to different control scenarios. - Interactive Discussions and Group Work - Simulations and Virtual Environments: Utilizing software-based PLC simulations and virtual environments provides a cost-effective and flexible approach to practice programming and troubleshooting. Students can experiment with different scenarios and observe the outcomes in a controlled environment. - Online Resources and Tutorials: Supplementing traditional teaching methods with online resources, tutorials, and interactive platforms can enhance students' independent learning. These resources may include video tutorials, online forums, PLC programming software, and online quizzes or assessments. - Industry Guest Speakers and Site Visits: Inviting industry professionals as guest speakers or organizing site visits to industrial facilities utilizing PLCs provides students with firsthand insights into real-world applications and industry practices. This bridges the gap between academia and industry. - Continuous Professional Development: Encouraging students to stay updated with the latest advancements in PLC technology through continuous professional development opportunities, such as workshops, conferences, or online courses, ensures they remain well-informed and adaptable in a rapidly evolving field.
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Student Workload (SWL)			
Structured SWL (h/sem)	62	Structured SWL (h/w)	4
Unstructured SWL (h/sem)	38	Unstructured SWL (h/w)	2.5
Total SWL (h/sem)	100		

Module Evaluation					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 12	LO #1, 2, and 6
	Assignments	1	10% (10)	13	LO # 1-3
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 3, 4 and 6
Summative assessment	Midterm Exam	1 hr	10% (10)	7	LO # 1-4
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	1. Introduction – Industrial control Panel components, what they control? And how they control? What is PLC? and it's Hardware components
Week 2	2. Main Industrial components and how they work (Contactors, Relays , Overload and Push buttons types)
Week 3	3. Reading electrical Schematic diagrams for power and control circuits for single and three phase motors, Wiring Diagrams
Week 4	4. Introduction to PLC Programming Languages, Ladder Diagrams, Ladder Diagram Rules, Basic Stop/Start Circuit, Sequenced Motor Starting Digital Logic Gates – Part 1
Week 5	5. Ladder Diagrams, Ladder Diagram Rules, Basic Stop/Start Circuit, Sequenced Motor Starting Digital Logic Gates – Part 2
Week 6	6. Data Type, Memory Types and properties, Memory Organization and Addressing, Introduction to special memory
Week 7	7. Mid-term Exam
Week 8	8. Ladder diagram – Bit Logic operations
Week 9	9. Timers Types and Timing diagram for them
Week 10	10. Ladder diagram – Compare operations
Week 11	11. Ladder diagram – Integer Math operations
Week 12	12. Counters
Week 13	13. Describe the I/O section of a programmable controller, Identify DIP switches, Describe the proper wiring connections for input and output devices and their corresponding module
Week 14	14. Sinking and sourcing
Week 15	15. Examples, real applications
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	Introduction Logo Soft Comfort, Step 7- Micro Win, Delta PLC Compilers
Week 2	Introduction to CADe_SIMU , CADe SIMU is a program used to create power schemes, control how they behave and see the simulations in real time. It is one of the best simulation programs for classic control or relay-based control for industrial panels
Week 3	At the end of the session, students will be familiarized with the following: 1. LOGO Wiring 2. Testing LOGO PLC Practically 3. Switches 4. Coils
Week 4	At the end of the session, students will be familiarized with the following: 1. Internal coil 2. Forward and Reverse Motor direction
Week 5	At the end of the session, students will be familiarized with the following : 1. Power and control circuits for Star – Delta Connection 2. Ladder diagram for Star – Delta Connection
Week 6	1. Logic Gates and Motor control circuits (Latching and interlocking) using CAD_SIMU 2. Sequenced Motor Starting Digital Logic Gates implementation
Week 7	Ladder diagram – Bit Logic operations

Week 8	Timers Types and Timing diagram for them
Week 9	Mid Exam
Week 10	Ladder diagram – Compare operations
Week 11	Ladder diagram – Integer Math operations
Week 12	Counters
Week 13	Practical example
Week 14	Practical example
Week 15	Practical example
Week 16	Preparatory work for final exam

Learning and Teaching Resources		
	Text	Available in the Library?
Required Texts	<i>Automating Manufacturing Systems with PLCs</i> , Year: 2010 Hugh Jack	Available Online
Recommended Texts	Title <i>Programmable Logic Controllers: Hardware and Programming</i> Author Max Rabiee , Year:2017 ISBN: 1631269348, 9781631269349	Available Online
Websites	https://www.youtube.com/channel/UCUKKQwBQZczpYzETkZNxi-w https://www.youtube.com/@A_R_94 https://www.udemy.com/course/classic-control-l/ https://youtube.com/playlist?list=PLhJQWRdDvAThM4S6APm6IpyfBhg1iEiHl	

Grading Scheme			
Group	Grade	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	90 - 100	Outstanding Performance
	B - Very Good	80 - 89	Above average with some errors
	C – Good	70 - 79	Sound work with notable errors
	D - Satisfactory	60 - 69	Fair but with major shortcomings
	E - Sufficient	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	(45-49)	More work required but credit awarded
	F – Fail	(0-44)	Considerable amount of work required
Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.			

Module Aims, Learning Outcomes and Indicative Contents	
Module Aims	After completing this course module, the student must be able to: 1. Define the terms related to computer-aided drafting systems in general and AutoCAD; for specific. 2. Identify the important tools used to create technical drawings in CAD; 3. Create electronic drawings (e-drawing) using CAD; 4. Apply the usefulness of the knowledge and skills in computer aided drafting as applied in his/her professional development. 5. Examine the utility of AutoCAD Electrical as a software solution for the creation and manipulation of schematic diagrams. 6. Applies knowledge of mathematics, science and engineering, 7. Design and conduct experiments, as well as to analyze and interpret data
Module Learning Outcomes	1- Using AutoCAD Interface: Students should become familiar with the AutoCAD user interface, including the various tools, menus, and commands available in the software. 2- Creating 2D Drawings: Learners should gain proficiency in creating accurate and detailed 2D drawings using AutoCAD. This includes drawing lines, circles, arcs, polygons, and other geometric shapes. Modifying and Editing Drawings: Students should be able to modify existing drawings by using AutoCAD's editing tools. This involves techniques such as scaling, stretching, rotating, mirroring, and trimming objects. 3- Working with Layers and Line-types: Participants should learn how to effectively use layers to organize and manage different elements of a drawing. They should also understand line-types and how to apply them to objects. Adding Annotations and Dimensions: Learners should be able to add text annotations, labels, and dimensions to their drawings using AutoCAD's annotation tools. This includes adding dimensions, text, and leaders to convey information accurately. 4- Creating and Managing Blocks: Students should gain proficiency in creating reusable blocks in AutoCAD. This involves creating block definitions, inserting blocks into drawings, and modifying blocks when necessary. 5- Understanding 3D Concepts: Gain a clear understanding of fundamental 3D concepts, including coordinate systems, viewpoints, and 3D navigation techniques. Creating Basic 3D Objects: Learn how to create basic 3D objects, such as cubes, spheres, cylinders, cones, and pyramids, using AutoCAD's 3D modeling tools. Furthermore, Modifying 3D Objects: Develop the ability to modify 3D objects by moving, rotating, scaling, mirroring, or stretching them in 3D space to achieve the desired shape and position. 6- Performing Printing and Plotting: Participants should learn how to set up and configure layouts for printing and plotting drawings. They should understand the different print settings, paper sizes, and scales. Furthermore, Glance to the basic electrical diagrams in AutoCAD Electrical

Indicative Contents	Indicative content includes the following. <u>Part A – 2D Drawing</u> 1- Drawing Area: The drawing area is where the actual geometry and objects are created. 2- Lines and Polylines: Lines and polylines are fundamental objects used to represent edges, outlines, and boundaries of various components in the drawing. They can be straight or curved, and they form the basis for creating other geometric shapes. 3- Circles and Arcs: 4- Layers: Layers are used to organize and control the visibility of different elements in the drawing. 5- Text: Text is used to add annotations, labels, and other textual information to the drawing 6- Dimensions: AutoCAD offers various dimensioning tools to add accurate measurements to the drawing. Linear dimensions, angular dimensions, and radial dimensions can be added to specify distances, angles, and sizes of objects. 7- Blocks and Symbols: Blocks are pre-defined groups of objects that can be reused multiple times in a drawing. They are often used to represent standard components or symbols. AutoCAD allows users to create custom blocks or use existing libraries of blocks and symbols. 8- Plotting and Printing: AutoCAD provides tools for plotting and printing the final drawing. This includes specifying the paper size, scale, print area, and setting up the plot style to control line weights and colors when generating physical or digital outputs. [60 hr.] <u>Part B – 3D Drawing</u> Introduction to 3D Modeling, Navigating the 3D workspace in AutoCAD Creating basic 3D geometric shapes (cubes, spheres, cylinders) , Editing and modifying basic 3D objects , Applying basic transformations (move, rotate, scale) to 3D objects Advanced 3D Objects, Using viewports to control multiple views of a 3D model Controlling perspective and orthographic views, Understanding and utilizing the 3D navigation tools [34 hr.] <u>Part C – AutoCAD Electrical</u> Introduction to workspace and main difference in panels Create simple projects inside AutoCAD Electrical [6 hr.]
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Learning and Teaching Strategies

Strategies	• Hands-On Practice: Provide ample opportunities for students to practice using AutoCAD through hands-on exercises and projects. • Visual Aids and Examples: Utilize visual aids, such as slides, diagrams, and video tutorials, to complement your explanations and make complex concepts more understandable. Provide examples and showcase real-world applications of AutoCAD to demonstrate its relevance and inspire students. • Resources and References: Provide students with additional resources, such as textbooks, online tutorials, and reference guides, to support their learning outside the classroom. Recommend reputable websites, forums, and communities where they can seek further assistance and expand their knowledge. • Continuous Learning: Encourage students to continue learning AutoCAD beyond the classroom. Highlight the importance of staying up-to-date with new features, tools, and techniques by exploring online resources, attending webinars, or participating in AutoCAD user communities.
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Student Workload (SWL)

Structured SWL (h/sem)	33	Structured SWL (h/w)	2
Unstructured SWL (h/sem)	17	Unstructured SWL (h/w)	1
Total SWL (h/sem)	50		

Module Evaluation

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	3, 9	LO # 2, 3 and 4
	Assignments	2	10% (10)	4, 13	LO # 4 and 5
	Projects / Lab.	1	10% (10)	15	LO # 6
	Report	1	10% (10)	13	LO # 3, 5 and 6
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-4
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	Introduction to CAD , Introduction to AutoCAD
Week 2	AutoCAD Fundamentals • Screen layout • Have a brief look at the AutoCAD Toolbars • Opening existing Drawing files • Saving your works • Coordinates systems
Week 3	Basics of Drawing or drafting (2D) in AutoCAD • Preparing the area of drawing • Drawing Lines • Polyline • Polygons • Circle drawing methods • View Port Tools
Week 4	• Two practical examples for practicing on AutoCAD Interface and coordinate systems
Week 5	2D- Modify Commands Using the following Commands: • Move , Copy , Rotate ,Mirror • Trim, fillets, offset • Scale , Array
Week 6	• Two practical examples for practicing on AutoCAD Modify Tools
Week 7	Annotation and Layers • Multiline Texts • Create linear dimensions • Layer Properties • Create group of objects
Week 8	• Two practical examples for practicing on Dimensions and layers for two different figures
Week 9	• Review on 2D- drafting with answering questions for students
Week 10	Basics of 3D in AutoCAD-Part 1 • Why use 3D drawing • Introduction to Orthographic Projection and Isometric • Switching to 3D- Modelling workspace in AutoCAD
Week 11	Basics of 3D in AutoCAD-Part 2 • Introduction to the Modelling commands (Basics) (Extrude, Press Pull and Solid Editing Tools)
Week 12	• One practical examples for practicing on 3D figure and Solid editing
Week 13	• Two different multi-view projections tutorials
Week 14	Glance to AutoCAD Electrical • Introduction to AutoCAD electrical and how to use wire panel
Week 15	• Create projects and dealing with templates based on IEC standards for Control Engineers
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources		
	Text	Available in the Library?
Required Texts	150 CAD Exercises Book by Sachidanand JHA	NO
Recommended Texts	1- Fundamentals of Engineering Drawing - By : Ahmed Nidham Mohammed Publisher: Dar Al-Waddah For Publishing & Distribution - Amman - Jordan ISBN: 9789923190906 2. / Fundamentals of AutoCAD 2020 By : Ahmed Nidham Mohammed Edition: First Publisher: Dar Al-Waddah For Publishing & Distribution - Amman - Jordan ISBN: 9789923190418	Available online
Websites	https://www.youtube.com/c/CADCAMTUTORIAL https://www.computeraideddesignguide.com/ https://autocadfiles.com/	

Grading Scheme			
Group	Grade	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	90 - 100	Outstanding Performance
	B - Very Good	80 - 89	Above average with some errors
	C – Good	70 - 79	Sound work with notable errors
	D - Satisfactory	60 - 69	Fair but with major shortcomings
	E - Sufficient	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	(45-49)	More work required but credit awarded
	F – Fail	(0-44)	Considerable amount of work required
Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.			

MODULE DESCRIPTION FORM

Module Information					
Module Title	English II		Module Delivery		
Module Type	Basic		☒ Theory ☐ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar		
Module Code	NVU15				
ECTS Credits	2				
SWL (hr/sem)	50				
Module Level		2	Semester of Delivery		4
Administering Department		SCE	College	EE	
Module Leader			e-mail		
Module Leader's Acad. Title			Module Leader's Qualification		
Module Tutor	Name (if available)		e-mail		
Peer Reviewer Name		Name	e-mail	E-mail	
Scientific Committee Approval Date		01/06/2023	Version Number	1.0	

Relation with other Modules			
Prerequisite module	NVU11	Semester	2
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents	
Module Aims	The aim of this course is to build students' foundational English language skills in speaking, listening, reading, and writing. By covering essential grammar and vocabulary within practical contexts, students will gain confidence in understanding and expressing themselves on familiar topics, preparing them for real-world communication and more advanced language study. By the end of the course, students are expected to: 1. Improved Vocabulary and Grammar Proficiency Students will demonstrate an understanding of essential vocabulary and foundational grammar structures, including present, past, and future tenses, as well as present perfect. They will be able to apply these structures in both spoken and written contexts. 2. Students will be able to read and comprehend medium-length texts, such as articles and narratives, identifying main ideas, specific details, and contextual vocabulary. They will gain confidence in understanding and interpreting English in written form. 3. Students will be able to write short, structured paragraphs and simple narratives, focusing on clear expression of ideas and accurate use of tenses. They will complete written assignments that demonstrate coherence and appropriate use of vocabulary and grammar. 4. Students will participate in group work, developing the ability to plan, communicate, and collaborate on assignments. They will be able to contribute ideas, meet deadlines, and function effectively in a team, applying language skills in a collaborative setting.
Module Learning Outcomes	1. Knowledge - Develop comprehension skills by reading medium-length texts and articles, with a focus on context-based vocabulary. - Enhance writing by constructing coherent paragraphs about past experiences and familiar topics, applying correct tense and grammar structures. - Build understanding of grammar topics such as present, past, future, and present perfect tenses, and comparative adjectives. 2. Skills - Improve oral and written communication skills tailored to various audiences, demonstrating proficiency through role-plays, presentations, and written assignments. 3. Teamwork Skills - Collaborate effectively within teams to plan writing tasks, analyze data, and meet deadlines in English communication contexts.
Indicative Contents	Grammar Vocabulary Everyday English

Learning and Teaching Strategies	
Strategies	Teaching Strategies -Interactive Lectures and Presentations • Use lectures to introduce new grammar points, vocabulary, and contextual topics. Keep sessions interactive by involving students in question-answer rounds, example analysis, and brief discussions to apply new concepts. • Use visuals, realia, or multimedia (e.g., videos, images) to make topics more engaging and relatable for non-native speakers. - Task-Based Learning • Engage students with activities that focus on practical, real-life language tasks, such as ordering food, making plans, or describing a past event. This approach reinforces the use of grammar and vocabulary in real-world contexts -Pair and Group Work • Incorporate pair and small group activities, where students can practice speaking and listening skills through role-play, dialogues, and collaborative tasks. • Assign group projects that require brainstorming, discussion, and team presentations, fostering teamwork and communication. Guided Writing Practice -Regular Assessments and Quizzes • Implement frequent low-stakes assessments, such as quizzes and mini-tests, to reinforce key points and provide regular feedback on student progress. Include a midterm exam and a final exam to assess overall knowledge and language skills.

Student Workload (SWL)			
Structured SWL (h/sem)	33	Structured SWL (h/w)	2
Unstructured SWL (h/sem)	17	Unstructured SWL (h/w)	1
Total SWL (h/sem)	50		

Module Evaluation					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	10% (10)	4,6	LO # 2, and 3
	Assignments	2	10% (10)	9, 12	LO # 2
	Projects / Lab.				
	Report	1	10% (10)	13	LO # 1, and 4

Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1 – 3
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Levels of language Parts of speech.
Week 2	Chapter one (tenses) Getting to know you
Week 3	Chapter one (tenses) Getting to know you
Week 4	Chapter two (Present tenses) Whatever makes you happy
Week 5	Chapter three (Past tenses) What's in the news?
Week 6	Present continuous tense
Week 7	Past continuous tense
Week 8	Mid exam
Week 9	Inventions -Engine -Sonar
Week 10	Present perfect
Week 11	Past perfect
Week 12	Future
Week 13	<i>Inventions</i> <i>-Servomechanism</i>
Week 14	-Prepositions -Articles
Week 15	Presentation tips
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	

Learning and Teaching Resources		
	Text	Available in the Library?
Required Texts		
Recommended Texts		
Websites	https://www.askoxford.com/betterwriting/successfulcv/application/?view=uk	

Grading Scheme			
Group	Grade	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	90 – 100	Outstanding Performance
	B - Very Good	80 – 89	Above average with some errors
	C – Good	70 – 79	Sound work with notable errors
	D - Satisfactory	60 – 69	Fair but with major shortcomings
	E - Sufficient	50 – 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	(45-49)	More work required but credit awarded
	F – Fail	(0-44)	Considerable amount of work required

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MODULE DESCRIPTION FORM

Module Information			
Module Title	Arabic II		Module Delivery
Module Type	Base		☒ Theory ☐ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	NVU16		
ECTS Credits	2		
SWL (hr/sem)	50		
Module Level	2	Semester of Delivery	2
Administering Department		College	Electronics Engineering
Module Leader	Abdullah Mohammed Qader		e-mail
Module Leader's Acad. Title	Assistant Lecturer	Module Leader's Qualification	MSc
Module Tutor		e-mail	
Peer Reviewer Name		e-mail	
Scientific Committee Approval Date	Feb. 01, 2025	Version Number	1.0

Relation with other Modules			
Prerequisite module	NVU16	Semester	2
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Content

Module Aims	تهدف هذه الوحدة إلى تعزيز مهارات اللغة وتنمية التفكير لدى الطلاب من معرفة القواعد الأساسية للغة العربية ، وكذلك تمكينهم من القدرة على الإلقاء والتحدث باللغة السليمة الخالية من الأخطاء النحوية.
Module Learning Outcomes	1. من المتوقع أن يكون الطالب قادرين على : 2. التعرف على النواسخ وأنواعها وفهم أثرها على الجملة السمية والتميز بين النواسخ الفعلية والحرفية. 3. الفاعل ونائبه وتمييز الفاعل للجملة الفعلية ومعرفة نائب الفاعل للمبني والمجهول وإعراب الفاعل ونائبه بدقة. 4. التعرف على الأسماء المذكرة والمؤنثة وتطبيق القواعد النحوية للتلخيص والتأنيث واستخدام الأشكال الصحيحة للجملة. 5. التعرف على نشوء جمع المذكر السالم وتكوين الجمع بشكل صحيح وإعراب الجمع في مختلف الحالات. 6. فهم مع الجمع التكرار والتعرف على أوزانه المختلفة واستخدامه في جمل مع إعرابه.
Indicative Contents	يتضمن المحتوى الإرشادي ما يلي خلل إبل علوم العربية ، والتعرف على أقسام الكلام في اللغة العربية ، والتعرف على الفعل وعالماته و الحرف وعالماته ، وكذلك علامات الإعراب الأصلية و الفرعية ، والتفريق بين الجمل و السمية والفعلية ، وكذلك التعرف على شبه الجملة بنوعها ، والتعرف على المعرب والمبني في الهمز والواو والياء في المشتقات في اللغة ، والتفريق بين الهمز المتصل والقطع ، والتعرف على ال الشمسية والقمرية ، والضاد والظاء ، والتاء المبسوطة والمربوطة.

Learning and Teaching Strategies

Strategies	اتباع طريقة التعليم المباشر من خلال عرض المادة وشرحها والاستعانة بالدوات التعليمية لشرحها من خلال توضيح الآيات المفهوم العلمي للغة العربية
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Student Workload (SWL)

Structured SWL (h/sem)	32	Structured SWL (h/w)	2
Unstructured SWL (h/sem)	18	Unstructured SWL (h/w)	1
Total SWL (h/sem)	50		

Module Evaluation					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	25% (10)	3, 10	LO # 1, 2, and 5
	Assignments	2	25% (10)	5, 12	LO # 3, and 4
	Classwork	1	25% (10)	9	LO # 5 and 6
	Report	1	10% (10)	14	All
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1 – 4
	Final Exam	2hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	النواسخ للجملة في اللغة العربية
Week 2	كان وأخواتها
Week 3	إن وأخواتها
Week 4	الفاعل ونائبه
Week 5	المفاعيل
Week 6	الحال
Week 7	التمييز
Week 8	العدد
Week 9	التذكير والتأنيث
Week 10	المثنى
Week 11	جمع المذكر السالم
Week 12	جمع المؤنث السالم
Week 13	جمع التذكير
Week 14	علمت لـ يقيم
Week 15	الألف المقصورة والألف المحدودة و الهمزة المتطرفة والهمزة المتوسطة
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	
Week 8	
Week 9	
Week 10	
Week 11	
Week 12	

Learning and Teaching Resources		
	Text	Available in the Library?
Required Texts	1 التحفة السنوية في الفقه المقدمة لأجرومية ، محمد محرر الدين عبد الحميد 2 البالغة الواضحة ، ع للجارم ومصطفى قلم ربي 3 الرصف الواضح ، عبد الجبار علوان النابلية 4 علم العروض والقافية ، عبدالعزيز عتيق	Yes
Recommended Texts		No
Websites		

Grading Scheme			
Group	Grade	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	90 – 100	Outstanding Performance
	B - Very Good	80 – 89	Above average with some errors
	C – Good	70 – 79	Sound work with notable errors
	D - Satisfactory	60 – 69	Fair but with major shortcomings
	E - Sufficient	50 – 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	(45-49)	More work required but credit awarded
	F – Fail	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

Module Information			
Module Title	Power Electronics		Module Delivery
Module Type	Core		☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	NVEESC318		
ECTS Credits	4		
SWL (hr/sem)	100		
Module Level	3	Semester of Delivery	6
Administering Department	SCE	College	EE
Module Leader	Mr. Salam Ibrahim	e-mail	salam.khather@uoninevah.edu.iq
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	MSc
Module Tutor	/	e-mail	/
Peer Reviewer Name	/	e-mail	/
Scientific Committee Approval Date	/	Version Number	/

Relation with other Modules			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents	
Module Aims	87. To understand the concepts, basic operation, steady state operation of efficient switched- mode power conversion techniques, including basic circuit operation. 88. Modeling, analysis, and control techniques. 89. design of power circuits including inverters, rectifiers, and DC-DC converters. 90. Numerous application examples will be presented such as motion control systems and power supplies.
Module Learning Outcomes	1. Describe the applications of power electronic converters. Explain the operation of half and full bridge rectifier circuits with resistive and inductive loads. Draw the circuit diagrams and understand the operation of common single phase rectifier circuits. 2. Draw the circuit diagrams and understand the operation of common three phase rectifier circuits. 3. Draw the circuit diagrams and understand the operation of common single phase cycloconverter circuits. 4. Draw the circuit diagrams and understand the operation of common Three phase cycloconverter circuits. 5. Explain the operation and design simple SMPS circuits, including buck and boost DC-DC converters. 6. Draw the circuit diagrams and understand the operation of common buck converter, common boost converter, common buck-boost converter, and common single-phase inverter

Learning and Teaching Strategies	
Strategies	The teacher explains the fundamental theoretical principles of the converter and solves numerical problems relating to the converter in the theory class. While in the laboratory, students use Matlab simulation software to verify the converters' reactions. Improve the technical understanding of the power electronics circuits and applications. Numerous application examples will be presented such as motion control systems, power supplies, and others.

Student Workload (SWL)			
Structured SWL (h/sem)	62	Structured SWL (h/w)	4
Unstructured SWL (h/sem)	38	Unstructured SWL (h/w)	2.5
Total SWL (h/sem)	100		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Introduction - Power Electronics Applications. Power Electronics Devices. Power Electronics Converter.
Week 2	Single-Phase Half -Wave Uncontrolled Rectifier and Single-Phase Full Wave Uncontrolled Rectifier. The Waveform Ripple Factor (R.F) & Form Factor (FF).
Week 3	A Single-Phase Half Wave Controlled Rectifier with Resistive (R) Load. The Efficiency of the Rectification and the Input Power Factor (PF).
Week 4	A Single-Phase Half Wave Controlled Rectifier with Inductive (RL) Load. A Single-Phase Half Wave Controlled Rectifier with Inductive (RL) Load and Free Wheeling Diode.
Week 5	A Single-Phase Full Wave Controlled Rectifier with Inductive (RL) Load
Week 6	A Single-Phase Full Wave Controlled Rectifier with Inductive (RL) Load and Free Wheeling Diode
Week 7	A Single-Phase Full Wave Controlled Rectifier with highly Inductive (RL) Load and Free Wheeling Diode.
Week 8	Three Phase Half Wave Controlled Rectifier with Resistive Load. Three Phase Half Wave Controlled Rectifier with Load Highly Inductive load.
Week 9	The Relationship Between Line Voltage and Phase voltage of the Three Phase Balanced Supply Voltage. Three Phase Full Wave Controlled Rectifier with Load Highly Inductive load.
Week 10	A Single-Phase AC Controller (Cycloconverter). The On-Off Cycloconverter with Resistive Load. The Phase type Cycloconverter.
Week 11	DC-DC Switch-Mode Converters. Step-Down DC-DC Converter (BUCK).

Week 12	Step-Up DC-DC Converter (BOOST). Step-Down/Up DC-DC Converter (BUCK - BOOST).
Week 13	Switch-Mode DC-AC Inverters. Pulse-width-modulated inverters and Square-wave inverters. Single-phase inverters with voltage cancellation.
Week 14	Single-phase switch-mode inverter, four quadrants of operation.
Week 15	Preparatory week before the final Exam.
Week 16	Exam.

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	Lab 1: Introduction - Power Electronics Applications using Matlab.
Week 2	Lab 2: Single-Phase Half -Wave Uncontrolled Rectifier and Single-Phase Full Wave Uncontrolled Rectifier.
Week 3	Lab 3: A Single-Phase Half Wave Controlled Rectifier with Resistive (R) Load. The Efficiency of the Rectification and the Input Power Factor (PF).
Week 4	Lab 4: A Single-Phase Half Wave Controlled Rectifier with Inductive (RL) Load.
Week 5	Lab 5: A Single-Phase Full Wave Controlled Rectifier with Inductive (RL) Load
Week 6	Lab 6: A Single-Phase Full Wave Controlled Rectifier with Inductive (RL) Load and Free Wheeling Diode.
Week 7	Lab 7: A Single-Phase Full Wave Controlled Rectifier with highly Inductive (RL) Load and Free Wheeling Diode.
Week 8	Lab 8: Three Phase Half Wave Controlled Rectifier with Load Highly Inductive load.
Week 9	Lab 9: Three Phase Full Wave Controlled Rectifier with Load Highly Inductive load.
Week 10	Lab 10: The Phase type Cycloconverter.
Week 11	Lab 11: Step-Down DC-DC Converter (BUCK).
Week 12	Lab 12: Step-Up DC-DC Converter (BOOST).
Week 13	Lab 13: Step-Down/Up DC-DC Converter (BUCK - BOOST).
Week 14	Lab 14: Single-phase switch-mode inverter.
Week 15	Lab 15: Preparatory week before the final Exam.
Week 16	Lab 16: Exam.

Learning and Teaching Resources		
	Text	Available in the Library?
Required Texts	Power electronics handbook: devices, circuits, and applications handbook” edited by Muhammad H. Rashid, 3rd ed.	Yes
Recommended Texts	/	/
Websites	/	

Grading Scheme			
Group	Grade	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	90 - 100	Outstanding Performance
	B - Very Good	80 - 89	Above average with some errors
	C - Good	70 - 79	Sound work with notable errors
	D - Satisfactory	60 - 69	Fair but with major shortcomings
	E - Sufficient	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	(45-49)	More work required but credit awarded
	F – Fail	(0-44)	Considerable amount of work required
Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.			

MODULE DESCRIPTION FORM

Module Information					
Module Title	Statistics and Probability		Module Delivery		
Module Type	Basic		☒ Theory ☐ Lecture ☐ Lab ☒ Tutorial ☐ Practical ☐ Seminar		
Module Code	NVEE				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level		3	Semester of Delivery		6
Administering Department		SCE	College	EE	
Module Leader	Abdurahman Basil AYOUB		e-mail	abdurahman.ayoub@uoninevah.edu.iq	
Module Leader's Acad. Title		Asst. Lecturer	Module Leader's Qualification		MSc
Module Tutor			e-mail	E-mail	
Peer Reviewer Name		Abdulallah I.	e-mail	E-mail	
Scientific Committee Approval Date		01/06/2023	Version Number		1.0

Relation with other Modules			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents

Module Aims	99. Introduce students to the basic concepts of statistics, including data types, data collection methods, and the role of statistics in engineering analysis and decision-making. 100. Develop students' skills in analyzing and interpreting data using appropriate statistical techniques, such as descriptive statistics, graphical methods, and summary measures. 101. Provide an understanding of probability theory, including probability distributions, random variables, and their applications in modeling and analyzing engineering systems. 102. Introduce students to the concept of discrete random variables and their importance in modeling and analyzing engineering systems. 103. Introduce and analyze common discrete probability distributions, such as the binomial distribution, and Poisson distribution, and their applications in modeling real-world engineering problems. 104. Introduce students to the concept of continuous random variables and their significance in modeling and analyzing continuous phenomena encountered in system and control engineering. 105. Introduce and analyze common continuous probability distributions, such as the uniform distribution, normal distribution, and exponential distribution, and their applications in modeling real-world engineering problems. 106. Introduce students to the fundamental concepts and principles of numerical analysis, emphasizing the importance of numerical methods in solving engineering problems. 107. Introduce and analyze numerical methods for solving equations, including root-finding algorithms, such as Newton-Raphson, and their applications in engineering analysis. 108. Introduce numerical methods for solving ordinary and partial differential equations, such as Euler's method, Runge-Kutta methods, and finite difference methods, providing tools for analyzing dynamic systems in engineering. 109. Develop skills in numerical differentiation and integration techniques, including finite difference approximations, Simpson's rule, and numerical integration methods, to approximate derivatives and integrals of functions encountered in engineering analysis.
Module Learning Outcomes	1. Understanding of fundamental statistical concepts: Demonstrate an understanding of basic statistical concepts, including population, sample, variable, data types, and levels of measurement. Also, knowledge of data collection methods: Identify and describe different methods of data collection, such as surveys, experiments, and observational studies, and understand their strengths and limitations.

	2. Interpretation of statistical measures: Interpret and analyze statistical measures, such as mean, median, mode, variance, and standard deviation, to gain insights into the characteristics of a dataset. 3. Understanding of probability: Comprehend the fundamental concepts of probability theory, including basic probability rules, conditional probability, and the concept of independence. 4. Application of probability distributions: Apply probability distributions, such as the binomial distribution, Poisson distribution, and normal distribution, to model and analyze real-world engineering problems. 5. Ability to conduct basic statistical analyses: Apply appropriate statistical techniques to analyze and draw conclusions from sample data, including hypothesis testing, confidence intervals, and correlation analysis. 6. Critical thinking and data interpretation: Develop critical thinking skills to evaluate and interpret statistical results, identify patterns or trends in data, and make informed decisions based on statistical analysis.
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Indicative Contents	Introduction to Basic Statistical Concepts (32) Descriptive Statistics, Inferential Statistics, Statistics Definitions (Sample space, Events, Venn diagram, Classical Probability), Conditional Probabilities, Counting Rules: Permutation, Combination, Probability Calculations using Combinations / Permutations) Discrete Random Variables (r.v.) (32) Discrete Probability Distributions, Cumulative Distribution Function (cdf), Mean or Expected Value, Variance and Standard Deviation, Binomial Distribution, Poisson Distribution. Continuous Random Variables (r.v.) (32) Continuous Probability Distributions, Cumulative Distribution, Mean or Expected Value, Normal Distribution, Standard Normal Distribution, Continuous Uniform Distribution, Exponential Distribution
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Learning and Teaching Strategies

Strategies	1. Lectures: Traditional lectures are delivered by the instructor to introduce and explain key concepts, theories, and methodologies related to mathematical engineering analysis. These lectures provide a foundation for students to understand the theoretical aspects of the course. 2. Problem-solving sessions: Dedicated problem-solving sessions are conducted to allow students to practice applying mathematical concepts and techniques to solve engineering problems. These sessions may involve group discussions, guided exercises, and example problems. 3. Tutorials: Tutorials are interactive sessions where students can clarify doubts, ask questions, and receive additional guidance on course materials. Tutorials may involve solving challenging problems, discussing case studies, or reviewing specific topics based on student needs. 4. Assignments and projects: Assignments and projects are assigned to students to reinforce their learning and apply mathematical engineering analysis techniques to real-world problems. These assignments may involve data analysis, modeling, simulation, or optimization tasks. 5. Group discussions and presentations: Group discussions and presentations are organized to encourage active participation and foster collaborative learning among students. Students may be assigned specific topics or problems to research, analyze, and present to their peers, promoting deeper understanding and knowledge sharing. 6. Formative and summative assessments: Regular formative assessments, such as quizzes, tests, or in-class exercises, are conducted to assess students' understanding and progress. Summative assessments, such as exams or project evaluations, are used to evaluate students' overall performance in the course.
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Student Workload (SWL)

Structured SWL (h/sem)	77	Structured SWL (h/w)	5
Unstructured SWL (h/sem)	48	Unstructured SWL (h/w)	3
Total SWL (h/sem)	125		

Module Evaluation					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	10% (10)	3, 9, 13	LO #1-6
	Assignments	2	10% (10)	2, 8	LO # 3
	Seminar	1	10% (10)	Continuous	
	Report	1	10% (10)	11	LO # 4, 5, and 6
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-6
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Introduction to Basic Statistical Concepts
Week 2	Introduction to Basic Statistical Concepts
Week 3	Introduction to Basic Statistical Concepts
Week 4	Discrete Random Variables (r.v.)
Week 5	Discrete Random Variables (r.v.)
Week 6	Discrete Random Variables (r.v.)
Week 7	Discrete Random Variables (r.v.)
Week 8	Discrete Random Variables (r.v.)
Week 9	Mid-Exam
Week 10	Continuous Random Variables (r.v.)
Week 11	Continuous Random Variables (r.v.)
Week 12	Continuous Random Variables (r.v.)
Week 13	Continuous Random Variables (r.v.)
Week 14	Continuous Random Variables (r.v.)
Week 15	Continuous Random Variables (r.v.)
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources		
	Text	Available in the Library?
Required Texts	Probability and Statistics for Engineers: By Ronald Johnson, Miller & Freund's 7 th Ed. Prentice Hall, 2005	No
Recommended Texts	Book - 2009 - Probability and Statistics - Schaums Outlines	No
Websites		

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	

Grading Scheme			
Group	Grade	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	90 - 100	Outstanding Performance
	B - Very Good	80 - 89	Above average with some errors
	C - Good	70 - 79	Sound work with notable errors
	D - Satisfactory	60 - 69	Fair but with major shortcomings
	E - Sufficient	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	(45-49)	More work required but credit awarded
	F – Fail	(0-44)	Considerable amount of work required
Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.			

MODULE DESCRIPTION FORM

Module Information		
Module Title	Fluid Mechanics	Module Delivery
Module Type	Core	☒ Theory ☐ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	NVEESC319	
ECTS Credits	4	
SWL (hr/sem)	100	

Module Level	3	Semester of Delivery	6
Administering Department	SCE	College	EE
Module Leader	Ismael Khudhair Abdullah Al-Jobury	e-mail	Ismael.abdullah@uoninevah.edu.iq
Module Leader's Acad. Title	Lecturer Assistant	Module Leader's Qualification	M.Sc.
Module Tutor		e-mail	E-mail
Peer Reviewer Name		e-mail	E-mail
Scientific Committee Approval Date	01/06/2023	Version Number	1.0

Relation with other Modules			
Prerequisite module	NVEESC314	Semester	5
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents	
Module Aims	• Understanding Fluid Properties: Develop a foundational grasp of compressibility, viscosity, and Newtonian vs. non-Newtonian fluids. • Fluid Statics: Explore pressure measurement techniques, Pascal's Law, and hydrostatic forces on submerged surfaces. • Fluid Dynamics: Analyze flow classification, equations of motion (Newton's second law, Euler's equation, Bernoulli's equation), and flow rate calculations. • Measurement Techniques: Learn practical applications of fluid mechanics in engineering, including flow rate measurements using Venturimeters and Pitot tubes. • Engineering Applications: Apply fluid mechanics principles to real-world problems in robotics, aerospace, hydraulics, and mechanical systems.
Module Learning Outcomes	• Comprehend Fundamental Fluid Properties: Gain a clear understanding of compressibility, bulk modulus, viscosity, and the distinction between Newtonian and non-Newtonian fluids. • Analyze Fluid Statics: Apply Pascal's Law and hydrostatic pressure principles to solve engineering problems related to submerged surfaces and pressure measurements. • Solve Fluid Dynamics Problems: Use equations of motion, including Newton's Second Law, Euler's Equation, and Bernoulli's Equation, to analyze fluid behavior in dynamic conditions.

	• Evaluate Flow Rate Measurement Techniques: Apply concepts like Venturimeter and Pitot Tube to measure fluid velocity and flow rate accurately. • Apply Engineering Mechanics to Real-World Scenarios: Utilize fluid mechanics principles in disciplines such as robotics, aerospace, hydraulics, and control systems.
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Indicative Contents	1. Fundamental Fluid Properties • Introduction to Fluid Mechanics: Basic definitions and significance in engineering • Compressibility and Bulk Modulus: Understanding fluid response under pressure • Fluid Viscosity: Effects on flow behavior and industrial applications • Newtonian vs. Non-Newtonian Fluids: How fluids behave under different stress conditions 2. Fluid Statics • Pascal's Law and Hydrostatic Pressure: Principles of pressure transmission in fluids • Fluid Pressure Types: Gauge, absolute, and atmospheric pressure • Pressure Measurement Techniques: Devices such as manometers and barometers • Hydrostatic Force on Submerged Surfaces: Applications in engineering and fluid containment 3. Fluid Dynamics • Flow Classification: Laminar vs. turbulent flow regimes • Equations of Motion: Newton's Second Law, Euler's Equation, and Bernoulli's Equation • Flow Rate Calculations: Quantifying movement of fluids in pipelines • Applications of Bernoulli's Equation: Engineering uses in aerodynamics and hydraulics 4. Flow Rate Measurement Techniques • Venturimeter: Principle, design, and applications in flow measurement • Pitot Tube: Functionality and use in velocity determination • Experimental and Computational Approaches: Using numerical methods to model fluid systems
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Learning and Teaching Strategies	
Strategies	1. Build a Strong Conceptual Foundation • Deeply understand the principles behind compressibility, viscosity, and Newtonian vs. non-Newtonian fluids before diving into calculations. • Compare different approaches to fluid statics and dynamics, focusing on equations like Bernoulli's equation and Euler's equation. 2. Apply Theory to Real-World Problems

	- Solve engineering case studies involving hydrostatic forces, pressure measurements, and flow rate calculations. - Explore practical applications in robotics and control systems, such as fluid motion in hydraulic actuators. 3. Computational & Numerical Techniques - Implement fluid mechanics simulations using software like MATLAB or Python. - Use numerical methods to approximate solutions for fluid dynamics problems, linking back to your expertise in differential equations and integration. 4. Error Analysis & Experimental Validation - Investigate accuracy and limitations of measurement tools like Venturimeters and Pitot tubes. - Conduct small-scale experiments or simulations to visualize laminar vs. turbulent flow behaviors. 5. Cross-Disciplinary Learning - Connect fluid mechanics with other areas of engineering mechanics, numerical analysis, and robotics. - Study how fluid properties impact automated systems, such as hydraulic controls in assistive technologies.
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Student Workload (SWL)			
Structured SWL (h/sem)	33	Structured SWL (h/w)	2
Unstructured SWL (h/sem)	67	Unstructured SWL (h/w)	4
Total SWL (h/sem)	100		

Module Evaluation					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	20% (20)	5, 11	LO #
	Assignments	2	10% (10)	2, 10	LO #
	Online Assignments	1	5% (5)	7, 9	LO #
	Report	1	5% (5)	13	LO #
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO #
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Introduction to Fluid Mechanics
Week 2	Compressibility and bulk Modules
Week 3	Fluid Viscosity
Week 4	Newtonian and non-Newtonian fluids
Week 5	Fluid Static - (Pascal's Law – hydrostatic pressure law)
Week 6	Fluid Static - Fluid Pressure (gauge, absolute and atmospheric)
Week 7	Fluid Static - Measurement of Pressure
Week 8	Fluid Static - Hydrostatic Force on Submerged Surface
Week 9	Mid-Exam
Week 10	Fluid Dynamics – Flow Classification
Week 11	Fluid Dynamics – Questions of motions (Newton 2 nd law , Euler equation, Bernoulli equation)
Week 12	Fluid Dynamics – Flow Rate
Week 13	Fluid Dynamics – Application on Bernoulli Equations
Week 14	Fluid Dynamics – Flow Rate Measurement (Venturimeter)
Week 15	Fluid Dynamics – Flow Rate Measurement (Pitot tube)
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources		
	Text	Available in the Library?
Required Texts	Fluid Mechanics and Hydraulic Machines R.K. Bansaf	No
Recommended Texts	Fundamentals of Fluid Mechanics 4 th edition	No
Websites		

Delivery Plan (Weekly Lab. Syllabus)

	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	

Grading Scheme

Group	Grade	Marks (%)	Definition
Success Group (50 - 100)	A – Excellent	90 - 100	Outstanding Performance
	B - Very Good	80 - 89	Above average with some errors
	C – Good	70 - 79	Sound work with notable errors
	D - Satisfactory	60 - 69	Fair but with major shortcomings
	E - Sufficient	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	(45-49)	More work required but credit awarded
	F – Fail	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

Module Information

Module Title	Microprocessors	Module Delivery
Module Type	Core	☒ Theory ☐ Lecture ☒ Lab
Module Code	NVEESC320	
ECTS Credits	4	
SWL (hr/sem)	100	

		☐ Tutorial ☐ Practical ☐ Seminar	
Module Level	3	Semester of Delivery	6
Administering Department		College	EEC
Module Leader	Zeyad Tariq Shareef	e-mail	Zeyad.tariq@uoninevah.edu.iq
Module Leader's Acad. Title	Assistant Lecturer	Module Leader's Qualification	MSc
Module Tutor	None	e-mail	None
Peer Reviewer Name	Mohammad Abdulrazzaq	e-mail	mohammed.alsayed@uoninevah.edu.iq
Scientific Committee Approval Date	01/09/2025	Version Number	1.0

Relation with other Modules			
Prerequisite module	None	Semester	-
Co-requisites module	None	Semester	-

Module Aims, Learning Outcomes and Indicative Contents	
Module Objectives	1. To introduce the Structure of Intel microprocessors. 2. To overview the fundamental concepts of instruction types and execution with respect to CISC, RISC and modern architectures. 3. To understand how memories and I/O devices are addressed and interfaced to microprocessors. 4. To simulate basic to advanced Microprocessor instructions and interfacing Devices.
Module Learning Outcomes	1- Demonstrate advanced knowledge and understanding of Assembly and Mixed language, Microprocessors Architecture. 2- Gain skills and facility in the use of Microprocessor hardware/software in conducting experiments on the interface of Microprocessor with external peripherals using Assembly Language. 3- Analyze and evaluate the performance of a Microprocessor in terms of BUS Latching/Buffering/Timing, Memory Interfacing, I/O Mapping, Interrupts, and other applications. 4- Synthesize program control instructions to communicate between Memory and I/O devices and Microprocessor. 5- Express and communicate ideas in written and oral form.
Indicative Contents	Indicative content includes the following. <u>Part A – Interfacing:</u> Interrupts –directives - pin diagram – buffering system. [15 hrs] Input/Output device interfacing and examples. [15 hrs] <u>Part B – Peripherals:</u> Peripherals interfacing to microprocessor. [30 hrs]

Learning and Teaching Strategies	
Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering types of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL)			
Structured SWL (h/sem)	62	Structured SWL (h/w)	4
Unstructured SWL (h/sem)	38	Unstructured SWL (h/w)	2
Total SWL (h/sem)	100		

Module Evaluation

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (20)	5 and 10	All
	Assignments	2	10% (10)	4 and 12	All
	Projects / Lab.	1	10% (10)	Continuous	All
Summative assessment	Midterm Exam	2 hr	10% (10)	7	All
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Basic Structure of Computers: Introduction about Processors, Memory and Input/output units
Week 2	Basic Structure of Computers: Basic processor concepts, Integer Numbers Representation & Arithmetic Operations
Week 3	The programming model of the 16-, 32- and 64-bits microprocessor architecture
Week 4	Instruction Set Architecture: Memory Locations and addressing
Week 5	Instruction Set Architecture: Memory operations, RISC and CISC computer systems, Introduction to RISC instruction sets
Week 6	Instruction Set Architecture: Addressing Modes
Week 7	Basic Processing Unit: Instruction execution, Hardware components
Week 8	Basic Processing Unit: Instruction fetch and execution steps, microprogramming
Week 9	Arithmetic and logic instructions
Week 10	Pipelining: Basic concept, Pipeline organization
Week 11	8086 Microprocessor Pin-Out Diagram
Week 12	Multiplexing and buffering in 8086 Microprocessor
Week 13	8255 PPI
Week 14	Interrupt Controller
Week 15	Preparatory week before the final Exam
Week 16	Final Exam

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	Lab 1: Assembly language programming (use of MOV instruction and get familiar with registers and memory locations).
Week 2	Lab 2: Assembly language programming (use of INC, DEC, ADD and CMP commands).
Week 3	Lab 3: Assembly language programming (use of SUB, PUSH and POP commands).
Week 4	Lab 4: Assembly language programming (use of MUL, DIV and logic commands).
Week 5	Lab 5: Disassembling and demonstrating the main computer components and explaining each part individually.
Week 6	Lab 6: Interrupt 21h – part 1
Week 7	Lab 7: Interrupt 21h – part 2

Learning and Teaching Resources		
	Text	Available in the Library?

Required Texts	“Intel Microprocessors: Architecture, Programming and Interfacing”, By: Barry B. Brey	Yes
Recommended Texts	“The 8088 and 8086 Microprocessors Programming, Interfacing and Hardware”, by: Walter A. Triebel and Avtar Singh	No
Websites	https://www.uobabylon.edu.iq/eprints/publication_1_26408_35.pdf	

Grading Scheme				
Group	Grade	Marks %	Definition	
Success Group (50 - 100)	A – Excellent	90 - 100	Outstanding Performance	
	B - Very Good	80 – 89	Above average with some errors	
	C – Good	70 – 79	Sound work with notable errors	
	D – Satisfactory	60 – 69	Fair but with major shortcomings	
	E – Sufficient	50 – 59	Work meets minimum criteria	
Fail Group (0 – 49)	FX – Fail	(45-49)	More work required but credit awarded	
	F – Fail	(0-44)	Considerable amount of work required	
Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.				

Fourth Year
(Course system)

Course Description Form

1. Course Name:					
Optimal Control I					
2. Course Code:					
SCE4301					
3. Semester / Year:					
Fourth Year / First Semester – 2025-2026					
4. Description Preparation Date:					
06/10/2026					
5. Available Attendance Forms:					
In-person attendance					
6. Number of Credit Hours (Total) / Number of Units:					
60 hours / 3 units					
7. Course administrator’s name (mention all, if more than one name):					
Systems and Control Engineering Department Academic Staff					
8. Course Objectives					
Course Objectives		• Understand the fundamental concepts and terminology of Optimal Control I. • Analyze and apply the principal methods covered in the course, including introduction, principles and general aspects of optimal control. • Develop engineering problem-solving skills through examples, exercises, and/or practical applications. • Interpret results and relate the course concepts to systems and control engineering applications.			
9. Teaching and Learning Strategies					
Strategy		The teaching strategy combines in-person lectures with guided problem solving, discussions, tutorials, and practical/laboratory activities where applicable. Students are encouraged to analyze engineering problems, use appropriate software or hardware tools, work collaboratively, and connect theoretical concepts with systems and control applications.			
10. Course Structure					
Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4	Understand, analyze, and apply the concepts of Introduction, principles and general aspects of optimal control.	Introduction, principles and general aspects of optimal control	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
2	4	Understand, analyze, and apply the concepts of Types of optimal control problems; definition and types of performance index.	Types of optimal control problems; definition and types of performance index	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
3	4	Understand, analyze, and apply the concepts of Problems optimization methods, maximum and minimum of optimal control....	Problems optimization methods, maximum and minimum of optimal control problems; calculus of variation, optimal control theory – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
4	4	Understand, analyze, and apply the concepts of Problems optimization methods, maximum and minimum of optimal control....	Problems optimization methods, maximum and minimum of optimal control problems; calculus of variation, optimal control theory – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
5	4	Understand, analyze, and apply the concepts of Problems optimization methods, maximum and minimum of optimal control....	Problems optimization methods, maximum and minimum of optimal control problems; calculus of variation, optimal control theory – Part III	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
6	4	Understand, analyze, and apply the concepts of Problems optimization methods, maximum and minimum of optimal control....	Problems optimization methods, maximum and minimum of optimal control problems; calculus of variation, optimal control theory – Part IV	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes

7	4	Understand, analyze, and apply the concepts of Linear quadratic regulator, Riccati equation, continuous-time; discrete-time....	Linear quadratic regulator, Riccati equation, continuous-time; discrete-time – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
8	4	Understand, analyze, and apply the concepts of Linear quadratic regulator, Riccati equation, continuous-time; discrete-time....	Linear quadratic regulator, Riccati equation, continuous-time; discrete-time – Part II	In-person lecture / tutorial / practical activity as applicable	Semester exam and assessment
9	4	Understand, analyze, and apply the concepts of Linear quadratic regulator, Riccati equation, continuous-time; discrete-time....	Linear quadratic regulator, Riccati equation, continuous-time; discrete-time – Part III	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
10	4	Understand, analyze, and apply the concepts of Linear quadratic regulator, Riccati equation, continuous-time; discrete-time....	Linear quadratic regulator, Riccati equation, continuous-time; discrete-time – Part IV	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
11	4	Understand, analyze, and apply the concepts of Linear quadratic regulator, Riccati equation, continuous-time; discrete-time....	Linear quadratic regulator, Riccati equation, continuous-time; discrete-time – Part V	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
12	4	Understand, analyze, and apply the concepts of Linear quadratic tracking problem, continuous-time; discrete-time – Part I.	Linear quadratic tracking problem, continuous-time; discrete-time – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
13	4	Understand, analyze, and apply the concepts of Linear quadratic tracking problem, continuous-time; discrete-time – Part II.	Linear quadratic tracking problem, continuous-time; discrete-time – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
14	4	Understand, analyze, and apply the concepts of Linear quadratic tracking problem, continuous-time; discrete-time – Part III.	Linear quadratic tracking problem, continuous-time; discrete-time – Part III	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
15	4	Understand, analyze, and apply the concepts of Linear quadratic tracking problem, continuous-time; discrete-time – Part IV.	Linear quadratic tracking problem, continuous-time; discrete-time – Part IV	In-person lecture / tutorial / practical activity as applicable	Review and final assessment

11. Course Evaluation

Daily preparation, attendance, homework and quizzes	Semester exams	Final exam	Sum
10	30	60	100

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	K. Ogata, Designing Linear Control Systems with MATLAB, Prentice-Hall, 1997.
Main references (sources)	R. S. Burns, Advanced Control Engineering.
Recommended books and references (scientific journals, reports...)	Recent journals, books, and technical reports related to the course.
Electronic References, Websites	Academic websites and official software/hardware documentation.

Course Description Form

1. Course Name:
Robotics I (Industrial robots)
2. Course Code:
SCE4302
3. Semester / Year:
Fourth Year / Second Semester – 2025-2026
4. Description Preparation Date:
06/10/2026
5. Available Attendance Forms:
In-person attendance
6. Number of Credit Hours (Total) / Number of Units:
60 hours / 3 units
7. Course administrator's name (mention all, if more than one name):
Systems and Control Engineering Department Academic Staff

8. Course Objectives

Course Objectives

- Understand the fundamental concepts and terminology of Robotics I (Industrial robots).
- Analyze and apply the principal methods covered in the course, including industrial robotics fundamentals & introduction to the lab.
- Develop engineering problem-solving skills through examples, exercises, and/or practical applications.
- Interpret results and relate the course concepts to systems and control engineering applications.

9. Teaching and Learning Strategies

Strategy

The teaching strategy combines in-person lectures with guided problem solving, discussions, tutorials, and practical/laboratory activities where applicable. Students are encouraged to analyze engineering problems, use appropriate software or hardware tools, work collaboratively, and connect theoretical concepts with systems and control applications.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4	Understand, analyze, and apply the concepts of Industrial Robotics Fundamentals & Introduction to the Lab.	Industrial Robotics Fundamentals & Introduction to the Lab	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
2	4	Understand, analyze, and apply the concepts of Spatial Description Part I (Position , Orientation and Frames) – Part I.	Spatial Description Part I (Position , Orientation and Frames) – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
3	4	Understand, analyze, and apply the concepts of Spatial Description Part I (Position , Orientation and Frames) – Part II.	Spatial Description Part I (Position , Orientation and Frames) – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
4	4	Understand, analyze, and apply the concepts of Spatial Description Part I (Transformation and Representation) – Part I.	Spatial Description Part I (Transformation and Representation) – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
5	4	Understand, analyze, and apply the concepts of Spatial Description Part I (Transformation and Representation) – Part II.	Spatial Description Part I (Transformation and Representation) – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
6	4	Understand, analyze, and apply the concepts of Solving some Exercises on spatial description.	Solving some Exercises on spatial description	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
7	4	Understand, analyze, and apply the concepts of Manipulator Forward kinematics-1 – Part I.	Manipulator Forward kinematics-1 – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes

8	4	Understand, analyze, and apply the concepts of Manipulator Forward kinematics-1 – Part II.	Manipulator Forward kinematics-1 – Part II	In-person lecture / tutorial / practical activity as applicable	Semester exam and assessment
9	4	Understand, analyze, and apply the concepts of Manipulator Forward kinematics-2 + solving some exercises.	Manipulator Forward kinematics-2 + solving some exercises	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
10	4	Understand, analyze, and apply the concepts of Inverse manipulator (robotic arm) kinematics part 1 – Part I.	Inverse manipulator (robotic arm) kinematics part 1 – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
11	4	Understand, analyze, and apply the concepts of Inverse manipulator (robotic arm) kinematics part 1 – Part II.	Inverse manipulator (robotic arm) kinematics part 1 – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
12	4	Understand, analyze, and apply the concepts of Inverse manipulator (robotic arm) kinematics part 2.	Inverse manipulator (robotic arm) kinematics part 2	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
13	4	Understand, analyze, and apply the concepts of Jacobians: Velocities , Explicit Form and Static Forces – Part I.	Jacobians: Velocities , Explicit Form and Static Forces – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
14	4	Understand, analyze, and apply the concepts of Jacobians: Velocities , Explicit Form and Static Forces – Part II.	Jacobians: Velocities , Explicit Form and Static Forces – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
15	4	Understand, analyze, and apply the concepts of Introduction to Vision in Robotics.	Introduction to Vision in Robotics	In-person lecture / tutorial / practical activity as applicable	Review and final assessment

11. Course Evaluation

Daily preparation, attendance, homework and quizzes	Semester exams	Final exam	Sum
10	30	60	100

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Introduction to Robotics: Mechanics and Control, 3rd Edition.
Main references (sources)	Saeed B. Niku, An Introduction to Robotics: Analysis, Systems, Applications.
Recommended books and references (scientific journals, reports...)	Recent journals, books, and technical reports related to the course.
Electronic References, Websites	Academic websites and official software/hardware documentation.

Course Description Form

1. Course Name:
Process Control
2. Course Code:
SCE4303
3. Semester / Year:
Fourth Year / First Semester – 2025-2026
4. Description Preparation Date:
06/10/2026
5. Available Attendance Forms:
In-person attendance
6. Number of Credit Hours (Total) / Number of Units:
30 hours / 3 units
7. Course administrator's name (mention all, if more than one name):
Systems and Control Engineering Department Academic Staff

8. Course Objectives

Course Objectives	- Understand the fundamental concepts and terminology of Process Control. - Analyze and apply the principal methods covered in the course, including introduction why process control ,process-control block diagram definitions ,manual.... - Develop engineering problem-solving skills through examples, exercises, and/or practical applications. - Interpret results and relate the course concepts to systems and control engineering applications.
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9. Teaching and Learning Strategies

Strategy	The teaching strategy combines in-person lectures with guided problem solving, discussions, tutorials, and practical/laboratory activities where applicable. Students are encouraged to analyze engineering problems, use appropriate software or hardware tools, work collaboratively, and connect theoretical concepts with systems and control applications.
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10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Understand, analyze, and apply the concepts of Introduction Why process control ,Process-control block diagram definitions....	Introduction Why process control ,Process-control block diagram definitions ,Manual automatic process control , Process control Terms , Control Loop Equipment , Analog & Digital Processing (ON/OFF Control , Analog Control , Digital Control & PLC) – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
2	2	Understand, analyze, and apply the concepts of Introduction Why process control ,Process-control block diagram definitions....	Introduction Why process control ,Process-control block diagram definitions ,Manual automatic process control , Process control Terms , Control Loop Equipment , Analog & Digital Processing (ON/OFF Control , Analog Control , Digital Control & PLC) – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
3	2	Understand, analyze, and apply the concepts of Introduction Why process control ,Process-control block diagram definitions....	Introduction Why process control ,Process-control block diagram definitions ,Manual automatic process control , Process control Terms , Control Loop Equipment , Analog & Digital Processing (ON/OFF Control , Analog Control , Digital Control & PLC) – Part III	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
4	2	Understand, analyze, and apply the concepts of LINEAR OPEN-LOOP SYSTEM Material & Energy Balance Equations Physical....	LINEAR OPEN-LOOP SYSTEM Material & Energy Balance Equations Physical examples of First-Order System (Liquid level system, Mixing process, Heating process) , Linearization Response of First-Order System in Series (Noninteracting&Interacting systems) Second-Order System & Transportation Lag – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes

5	2	Understand, analyze, and apply the concepts of LINEAR OPEN-LOOP SYSTEM Material & Energy Balance Equations Physical....	LINEAR OPEN-LOOP SYSTEM Material & Energy Balance Equations Physical examples of First-Order System (Liquid level system, Mixing process, Heating process) , Linearization Response of First-Order System in Series (Noninteracting&Interacting systems) Second-Order System & Transportation Lag – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
6	2	Understand, analyze, and apply the concepts of LINEAR OPEN-LOOP SYSTEM Material & Energy Balance Equations Physical....	LINEAR OPEN-LOOP SYSTEM Material & Energy Balance Equations Physical examples of First-Order System (Liquid level system, Mixing process, Heating process) , Linearization Response of First-Order System in Series (Noninteracting&Interacting systems) Second-Order System & Transportation Lag – Part III	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
7	2	Understand, analyze, and apply the concepts of LINEAR OPEN-LOOP SYSTEM Material & Energy Balance Equations Physical....	LINEAR OPEN-LOOP SYSTEM Material & Energy Balance Equations Physical examples of First-Order System (Liquid level system, Mixing process, Heating process) , Linearization Response of First-Order System in Series (Noninteracting&Interacting systems) Second-Order System & Transportation Lag – Part IV	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
8	2	Understand, analyze, and apply the concepts of Controller and Final control element Ideal Transfer Function , Piping and....	Controller and Final control element Ideal Transfer Function , Piping and Instrumentation Diagram Symbols (P&ID) – Part I	In-person lecture / tutorial / practical activity as applicable	Semester exam and assessment
9	2	Understand, analyze, and apply the concepts of Controller and Final control element Ideal Transfer Function , Piping and....	Controller and Final control element Ideal Transfer Function , Piping and Instrumentation Diagram Symbols (P&ID) – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
10	2	Understand, analyze, and apply the concepts of LINEAR CLOSED-LOOP SYSTEM Chemical – Reactor Control System – Part I.	LINEAR CLOSED-LOOP SYSTEM Chemical – Reactor Control System – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
11	2	Understand, analyze, and apply the concepts of LINEAR CLOSED-LOOP SYSTEM Chemical – Reactor Control System – Part II.	LINEAR CLOSED-LOOP SYSTEM Chemical – Reactor Control System – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
12	2	Understand, analyze, and apply the concepts of Advanced Control Strategies Feedback Control, Feedforward Control, Cascade....	Advanced Control Strategies Feedback Control, Feedforward Control, Cascade Control & Ratio Control – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
13	2	Understand, analyze, and apply the concepts of Advanced Control Strategies Feedback Control, Feedforward Control, Cascade....	Advanced Control Strategies Feedback Control, Feedforward Control, Cascade Control & Ratio Control – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
14	2	Understand, analyze, and apply the concepts of Advanced Control Strategies Feedback Control, Feedforward Control, Cascade....	Advanced Control Strategies Feedback Control, Feedforward Control, Cascade Control & Ratio Control – Part III	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
15	2	Understand, analyze, and apply the concepts of Advanced Control Strategies Feedback Control, Feedforward Control, Cascade....	Advanced Control Strategies Feedback Control, Feedforward Control, Cascade Control & Ratio Control – Part IV	In-person lecture / tutorial / practical activity as applicable	Review and final assessment

11. Course Evaluation

Daily preparation, attendance, homework and quizzes	Semester exams	Final exam	Sum
10	30	60	100

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Process Systems Analysis and Control, 3rd Edition, 2009.
Main references (sources)	Curtis D. Johnson, Process Control Instrumentation Technology, 8th Edition, 2014.
Recommended books and references (scientific journals, reports...)	Recent journals, books, and technical reports related to the course.
Electronic References, Websites	Academic websites and official software/hardware documentation.

Course Description Form

1. Course Name:
Electronic Design Automation
2. Course Code:
SCE4304
3. Semester / Year:
Fourth Year / First Semester – 2025-2026
4. Description Preparation Date:
06/10/2026
5. Available Attendance Forms:
In-person attendance
6. Number of Credit Hours (Total) / Number of Units:
75 hours / 3 units
7. Course administrator's name (mention all, if more than one name):
Systems and Control Engineering Department Academic Staff

8. Course Objectives

Course Objectives	- Understand the fundamental concepts and terminology of Electronic Design Automation. - Analyze and apply the principal methods covered in the course, including introduction, overview of eda , historical perspectives, vlsi design flow and typical eda.... - Develop engineering problem-solving skills through examples, exercises, and/or practical applications. - Interpret results and relate the course concepts to systems and control engineering applications.
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9. Teaching and Learning Strategies

Strategy	The teaching strategy combines in-person lectures with guided problem solving, discussions, tutorials, and practical/laboratory activities where applicable. Students are encouraged to analyze engineering problems, use appropriate software or hardware tools, work collaboratively, and connect theoretical concepts with systems and control applications.
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10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	5	Understand, analyze, and apply the concepts of Introduction, OVERVIEW OF EDA , historical perspectives, VLSI design flow....	Introduction, OVERVIEW OF EDA , historical perspectives, VLSI design flow and typical EDA flow. Typical EDA implementation examples. Logic design automation. – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
2	5	Understand, analyze, and apply the concepts of Introduction, OVERVIEW OF EDA , historical perspectives, VLSI design flow....	Introduction, OVERVIEW OF EDA , historical perspectives, VLSI design flow and typical EDA flow. Typical EDA implementation examples. Logic design automation. – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
3	5	Understand, analyze, and apply the concepts of Test automation, Physical design automation..	Test automation, Physical design automation.	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
4	5	Understand, analyze, and apply the concepts of Fundamentals of CMOS design, Integrated circuit technology, CMOS logic .	Fundamentals of CMOS design, Integrated circuit technology, CMOS logic ,	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
5	5	Understand, analyze, and apply the concepts of Integrated circuit design techniques. CMOS PHYSICAL DESIGN..	Integrated circuit design techniques. CMOS PHYSICAL DESIGN,	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
6	5	Understand, analyze, and apply the concepts of LOW-POWER CIRCUIT DESIGN TECHNIQUES..	LOW-POWER CIRCUIT DESIGN TECHNIQUES.	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
7	5	Understand, analyze, and apply the concepts of Design for testability, TESTABILITY ANALYSIS.	Design for testability, TESTABILITY ANALYSIS	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes

8	5	Understand, analyze, and apply the concepts of SCAN DESIGN, LOGIC BUILT-IN SELF-TEST.	SCAN DESIGN, LOGIC BUILT-IN SELF-TEST	In-person lecture / tutorial / practical activity as applicable	Semester exam and assessment
9	5	Understand, analyze, and apply the concepts of FUNDAMENTALS OF HIGH-LEVEL SYNTHESIS, HIGH-LEVEL SYNTHESIS ALGORITHM OVERVIEW.	FUNDAMENTALS OF HIGH-LEVEL SYNTHESIS, HIGH-LEVEL SYNTHESIS ALGORITHM OVERVIEW	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
10	5	Understand, analyze, and apply the concepts of SCHEDULING, REGISTER BINDING, FUNCTIONAL UNIT BINDING.	SCHEDULING, REGISTER BINDING, FUNCTIONAL UNIT BINDING	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
11	5	Understand, analyze, and apply the concepts of CHAPTER Logic synthesis, COMBINATIONAL LOGIC MINIMIZATION, TECHNOLOGY MAPPING.	CHAPTER Logic synthesis, COMBINATIONAL LOGIC MINIMIZATION, TECHNOLOGY MAPPING	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
12	5	Understand, analyze, and apply the concepts of TIMING ANALYSIS, TIMING OPTIMIZATION.	TIMING ANALYSIS, TIMING OPTIMIZATION	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
13	5	Understand, analyze, and apply the concepts of Test synthesis, SCAN DESIGN,.	Test synthesis, SCAN DESIGN,	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
14	5	Understand, analyze, and apply the concepts of LOGIC BUILT-IN SELF-TEST, RTL DESIGN FOR TESTABILITY.	LOGIC BUILT-IN SELF-TEST, RTL DESIGN FOR TESTABILITY	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
15	5	Understand, analyze, and apply the concepts of Logic and circuit simulation, LOGIC SIMULATION MODELS, LOGIC SIMULATION....	Logic and circuit simulation, LOGIC SIMULATION MODELS, LOGIC SIMULATION TECHNIQUES	In-person lecture / tutorial / practical activity as applicable	Review and final assessment

11. Course Evaluation

Daily preparation, attendance, homework and quizzes	Semester exams	Final exam	Sum
10	30	60	100

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Electronic Design Automation: Synthesis, Verification, and Test.
Main references (sources)	Electronic Design Automation: Synthesis, Verification, and Test.
Recommended books and references (scientific journals, reports...)	Recent journals, books, and technical reports related to the course.
Electronic References, Websites	Academic websites and official software/hardware documentation.

Course Description Form

1. Course Name:
Embedded Systems
2. Course Code:
SCE4305
3. Semester / Year:
Fourth Year / First Semester – 2025-2026
4. Description Preparation Date:
06/10/2026
5. Available Attendance Forms:
In-person attendance
6. Number of Credit Hours (Total) / Number of Units:
60 hours / 3 units
7. Course administrator's name (mention all, if more than one name):
Systems and Control Engineering Department Academic Staff

8. Course Objectives

Course Objectives

- Understand the fundamental concepts and terminology of Embedded Systems.
- Analyze and apply the principal methods covered in the course, including what is an embedded system? appropriate microcontroller use, embedded concept map, systems....
- Develop engineering problem-solving skills through examples, exercises, and/or practical applications.
- Interpret results and relate the course concepts to systems and control engineering applications.

9. Teaching and Learning Strategies

Strategy

The teaching strategy combines in-person lectures with guided problem solving, discussions, tutorials, and practical/laboratory activities where applicable. Students are encouraged to analyze engineering problems, use appropriate software or hardware tools, work collaboratively, and connect theoretical concepts with systems and control applications.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4	Understand, analyze, and apply the concepts of What is an Embedded System? Appropriate Microcontroller Use, Embedded....	What is an Embedded System? Appropriate Microcontroller Use, Embedded Concept Map, Systems Needing Control, Sensor&Signal Conditioner, Power Source(s), Power Interface, Actuators, User Interface, Controller Hardware, and Controller Software. – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
2	4	Understand, analyze, and apply the concepts of What is an Embedded System? Appropriate Microcontroller Use, Embedded....	What is an Embedded System? Appropriate Microcontroller Use, Embedded Concept Map, Systems Needing Control, Sensor&Signal Conditioner, Power Source(s), Power Interface, Actuators, User Interface, Controller Hardware, and Controller Software. – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
3	4	Understand, analyze, and apply the concepts of Microprocessor vs. Microcontroller Advantages and disadvantages,....	Microprocessor vs. Microcontroller Advantages and disadvantages, characteristic of microcontrollers. – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
4	4	Understand, analyze, and apply the concepts of Microprocessor vs. Microcontroller Advantages and disadvantages,....	Microprocessor vs. Microcontroller Advantages and disadvantages, characteristic of microcontrollers. – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
5	4	Understand, analyze, and apply the concepts of Microcontroller MFGRs & Arduino Overview International Microcontroller....	Microcontroller MFGRs & Arduino Overview International Microcontroller MFGRs, Why the Arduino? Arduino Shields, Arduino Applications, Arduino UNO, Compatibles, Shields, GPIO, Digital Inputs, Analog Inputs, Hardware & Software, Software Comparison. – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes

6	4	Understand, analyze, and apply the concepts of Microcontroller MFGRs & Arduino Overview International Microcontroller....	Microcontroller MFGRs & Arduino Overview International Microcontroller MFGRs, Why the Arduino? Arduino Shields, Arduino Applications, Arduino UNO, Compatibles, Shields, GPIO, Digital Inputs, Analog Inputs, Hardware & Software, Software Comparison. – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
7	4	Understand, analyze, and apply the concepts of ATmega328 microcontroller and Important Specification/Features. ATmega328....	ATmega328 microcontroller and Important Specification/Features. ATmega328 microcontroller architecture, Supply Voltage, clock, reset, timer, Interrupt and A/D Converter. – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
8	4	Understand, analyze, and apply the concepts of ATmega328 microcontroller and Important Specification/Features. ATmega328....	ATmega328 microcontroller and Important Specification/Features. ATmega328 microcontroller architecture, Supply Voltage, clock, reset, timer, Interrupt and A/D Converter. – Part II	In-person lecture / tutorial / practical activity as applicable	Semester exam and assessment
9	4	Understand, analyze, and apply the concepts of Software: Arduino IDE Programming IDE, Programming in C, The Arduino IDE....	Software: Arduino IDE Programming IDE, Programming in C, The Arduino IDE Commands, And Serial Communication. – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
10	4	Understand, analyze, and apply the concepts of Software: Arduino IDE Programming IDE, Programming in C, The Arduino IDE....	Software: Arduino IDE Programming IDE, Programming in C, The Arduino IDE Commands, And Serial Communication. – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
11	4	Understand, analyze, and apply the concepts of General Purpose Input/output Ports of Arduino Counter & Timers, Analog....	General Purpose Input/output Ports of Arduino Counter & Timers, Analog Input, Interrupts, and Serial Communications.	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
12	4	Understand, analyze, and apply the concepts of Interfacing Circuits Connect the μ C to the outside world [Circuit Basics,....	Interfacing Circuits Connect the μ C to the outside world [Circuit Basics, Op-Amp Circuits, Digital Interfacing, Analog Interfacing, Power Interfacing] , Analog to Digital Converter (ADC) and Digital to Analog Converter (DAC). – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
13	4	Understand, analyze, and apply the concepts of Interfacing Circuits Connect the μ C to the outside world [Circuit Basics,....	Interfacing Circuits Connect the μ C to the outside world [Circuit Basics, Op-Amp Circuits, Digital Interfacing, Analog Interfacing, Power Interfacing] , Analog to Digital Converter (ADC) and Digital to Analog Converter (DAC). – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
14	4	Understand, analyze, and apply the concepts of Alternative Microcontrollers & System requirements Alternatives to μ C,....	Alternative Microcontrollers & System requirements Alternatives to μ C, (ASIC, CPLD, DSP, FPGA, PLC, μ P) , list of system requirements – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
15	4	Understand, analyze, and apply the concepts of Alternative Microcontrollers & System requirements Alternatives to μ C,....	Alternative Microcontrollers & System requirements Alternatives to μ C, (ASIC, CPLD, DSP, FPGA, PLC, μ P) , list of system requirements – Part II	In-person lecture / tutorial / practical activity as applicable	Review and final assessment

11. Course Evaluation

Daily preparation, attendance, homework and quizzes	Semester exams	Final exam	Sum
10	30	60	100

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	David Russell, Introduction to Embedded Systems, 2010.
Main references (sources)	Stephen Prata, C Primer Plus.
Recommended books and references (scientific journals, reports...)	Recent journals, books, and technical reports related to the course.
Electronic References, Websites	Academic websites and official software/hardware documentation.

Course Description Form

1. Course Name:					
Project Management					
2. Course Code:					
SCE4306					
3. Semester / Year:					
Fourth Year / First Semester – 2025-2026					
4. Description Preparation Date:					
06/10/2026					
5. Available Attendance Forms:					
In-person attendance					
6. Number of Credit Hours (Total) / Number of Units:					
30 hours / 2 units					
7. Course administrator's name (mention all, if more than one name):					
Systems and Control Engineering Department Academic Staff					
8. Course Objectives					
Course Objectives		• Understand the fundamental concepts and terminology of Project Management. • Analyze and apply the principal methods covered in the course, including project management overview. • Develop engineering problem-solving skills through examples, exercises, and/or practical applications. • Interpret results and relate the course concepts to systems and control engineering applications.			
9. Teaching and Learning Strategies					
Strategy		The teaching strategy combines in-person lectures with guided problem solving, discussions, tutorials, and practical/laboratory activities where applicable. Students are encouraged to analyze engineering problems, use appropriate software or hardware tools, work collaboratively, and connect theoretical concepts with systems and control applications.			
10. Course Structure					
Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Understand, analyze, and apply the concepts of Project Management overview.	Project Management overview	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
2	2	Understand, analyze, and apply the concepts of Concepts of Project Management: Prepare, Do, Follow Through.	Concepts of Project Management: Prepare, Do, Follow Through	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
3	2	Understand, analyze, and apply the concepts of Project Selection and Initiation: Feasibility Study, Market and Demand....	Project Selection and Initiation: Feasibility Study, Market and Demand Study, Benchmarks identification, Project Scope Management, Project Time Management – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
4	2	Understand, analyze, and apply the concepts of Project Selection and Initiation: Feasibility Study, Market and Demand....	Project Selection and Initiation: Feasibility Study, Market and Demand Study, Benchmarks identification, Project Scope Management, Project Time Management – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
5	2	Understand, analyze, and apply the concepts of Project Schedule: Work Breakout Structure, Zero Date of a Project,....	Project Schedule: Work Breakout Structure, Zero Date of a Project, Pre-Project Activities, and Project Activities with examples of real projects. – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
6	2	Understand, analyze, and apply the concepts of Project Schedule: Work Breakout Structure, Zero Date of a Project,....	Project Schedule: Work Breakout Structure, Zero Date of a Project, Pre-Project Activities, and Project Activities with examples of real projects. – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
7	2	Understand, analyze, and apply the concepts of Stakeholders: Types of stakeholders and how Project Manager works with each....	Stakeholders: Types of stakeholders and how Project Manager works with each of them	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes

8	2	Understand, analyze, and apply the concepts of Projects and Strategic Planning.	Projects and Strategic Planning	In-person lecture / tutorial / practical activity as applicable	Semester exam and assessment
9	2	Understand, analyze, and apply the concepts of Organizing Human Resources, Project Procurement Management – Part I.	Organizing Human Resources, Project Procurement Management – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
10	2	Understand, analyze, and apply the concepts of Organizing Human Resources, Project Procurement Management – Part II.	Organizing Human Resources, Project Procurement Management – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
11	2	Understand, analyze, and apply the concepts of Project Risk Management: Types of Risks and how to mitigate them – Part I.	Project Risk Management: Types of Risks and how to mitigate them – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
12	2	Understand, analyze, and apply the concepts of Project Risk Management: Types of Risks and how to mitigate them – Part II.	Project Risk Management: Types of Risks and how to mitigate them – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
13	2	Understand, analyze, and apply the concepts of Project Integration Management, Project Quality Management.	Project Integration Management, Project Quality Management	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
14	2	Understand, analyze, and apply the concepts of Project close-up: Deliverables, Documentations, Charts, use-cases,....	Project close-up: Deliverables, Documentations, Charts, use-cases, "How-to's" documents – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
15	2	Understand, analyze, and apply the concepts of Project close-up: Deliverables, Documentations, Charts, use-cases,....	Project close-up: Deliverables, Documentations, Charts, use-cases, "How-to's" documents – Part II	In-person lecture / tutorial / practical activity as applicable	Review and final assessment

11. Course Evaluation

Daily preparation, attendance, homework and quizzes	Semester exams	Final exam	Sum
10	30	60	100

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	R. C. Mishra and Tarun Soota, Modern Project Management, 2005.
Main references (sources)	Stefano Tonchia, Industrial Project Management: Planning, Design, and Construction, 2008.
Recommended books and references (scientific journals, reports...)	Recent journals, books, and technical reports related to the course.
Electronic References, Websites	Academic websites and official software/hardware documentation.

Course Description Form

1. Course Name:					
Computer Networks I					
2. Course Code:					
SCE4307					
3. Semester / Year:					
Fourth Year / First Semester – 2025-2026					
4. Description Preparation Date:					
06/10/2026					
5. Available Attendance Forms:					
In-person attendance					
6. Number of Credit Hours (Total) / Number of Units:					
30 hours / 2 units					
7. Course administrator's name (mention all, if more than one name):					
Systems and Control Engineering Department Academic Staff					
8. Course Objectives					
Course Objectives		- Understand the fundamental concepts and terminology of Computer Networks I. - Analyze and apply the principal methods covered in the course, including introduction and definitions: - data communication, networks, protocols, standards, and.... - Develop engineering problem-solving skills through examples, exercises, and/or practical applications. - Interpret results and relate the course concepts to systems and control engineering applications.			
9. Teaching and Learning Strategies					
Strategy		The teaching strategy combines in-person lectures with guided problem solving, discussions, tutorials, and practical/laboratory activities where applicable. Students are encouraged to analyze engineering problems, use appropriate software or hardware tools, work collaboratively, and connect theoretical concepts with systems and control applications.			
10. Course Structure					
Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Understand, analyze, and apply the concepts of Introduction and Definitions: - Data Communication, Networks, Protocols,....	Introduction and Definitions: - Data Communication, Networks, Protocols, Standards, and Standard organizations.	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
2	2	Understand, analyze, and apply the concepts of Basic Concepts: - Line configuration, Topology, Categories of networks..	Basic Concepts: - Line configuration, Topology, Categories of networks.	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
3	2	Understand, analyze, and apply the concepts of Network Models: - Principles of Protocol Layerin.TCP/IP Protocol Suite: -	Network Models: - Principles of Protocol Layerin.TCP/IP Protocol Suite: - Layers in the TCP/IP Protocol Suite, Description of Each Layer, Encapsulation and DE capsulation. THE OSI Model:- Layers in the OSI Model, OSI versus TCP/IP. – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
4	2	Understand, analyze, and apply the concepts of Network Models: - Principles of Protocol Layerin.TCP/IP Protocol Suite: -	Network Models: - Principles of Protocol Layerin.TCP/IP Protocol Suite: - Layers in the TCP/IP Protocol Suite, Description of Each Layer, Encapsulation and DE capsulation. THE OSI Model:- Layers in the OSI Model, OSI versus TCP/IP. – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
5	2	Understand, analyze, and apply the concepts of Transmission Media: Electromagnetic spectrum., Guided media: Unshielded....	Transmission Media: Electromagnetic spectrum., Guided media: Unshielded Twisted Pair (UTP) Cable., Shielded Twisted Pair (STP) Cable., Coaxial Cable., Optical Fiber., Unguided media: Radio Transmission., Microwave Transmission., Satellite Microwave. – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes

6	2	Understand, analyze, and apply the concepts of Transmission Media: Electromagnetic spectrum., Guided media: Unshielded....	Transmission Media: Electromagnetic spectrum., Guided media: Unshielded Twisted Pair (UTP) Cable., Shielded Twisted Pair (STP) Cable., Coaxial Cable., Optical Fiber., Unguided media: Radio Transmission., Microwave Transmission., Satellite Microwave. – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
7	2	Understand, analyze, and apply the concepts of Transmission Media: Electromagnetic spectrum., Guided media: Unshielded....	Transmission Media: Electromagnetic spectrum., Guided media: Unshielded Twisted Pair (UTP) Cable., Shielded Twisted Pair (STP) Cable., Coaxial Cable., Optical Fiber., Unguided media: Radio Transmission., Microwave Transmission., Satellite Microwave. – Part III	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
8	2	Understand, analyze, and apply the concepts of Networking and Internetworking Devices: - Networking devices: NICs, Hubs,....	Networking and Internetworking Devices: - Networking devices: NICs, Hubs, Repeaters, Bridges and Switches., Internetworking devices: Routers and Gateways.	In-person lecture / tutorial / practical activity as applicable	Semester exam and assessment
9	2	Understand, analyze, and apply the concepts of Data Link Layer Basics: - Data Link Layer Services, Flow Control, Error....	Data Link Layer Basics: - Data Link Layer Services, Flow Control, Error control, Data Link Sublayers, Link layer Addressing. – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
10	2	Understand, analyze, and apply the concepts of Data Link Layer Basics: - Data Link Layer Services, Flow Control, Error....	Data Link Layer Basics: - Data Link Layer Services, Flow Control, Error control, Data Link Sublayers, Link layer Addressing. – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
11	2	Understand, analyze, and apply the concepts of Network Layer Basics: - Introduction, Network Layer Services and Protocols.....	Network Layer Basics: - Introduction, Network Layer Services and Protocols. – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
12	2	Understand, analyze, and apply the concepts of Network Layer Basics: - Introduction, Network Layer Services and Protocols.....	Network Layer Basics: - Introduction, Network Layer Services and Protocols. – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
13	2	Understand, analyze, and apply the concepts of Internet Protocol (IPv4): - Introduction to IPv4, IPv4 Addressing, Address....	Internet Protocol (IPv4): - Introduction to IPv4, IPv4 Addressing, Address Mask, Glassful Addressing (Class A,B,C and D), IPv4 Mapping. – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
14	2	Understand, analyze, and apply the concepts of Internet Protocol (IPv4): - Introduction to IPv4, IPv4 Addressing, Address....	Internet Protocol (IPv4): - Introduction to IPv4, IPv4 Addressing, Address Mask, Glassful Addressing (Class A,B,C and D), IPv4 Mapping. – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
15	2	Understand, analyze, and apply the concepts of Internet Protocol (IPv4): - Introduction to IPv4, IPv4 Addressing, Address....	Internet Protocol (IPv4): - Introduction to IPv4, IPv4 Addressing, Address Mask, Glassful Addressing (Class A,B,C and D), IPv4 Mapping. – Part III	In-person lecture / tutorial / practical activity as applicable	Review and final assessment

11. Course Evaluation

Daily preparation, attendance, homework and quizzes	Semester exams	Final exam	Sum
10	30	60	100

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Behrouz A. Forouzan, Data Communications and Networking, 5th Edition.
Main references (sources)	Douglas E. Comer, Computer Networks and Internets.
Recommended books and references (scientific journals, reports...)	Recent journals, books, and technical reports related to the course.
Electronic References, Websites	Academic websites and official software/hardware documentation.

Course Description Form

1. Course Name:					
Optimal Control II					
2. Course Code:					
SCE4311					
3. Semester / Year:					
Fourth Year / Second Semester – 2025-2026					
4. Description Preparation Date:					
06/10/2026					
5. Available Attendance Forms:					
In-person attendance					
6. Number of Credit Hours (Total) / Number of Units:					
60 hours / 3 units					
7. Course administrator's name (mention all, if more than one name):					
Systems and Control Engineering Department Academic Staff					
8. Course Objectives					
Course Objectives		• Understand the fundamental concepts and terminology of Optimal Control II. • Analyze and apply the principal methods covered in the course, including steady-state discrete-time quadratic optimal control systems.. • Develop engineering problem-solving skills through examples, exercises, and/or practical applications. • Interpret results and relate the course concepts to systems and control engineering applications.			
9. Teaching and Learning Strategies					
Strategy		The teaching strategy combines in-person lectures with guided problem solving, discussions, tutorials, and practical/laboratory activities where applicable. Students are encouraged to analyze engineering problems, use appropriate software or hardware tools, work collaboratively, and connect theoretical concepts with systems and control applications.			
10. Course Structure					
Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4	Understand, analyze, and apply the concepts of Steady-state discrete-time quadratic optimal control systems..	Steady-state discrete-time quadratic optimal control systems.	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
2	4	Understand, analyze, and apply the concepts of Minimum energy of quadratic optimal control problem. – Part I.	Minimum energy of quadratic optimal control problem. – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
3	4	Understand, analyze, and apply the concepts of Minimum energy of quadratic optimal control problem. – Part II.	Minimum energy of quadratic optimal control problem. – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
4	4	Understand, analyze, and apply the concepts of Linear quadratic Guassian optimal control system design. – Part I.	Linear quadratic Guassian optimal control system design. – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
5	4	Understand, analyze, and apply the concepts of Linear quadratic Guassian optimal control system design. – Part II.	Linear quadratic Guassian optimal control system design. – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
6	4	Understand, analyze, and apply the concepts of Linear quadratic Guassian optimal control system design. – Part III.	Linear quadratic Guassian optimal control system design. – Part III	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
7	4	Understand, analyze, and apply the concepts of Linear quadratic Guassian optimal control system design. – Part IV.	Linear quadratic Guassian optimal control system design. – Part IV	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
8	4	Understand, analyze, and apply the concepts of Introduction, principles and general aspects of adaptive control. – Part I.	Introduction, principles and general aspects of adaptive control. – Part I	In-person lecture / tutorial / practical activity as applicable	Semester exam and assessment

9	4	Understand, analyze, and apply the concepts of Introduction, principles and general aspects of adaptive control. – Part II.	Introduction, principles and general aspects of adaptive control. – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
10	4	Understand, analyze, and apply the concepts of Introduction, principles and general aspects of adaptive control. – Part III.	Introduction, principles and general aspects of adaptive control. – Part III	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
11	4	Understand, analyze, and apply the concepts of Types of adaptive control strategies; gain scheduling regulators;....	Types of adaptive control strategies; gain scheduling regulators; self-tuning regulators: Pole assignment by output feedback ; model reference adaptive control. – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
12	4	Understand, analyze, and apply the concepts of Types of adaptive control strategies; gain scheduling regulators;....	Types of adaptive control strategies; gain scheduling regulators; self-tuning regulators: Pole assignment by output feedback ; model reference adaptive control. – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
13	4	Understand, analyze, and apply the concepts of Types of adaptive control strategies; gain scheduling regulators;....	Types of adaptive control strategies; gain scheduling regulators; self-tuning regulators: Pole assignment by output feedback ; model reference adaptive control. – Part III	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
14	4	Understand, analyze, and apply the concepts of Types of adaptive control strategies; gain scheduling regulators;....	Types of adaptive control strategies; gain scheduling regulators; self-tuning regulators: Pole assignment by output feedback ; model reference adaptive control. – Part IV	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
15	4	Understand, analyze, and apply the concepts of Types of adaptive control strategies; gain scheduling regulators;....	Types of adaptive control strategies; gain scheduling regulators; self-tuning regulators: Pole assignment by output feedback ; model reference adaptive control. – Part V	In-person lecture / tutorial / practical activity as applicable	Review and final assessment

11. Course Evaluation

Daily preparation, attendance, homework and quizzes	Semester exams	Final exam	Sum
10	30	60	100

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	K. Ogata, Designing Linear Control Systems with MATLAB, 1997.
Main references (sources)	Roland S. Burns, Advanced Control Engineering, 2011. K. J. Åström and B. Wittenmark, Adaptive Control, 1997.
Recommended books and references (scientific journals, reports...)	Recent journals, books, and technical reports related to the course.
Electronic References, Websites	Academic websites and official software/hardware documentation.

Course Description Form

1. Course Name:	
Robotics II (Mobile robots)	
2. Course Code:	
SCE4312	
3. Semester / Year:	
Fourth Year / Second Semester – 2025-2026	
4. Description Preparation Date:	
06/10/2026	
5. Available Attendance Forms:	
In-person attendance	
6. Number of Credit Hours (Total) / Number of Units:	
60 hours / 3 units	
7. Course administrator's name (mention all, if more than one name):	
Systems and Control Engineering Department Academic Staff	

8. Course Objectives

Course Objectives

- Understand the fundamental concepts and terminology of Robotics II (Mobile robots).
- Analyze and apply the principal methods covered in the course, including mobile robots (overview , history , classifications , fundamentals and applications).
- Develop engineering problem-solving skills through examples, exercises, and/or practical applications.
- Interpret results and relate the course concepts to systems and control engineering applications.

9. Teaching and Learning Strategies

Strategy

The teaching strategy combines in-person lectures with guided problem solving, discussions, tutorials, and practical/laboratory activities where applicable. Students are encouraged to analyze engineering problems, use appropriate software or hardware tools, work collaboratively, and connect theoretical concepts with systems and control applications.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4	Understand, analyze, and apply the concepts of Mobile robots (Overview , History , Classifications , Fundamentals and....	Mobile robots (Overview , History , Classifications , Fundamentals and applications)	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
2	4	Understand, analyze, and apply the concepts of Mechanical Design (Mechanical Platform, Types of Motors , Wheels & Motor....	Mechanical Design (Mechanical Platform, Types of Motors , Wheels & Motor Driving)	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
3	4	Understand, analyze, and apply the concepts of Localization & Mapping – Part I.	Localization & Mapping – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
4	4	Understand, analyze, and apply the concepts of Localization & Mapping – Part II.	Localization & Mapping – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
5	4	Understand, analyze, and apply the concepts of Sensors & Perceptions + Wireless communications for Mobile robot – Part I.	Sensors & Perceptions + Wireless communications for Mobile robot – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
6	4	Understand, analyze, and apply the concepts of Sensors & Perceptions + Wireless communications for Mobile robot – Part II.	Sensors & Perceptions + Wireless communications for Mobile robot – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
7	4	Understand, analyze, and apply the concepts of Mobile Robot Modelling :- Kinematics of wheeled robots & using a constraints....	Mobile Robot Modelling :- Kinematics of wheeled robots & using a constraints approach – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
8	4	Understand, analyze, and apply the concepts of Mobile Robot Modelling :- Kinematics of wheeled robots & using a constraints....	Mobile Robot Modelling :- Kinematics of wheeled robots & using a constraints approach – Part II	In-person lecture / tutorial / practical activity as applicable	Semester exam and assessment

9	4	Understand, analyze, and apply the concepts of Mobile Robot Modelling :- Kinematics of wheeled robots & using a constraints....	Mobile Robot Modelling :- Kinematics of wheeled robots & using a constraints approach – Part III	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
10	4	Understand, analyze, and apply the concepts of Navigation - Maps, path planning algorithms – Part I.	Navigation - Maps, path planning algorithms – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
11	4	Understand, analyze, and apply the concepts of Navigation - Maps, path planning algorithms – Part II.	Navigation - Maps, path planning algorithms – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
12	4	Understand, analyze, and apply the concepts of Arduino Robotics Platform – Part I.	Arduino Robotics Platform – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
13	4	Understand, analyze, and apply the concepts of Arduino Robotics Platform – Part II.	Arduino Robotics Platform – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
14	4	Understand, analyze, and apply the concepts of Programming languages for robotics + practical examples.	Programming languages for robotics + practical examples	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
15	4	Understand, analyze, and apply the concepts of Introduction to LabVIEW + MATLAB integration with Mobile Robot.	Introduction to LabVIEW + MATLAB integration with Mobile Robot	In-person lecture / tutorial / practical activity as applicable	Review and final assessment

11. Course Evaluation

Daily preparation, attendance, homework and quizzes	Semester exams	Final exam	Sum
10	30	60	100

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	R. Siegwart, Introduction to Autonomous Mobile Robots, 2004.
Main references (sources)	Thomas Bräunl, Embedded Robotics: Mobile Robot Design and Applications with Embedded Systems, 3rd Edition, 2008.
Recommended books and references (scientific journals, reports...)	Recent journals, books, and technical reports related to the course.
Electronic References, Websites	Academic websites and official software/hardware documentation.

Course Description Form

1. Course Name:					
Computer Control System					
2. Course Code:					
SCE4313					
3. Semester / Year:					
Fourth Year / Second Semester – 2025-2026					
4. Description Preparation Date:					
06/10/2026					
5. Available Attendance Forms:					
In-person attendance					
6. Number of Credit Hours (Total) / Number of Units:					
45 hours / 2 units					
7. Course administrator's name (mention all, if more than one name):					
Systems and Control Engineering Department Academic Staff					
8. Course Objectives					
Course Objectives		- Understand the fundamental concepts and terminology of Computer Control System. - Analyze and apply the principal methods covered in the course, including industrial sensors and actuators. - Develop engineering problem-solving skills through examples, exercises, and/or practical applications. - Interpret results and relate the course concepts to systems and control engineering applications.			
9. Teaching and Learning Strategies					
Strategy		The teaching strategy combines in-person lectures with guided problem solving, discussions, tutorials, and practical/laboratory activities where applicable. Students are encouraged to analyze engineering problems, use appropriate software or hardware tools, work collaboratively, and connect theoretical concepts with systems and control applications.			
10. Course Structure					
Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3	Understand, analyze, and apply the concepts of Industrial sensors and actuators – Part I.	Industrial sensors and actuators – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
2	3	Understand, analyze, and apply the concepts of Industrial sensors and actuators – Part II.	Industrial sensors and actuators – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
3	3	Understand, analyze, and apply the concepts of Computer buses and interfaces.	Computer buses and interfaces	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
4	3	Understand, analyze, and apply the concepts of Signal sampling and conditioning.	Signal sampling and conditioning	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
5	3	Understand, analyze, and apply the concepts of Considerations for analog signals.	Considerations for analog signals	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
6	3	Understand, analyze, and apply the concepts of PC-based data acquisition – Part I.	PC-based data acquisition – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
7	3	Understand, analyze, and apply the concepts of PC-based data acquisition – Part II.	PC-based data acquisition – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
8	3	Understand, analyze, and apply the concepts of PC-based data acquisition – Part III.	PC-based data acquisition – Part III	In-person lecture / tutorial / practical activity as applicable	Semester exam and assessment

9	3	Understand, analyze, and apply the concepts of Remote Terminal Units (RTU).	Remote Terminal Units (RTU)	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
10	3	Understand, analyze, and apply the concepts of Supervisory Control and Data Acquisition (SCADA) Systems – Part I.	Supervisory Control and Data Acquisition (SCADA) Systems – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
11	3	Understand, analyze, and apply the concepts of Supervisory Control and Data Acquisition (SCADA) Systems – Part II.	Supervisory Control and Data Acquisition (SCADA) Systems – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
12	3	Understand, analyze, and apply the concepts of Distributed Control Systems (DCS) – Part I.	Distributed Control Systems (DCS) – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
13	3	Understand, analyze, and apply the concepts of Distributed Control Systems (DCS) – Part II.	Distributed Control Systems (DCS) – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
14	3	Understand, analyze, and apply the concepts of CAN: Controller Area Network – Part I.	CAN: Controller Area Network – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
15	3	Understand, analyze, and apply the concepts of CAN: Controller Area Network – Part II.	CAN: Controller Area Network – Part II	In-person lecture / tutorial / practical activity as applicable	Review and final assessment

11. Course Evaluation

Daily preparation, attendance, homework and quizzes	Semester exams	Final exam	Sum
10	30	60	100

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Kevin James, PC Interfacing and Data Acquisition, 2000.
Main references (sources)	Gary Johnson and Richard Jennings, LabVIEW Graphical Programming, 4th Edition, 2006. Matthew Armstrong, Distributed Control Systems, 2016.
Recommended books and references (scientific journals, reports...)	Recent journals, books, and technical reports related to the course.
Electronic References, Websites	Academic websites and official software/hardware documentation.

Course Description Form

1. Course Name:					
Soft Computing					
2. Course Code:					
SCE4314					
3. Semester / Year:					
Fourth Year / Second Semester – 2025-2026					
4. Description Preparation Date:					
06/10/2026					
5. Available Attendance Forms:					
In-person attendance					
6. Number of Credit Hours (Total) / Number of Units:					
30 hours / 2 units					
7. Course administrator's name (mention all, if more than one name):					
Systems and Control Engineering Department Academic Staff					
8. Course Objectives					
Course Objectives		- Understand the fundamental concepts and terminology of Soft Computing. - Analyze and apply the principal methods covered in the course, including introduction to soft computing fuzzy logic (fl): overview of fl and its applications, fuzzy.... - Develop engineering problem-solving skills through examples, exercises, and/or practical applications. - Interpret results and relate the course concepts to systems and control engineering applications.			
9. Teaching and Learning Strategies					
Strategy		The teaching strategy combines in-person lectures with guided problem solving, discussions, tutorials, and practical/laboratory activities where applicable. Students are encouraged to analyze engineering problems, use appropriate software or hardware tools, work collaboratively, and connect theoretical concepts with systems and control applications.			
10. Course Structure					
Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Understand, analyze, and apply the concepts of Introduction to Soft Computing Fuzzy Logic (FL): overview of FL and its....	Introduction to Soft Computing Fuzzy Logic (FL): overview of FL and its applications, Fuzzy sets, Fuzzy Logic and Boolean Logic, membership function. Fuzzy Systems: Fuzzy Inference Engine, Fuzzification, Defuzzification, crisp input and output, Fuzzy Rules, reasoning with Fuzzy Rules. Tutorial: solve example application problems using FL. – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes

2	2	Understand, analyze, and apply the concepts of Introduction to Soft Computing Fuzzy Logic (FL): overview of FL and its....	Introduction to Soft Computing Fuzzy Logic (FL): overview of FL and its applications, Fuzzy sets, Fuzzy Logic and Boolean Logic, membership function. Fuzzy Systems: Fuzzy Inference Engine, Fuzzification, Defuzzification, crisp input and output, Fuzzy Rules, reasoning with Fuzzy Rules. Tutorial: solve example application problems using FL. – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
3	2	Understand, analyze, and apply the concepts of Introduction to Soft Computing Fuzzy Logic (FL): overview of FL and its....	Introduction to Soft Computing Fuzzy Logic (FL): overview of FL and its applications, Fuzzy sets, Fuzzy Logic and Boolean Logic, membership function. Fuzzy Systems: Fuzzy Inference Engine, Fuzzification, Defuzzification, crisp input and output, Fuzzy Rules, reasoning with Fuzzy Rules. Tutorial: solve example application problems using FL. – Part III	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
4	2	Understand, analyze, and apply the concepts of Introduction to Soft Computing Fuzzy Logic (FL): overview of FL and its....	Introduction to Soft Computing Fuzzy Logic (FL): overview of FL and its applications, Fuzzy sets, Fuzzy Logic and Boolean Logic, membership function. Fuzzy Systems: Fuzzy Inference Engine, Fuzzification, Defuzzification, crisp input and output, Fuzzy Rules, reasoning with Fuzzy Rules. Tutorial: solve example application problems using FL. – Part IV	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
5	2	Understand, analyze, and apply the concepts of Introduction to Soft Computing Fuzzy Logic (FL): overview of FL and its....	Introduction to Soft Computing Fuzzy Logic (FL): overview of FL and its applications, Fuzzy sets, Fuzzy Logic and Boolean Logic, membership function. Fuzzy Systems: Fuzzy Inference Engine, Fuzzification, Defuzzification, crisp input and output, Fuzzy Rules, reasoning with Fuzzy Rules. Tutorial: solve example application problems using FL. – Part V	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
6	2	Understand, analyze, and apply the concepts of Neural Networks (NN): Overview of Biological Neural Networks, Artificial....	Neural Networks (NN): Overview of Biological Neural Networks, Artificial Neural Networks (ANN), Structure of ANN, Phases of Information Processing, Activation Functions, Learning Rules, Firing Rules Tutorial: Pattern Recognition Example application – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes

7	2	Understand, analyze, and apply the concepts of Neural Networks (NN): Overview of Biological Neural Networks, Artificial....	Neural Networks (NN): Overview of Biological Neural Networks, Artificial Neural Networks (ANN), Structure of ANN, Phases of Information Processing, Activation Functions, Learning Rules, Firing Rules Tutorial: Pattern Recognition Example application – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
8	2	Understand, analyze, and apply the concepts of Neural Networks (NN): Overview of Biological Neural Networks, Artificial....	Neural Networks (NN): Overview of Biological Neural Networks, Artificial Neural Networks (ANN), Structure of ANN, Phases of Information Processing, Activation Functions, Learning Rules, Firing Rules Tutorial: Pattern Recognition Example application – Part III	In-person lecture / tutorial / practical activity as applicable	Semester exam and assessment
9	2	Understand, analyze, and apply the concepts of Neural Networks (NN): Overview of Biological Neural Networks, Artificial....	Neural Networks (NN): Overview of Biological Neural Networks, Artificial Neural Networks (ANN), Structure of ANN, Phases of Information Processing, Activation Functions, Learning Rules, Firing Rules Tutorial: Pattern Recognition Example application – Part IV	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
10	2	Understand, analyze, and apply the concepts of Neural Networks (NN): Overview of Biological Neural Networks, Artificial....	Neural Networks (NN): Overview of Biological Neural Networks, Artificial Neural Networks (ANN), Structure of ANN, Phases of Information Processing, Activation Functions, Learning Rules, Firing Rules Tutorial: Pattern Recognition Example application – Part V	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
11	2	Understand, analyze, and apply the concepts of Genetic Algorithm (GA): Biological overview, Encoding Types, Selection,....	Genetic Algorithm (GA): Biological overview, Encoding Types, Selection, Crossover, Mutation, Applications of GA Tutorial: solve problems on GA applications – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
12	2	Understand, analyze, and apply the concepts of Genetic Algorithm (GA): Biological overview, Encoding Types, Selection,....	Genetic Algorithm (GA): Biological overview, Encoding Types, Selection, Crossover, Mutation, Applications of GA Tutorial: solve problems on GA applications – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
13	2	Understand, analyze, and apply the concepts of Genetic Algorithm (GA): Biological overview, Encoding Types, Selection,....	Genetic Algorithm (GA): Biological overview, Encoding Types, Selection, Crossover, Mutation, Applications of GA Tutorial: solve problems on GA applications – Part III	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
14	2	Understand, analyze, and apply the concepts of Genetic Algorithm (GA): Biological overview, Encoding Types, Selection,....	Genetic Algorithm (GA): Biological overview, Encoding Types, Selection, Crossover, Mutation, Applications of GA Tutorial: solve problems on GA applications – Part IV	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes

15	2	Understand, analyze, and apply the concepts of Genetic Algorithm (GA): Biological overview, Encoding Types, Selection,....	Genetic Algorithm (GA): Biological overview, Encoding Types, Selection, Crossover, Mutation, Applications of GA Tutorial: solve problems on GA applications – Part V	In-person lecture / tutorial / practical activity as applicable	Review and final assessment
11. Course Evaluation					
Daily preparation, attendance, homework and quizzes			Semester exams	Final exam	Sum
10			30	60	100
12. Learning and Teaching Resources					
Required textbooks (curricular books, if any)				Michael Negnevitsky, Artificial Intelligence: A Guide to Intelligent Systems, 2nd Edition, Pearson Education, 2005.	
Main references (sources)				Michael Negnevitsky, Artificial Intelligence: A Guide to Intelligent Systems, 2nd Edition, Pearson Education, 2005.	
Recommended books and references (scientific journals, reports...)				Recent journals, books, and technical reports related to the course.	
Electronic References, Websites				Academic websites and official software/hardware documentation.	

Course Description Form

1. Course Name:
Real time Systems
2. Course Code:
SCE4315
3. Semester / Year:
Fourth Year / Second Semester – 2025-2026
4. Description Preparation Date:
06/10/2026
5. Available Attendance Forms:
In-person attendance
6. Number of Credit Hours (Total) / Number of Units:
30 hours / 3 units
7. Course administrator's name (mention all, if more than one name):
Systems and Control Engineering Department Academic Staff

8. Course Objectives

Course Objectives

- Understand the fundamental concepts and terminology of Real time Systems.
- Analyze and apply the principal methods covered in the course, including introduction to real-time systems what is needed to create a real-time system where....
- Develop engineering problem-solving skills through examples, exercises, and/or practical applications.
- Interpret results and relate the course concepts to systems and control engineering applications.

9. Teaching and Learning Strategies

Strategy

The teaching strategy combines in-person lectures with guided problem solving, discussions, tutorials, and practical/laboratory activities where applicable. Students are encouraged to analyze engineering problems, use appropriate software or hardware tools, work collaboratively, and connect theoretical concepts with systems and control applications.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Understand, analyze, and apply the concepts of Introduction to Real-Time Systems What is needed to create a real-time....	Introduction to Real-Time Systems What is needed to create a real-time system Where real-time requirements are needed. The task and job structure and the parameters needed to schedule a task. Difference between pre-emptive and non-pre-emptive tasks. – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
2	2	Understand, analyze, and apply the concepts of Introduction to Real-Time Systems What is needed to create a real-time....	Introduction to Real-Time Systems What is needed to create a real-time system Where real-time requirements are needed. The task and job structure and the parameters needed to schedule a task. Difference between pre-emptive and non-pre-emptive tasks. – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
3	2	Understand, analyze, and apply the concepts of Static Scheduling Schedule a set of tasks with the clock driven scheduler,....	Static Scheduling Schedule a set of tasks with the clock driven scheduler, with the fixed priority scheduler, with the monotonic schedulers. Determine if a system is overloaded using the total-utilization method and the Urm method. Program FreeRTOS to schedule a set of tasks using the fixed priority scheduler. – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes

4	2	Understand, analyze, and apply the concepts of Static Scheduling Schedule a set of tasks with the clock driven scheduler,....	Static Scheduling Schedule a set of tasks with the clock driven scheduler, with the fixed priority scheduler, with the monotonic schedulers. Determine if a system is overloaded using the total-utilization method and the Urm method. Program FreeRTOS to schedule a set of tasks using the fixed priority scheduler. – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
5	2	Understand, analyze, and apply the concepts of Static Scheduling Schedule a set of tasks with the clock driven scheduler,....	Static Scheduling Schedule a set of tasks with the clock driven scheduler, with the fixed priority scheduler, with the monotonic schedulers. Determine if a system is overloaded using the total-utilization method and the Urm method. Program FreeRTOS to schedule a set of tasks using the fixed priority scheduler. – Part III	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
6	2	Understand, analyze, and apply the concepts of Dynamic Scheduling How to determine feasibility of a set of tasks using the....	Dynamic Scheduling How to determine feasibility of a set of tasks using the time demand analysis method. How to schedule a set of tasks using LST and EDF. To determine when a dynamic scheduler is appropriate and when it is not appropriate. – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
7	2	Understand, analyze, and apply the concepts of Dynamic Scheduling How to determine feasibility of a set of tasks using the....	Dynamic Scheduling How to determine feasibility of a set of tasks using the time demand analysis method. How to schedule a set of tasks using LST and EDF. To determine when a dynamic scheduler is appropriate and when it is not appropriate. – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
8	2	Understand, analyze, and apply the concepts of Dynamic Scheduling How to determine feasibility of a set of tasks using the....	Dynamic Scheduling How to determine feasibility of a set of tasks using the time demand analysis method. How to schedule a set of tasks using LST and EDF. To determine when a dynamic scheduler is appropriate and when it is not appropriate. – Part III	In-person lecture / tutorial / practical activity as applicable	Semester exam and assessment
9	2	Understand, analyze, and apply the concepts of Non-Periodic Jobs How to use the slack stealing method to optimize a....	Non-Periodic Jobs How to use the slack stealing method to optimize a schedule with non-periodic jobs How to use the LRT scheduler to optimize a schedule with non-periodic jobs How to use the deferrable server to optimize a schedule with non-periodic jobs Formally verify a schedule with non-periodic jobs – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
10	2	Understand, analyze, and apply the concepts of Non-Periodic Jobs How to use the slack stealing method to optimize a....	Non-Periodic Jobs How to use the slack stealing method to optimize a schedule with non-periodic jobs How to use the LRT scheduler to optimize a schedule with non-periodic jobs How to use the deferrable server to optimize a schedule with non-periodic jobs Formally verify a schedule with non-periodic jobs – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
11	2	Understand, analyze, and apply the concepts of Non-Periodic Jobs How to use the slack stealing method to optimize a....	Non-Periodic Jobs How to use the slack stealing method to optimize a schedule with non-periodic jobs How to use the LRT scheduler to optimize a schedule with non-periodic jobs How to use the deferrable server to optimize a schedule with non-periodic jobs Formally verify a schedule with non-periodic jobs – Part III	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
12	2	Understand, analyze, and apply the concepts of Real-Time Operating Systems The internal mechanisms of FreeRTOS, for example....	Real-Time Operating Systems The internal mechanisms of FreeRTOS, for example mutexes/semaphores and message queues. Multi-core computer architectures for real-time systems. Multi-core scheduling methods. – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
13	2	Understand, analyze, and apply the concepts of Real-Time Operating Systems The internal mechanisms of FreeRTOS, for example....	Real-Time Operating Systems The internal mechanisms of FreeRTOS, for example mutexes/semaphores and message queues. Multi-core computer architectures for real-time systems. Multi-core scheduling methods. – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
14	2	Understand, analyze, and apply the concepts of Real-Time Operating Systems The internal mechanisms of FreeRTOS, for example....	Real-Time Operating Systems The internal mechanisms of FreeRTOS, for example mutexes/semaphores and message queues. Multi-core computer architectures for real-time systems. Multi-core scheduling methods. – Part III	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes

15	2	Understand, analyze, and apply the concepts of Real-Time Operating Systems The internal mechanisms of FreeRTOS, for example....	Real-Time Operating Systems The internal mechanisms of FreeRTOS, for example mutexes/semaphores and message queues. Multi-core computer architectures for real-time systems. Multi-core scheduling methods. – Part IV	In-person lecture / tutorial / practical activity as applicable	Review and final assessment
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11. Course Evaluation			
Daily preparation, attendance, homework and quizzes	Semester exams	Final exam	Sum
10	30	60	100
12. Learning and Teaching Resources			
Required textbooks (curricular books, if any)		Real-Time Concepts for Embedded Systems.	
Main references (sources)		C. G. Krishna, Real-Time Systems.	
Recommended books and references (scientific journals, reports...)		Recent journals, books, and technical reports related to the course.	
Electronic References, Websites		Academic websites and official software/hardware documentation.	

Course Description Form

1. Course Name:
Advanced control systems
2. Course Code:
SCE4316
3. Semester / Year:
Fourth Year / Second Semester – 2025-2026
4. Description Preparation Date:
06/10/2026
5. Available Attendance Forms:
In-person attendance
6. Number of Credit Hours (Total) / Number of Units:
30 hours / 3 units
7. Course administrator's name (mention all, if more than one name):
Systems and Control Engineering Department Academic Staff

8. Course Objectives

Course Objectives	- Understand the fundamental concepts and terminology of Advanced control systems. - Analyze and apply the principal methods covered in the course, including chapter 1 linear systems. - Develop engineering problem-solving skills through examples, exercises, and/or practical applications. - Interpret results and relate the course concepts to systems and control engineering applications.
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9. Teaching and Learning Strategies

Strategy	The teaching strategy combines in-person lectures with guided problem solving, discussions, tutorials, and practical/laboratory activities where applicable. Students are encouraged to analyze engineering problems, use appropriate software or hardware tools, work collaboratively, and connect theoretical concepts with systems and control applications.
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10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Understand, analyze, and apply the concepts of CHAPTER 1 Linear Systems.	CHAPTER 1 Linear Systems	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
2	2	Understand, analyze, and apply the concepts of 1.1 Introduction.	1.1 Introduction	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
3	2	Understand, analyze, and apply the concepts of 1.2 Review of System Modeling.	1.2 Review of System Modeling	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
4	2	Understand, analyze, and apply the concepts of 1.3 State-variable Modeling.	1.3 State-variable Modeling	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
5	2	Understand, analyze, and apply the concepts of 1.3.1 The Concept of State.	1.3.1 The Concept of State	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes

6	2	Understand, analyze, and apply the concepts of 1.4 Simulation Diagrams.	1.4 Simulation Diagrams	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
7	2	Understand, analyze, and apply the concepts of 1.4.1 State-variable models from Transfer Function.	1.4.1 State-variable models from Transfer Function	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
8	2	Understand, analyze, and apply the concepts of 1.4.2 Transfer Functions from State-variable Models.	1.4.2 Transfer Functions from State-variable Models	In-person lecture / tutorial / practical activity as applicable	Semester exam and assessment
9	2	Understand, analyze, and apply the concepts of 1.5 System Interconnections.	1.5 System Interconnections	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
10	2	Understand, analyze, and apply the concepts of 1.5.1 Series and Parallel Connections.	1.5.1 Series and Parallel Connections	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
11	2	Understand, analyze, and apply the concepts of 1.5.2 Feedback Connection.	1.5.2 Feedback Connection	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
12	2	Understand, analyze, and apply the concepts of 1.6 Solution of State Equations.	1.6 Solution of State Equations	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
13	2	Understand, analyze, and apply the concepts of 1.6.1 Properties of the State-Transition Matrix.	1.6.1 Properties of the State-Transition Matrix	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
14	2	Understand, analyze, and apply the concepts of 1.7 Characteristic Equations.	1.7 Characteristic Equations	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
15	2	Understand, analyze, and apply the concepts of 1.7.1 Eigen values.	1.7.1 Eigen values	In-person lecture / tutorial / practical activity as applicable	Review and final assessment

11. Course Evaluation

Daily preparation, attendance, homework and quizzes	Semester exams	Final exam	Sum
10	30	60	100

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Katsuhiko Ogata, Modern Control Engineering, 4th Edition, 2002.
Main references (sources)	Farid Golnaraghi and Benjamin C. Kuo, Automatic Control Systems, 9th Edition, 2010.
Recommended books and references (scientific journals, reports...)	Recent journals, books, and technical reports related to the course.
Electronic References, Websites	Academic websites and official software/hardware documentation.

Course Description Form

1. Course Name:					
Project					
2. Course Code:					
SCE4317					
3. Semester / Year:					
Fourth Year / Second Semester – 2025-2026					
4. Description Preparation Date:					
06/10/2026					
5. Available Attendance Forms:					
In-person attendance					
6. Number of Credit Hours (Total) / Number of Units:					
45 hours / 2 units					
7. Course administrator's name (mention all, if more than one name):					
Systems and Control Engineering Department Academic Staff					
8. Course Objectives					
Course Objectives		- Understand the fundamental concepts and terminology of Project. - Analyze and apply the principal methods covered in the course, including project orientation, topic selection and problem definition. - Develop engineering problem-solving skills through examples, exercises, and/or practical applications. - Interpret results and relate the course concepts to systems and control engineering applications.			
9. Teaching and Learning Strategies					
Strategy		The teaching strategy combines in-person lectures with guided problem solving, discussions, tutorials, and practical/laboratory activities where applicable. Students are encouraged to analyze engineering problems, use appropriate software or hardware tools, work collaboratively, and connect theoretical concepts with systems and control applications.			
10. Course Structure					
Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3	Understand, analyze, and apply the concepts of Project orientation, topic selection and problem definition.	Project orientation, topic selection and problem definition	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
2	3	Understand, analyze, and apply the concepts of Literature review and requirements analysis – Part I.	Literature review and requirements analysis – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
3	3	Understand, analyze, and apply the concepts of Literature review and requirements analysis – Part II.	Literature review and requirements analysis – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
4	3	Understand, analyze, and apply the concepts of System specification and project planning – Part I.	System specification and project planning – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
5	3	Understand, analyze, and apply the concepts of System specification and project planning – Part II.	System specification and project planning – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes

6	3	Understand, analyze, and apply the concepts of Design methodology and modeling – Part I.	Design methodology and modeling – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
7	3	Understand, analyze, and apply the concepts of Design methodology and modeling – Part II.	Design methodology and modeling – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
8	3	Understand, analyze, and apply the concepts of Implementation, simulation and/or prototype development – Part I.	Implementation, simulation and/or prototype development – Part I	In-person lecture / tutorial / practical activity as applicable	Semester exam and assessment
9	3	Understand, analyze, and apply the concepts of Implementation, simulation and/or prototype development – Part II.	Implementation, simulation and/or prototype development – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
10	3	Understand, analyze, and apply the concepts of Implementation, simulation and/or prototype development – Part III.	Implementation, simulation and/or prototype development – Part III	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
11	3	Understand, analyze, and apply the concepts of Testing, validation and performance evaluation – Part I.	Testing, validation and performance evaluation – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
12	3	Understand, analyze, and apply the concepts of Testing, validation and performance evaluation – Part II.	Testing, validation and performance evaluation – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
13	3	Understand, analyze, and apply the concepts of Technical report writing and documentation – Part I.	Technical report writing and documentation – Part I	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
14	3	Understand, analyze, and apply the concepts of Technical report writing and documentation – Part II.	Technical report writing and documentation – Part II	In-person lecture / tutorial / practical activity as applicable	Discussions and quizzes
15	3	Understand, analyze, and apply the concepts of Final presentation and project defense.	Final presentation and project defense	In-person lecture / tutorial / practical activity as applicable	Review and final assessment

11. Course Evaluation

Daily preparation, attendance, homework and quizzes	Semester exams	Final exam	Sum
10	30	60	100

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Departmental graduation-project guidelines and relevant technical standards.
Main references (sources)	Recent textbooks, journal papers, datasheets, and technical documentation related to the selected project.
Recommended books and references (scientific journals, reports...)	Recent journals, books, and technical reports related to the course.
Electronic References, Websites	Academic websites and official software/hardware documentation.