Course Specification of: Advanced Embedded Systems Design

Course Code (CCE580/ MTE531)

I. General Information About the Course:

	Course Title:	**Advanced Embedded Systems Design**			
	Course Code and Number:	**CCE580/MTE531**			
	Credit Hours:	**Credit Hours**			**Total**
		Lecture	Practical	Seminar/Tutorial	
		3	--	--	**3**
	Study Level and Semester:	**1st Semester (Computer) / 2nd Semester (Mechatronics)**			
	Pre-requisites (if any):				
	Co-requisites (if any):				
	Program (s) in which the course is offered:	M. Sc. in Computer Engineering & Control and M. Sc. in Mechatronics Engineering Programs			
	Language of teaching the course:	English			
	Study System:	Courses & Thesis			
	Prepared By:	Assoc. Prof. Dr. Farouk Al-Fahaidy			
	Reviewed by:	Assoc. Prof. Dr. Radwan M. AL Bouthigy			
	Date of Approval:				

I. Course Description:

This course provides advanced concepts on Embedded systems design, advanced microcontrollers architecture and capabilities, as well as, System on Chip (SoC) design. The future of embedded systems and IoT lies in the advancement of technologies that enable

faster communication with high interwoven connections between different devices. Course covers, an overview on advanced 32-bit ARM microcontrollers, Embedded System Design concepts & Project Management, ESs Firmware/software, ESs Digital Signal Processing and ESs Communications. Throughout course projects & case study works, students develop their skills in ESs design and implementation.

V. Course Intended Learning Outcomes (CILOs):

Upon successful completion of **Advanced Embedded Systems Design Course**, the graduates will be able to:

Discuss hardware/software partitioning in system design and the strategies for embedded firmware design and development.

Explain architectural features of 32-bit ARM Microcontrollers, as well as, their instruction sets, programming and applications in sustainable design and development of embedded Systems.

Analyze a system both as whole and in the included parts, for understanding how these parts interact in the functionality and properties of the system.

Suggest innovative embedded systems for solving practice problems, related to SoC designing and implementation considering their constituting elements limits.

Develop an integrated development environment in embedded system based on software and electronical hardware tools.

Apply formal method, testing, verification, validation and simulation techniques and tools in order to engineer reliable and safe embedded systems.

Establish a high level of skills in writing, presenting and defending research/project activities through course works.

Balance professional and ethical responsibilities including contemporary issues and environmental awareness in the field of embedded systems design and integration.

7. Alignment of Course Intended Learning Outcomes (CILOs) to Program Intended Learning Outcomes (PILOs)

CILOs		PILOs
. Knowledge and Understanding: Upon successful completion of **the Advanced Embedded Systems Design Course**, the graduates will be able to:		**. Knowledge and Understanding:** Upon successful completion of the **MSc. In Computer Engineering & Control Program**, the graduates will be able to:
	Discuss hardware/software partitioning in system design and the strategies for embedded firmware design and development.	Demonstrate deep understanding of computer engineering and control as well as knowledge of applied mathematics and engineering science to the field of computing and intelligent control.
		A2. Recognize and Explain the contemporary engineering technologies and issues in the specialization field of computing and control.
	Explain architectural features of 32-bit ARM Microcontrollers, as well as, their instruction sets, programming and applications in sustainable design and development of embedded Systems.	**A3.** Explain in-depth the principles of sustainable design and development of computing products, standards and protocols and intelligent control systems.
. Cognitive/ Intellectual Skills: Upon successful completion of the **Advanced Embedded Systems Design Course,** the graduates will be able to:		**. Cognitive/ Intellectual Skills:** Upon successful completion of the **MSc. In Mechanical Engineering Program,** the graduates will be able to:
	Analyze a system both as whole and in the included parts, for understanding how these parts interact in the functionality and properties of the system.	**1.** Evaluate, select and apply appropriate principles, methodologies, techniques, tools and packages to the analysis, specification, development and evaluation of computing and engineering systems.
	Suggest innovative embedded systems for solving practice problems, related to SoC	**3.** Propose computing system, component, or process to meet desired needs within realistic

	designing and implementation considering their constituting elements limits.	constraints.
g. Professional and Practical Skills: Upon successful completion of the **Advanced Embedded Systems Design Course,** the graduates will be able to:		**G. Professional and Practical Skills:** Upon successful completion of the **MSc. In Computer Engineering & Control Program,** the graduates will be able to:
	Develop an integrated development environment in embedded system based on software and electronical hardware tools.	**1.** Develop, configure, upgrade, and/or write computer software/program to solve computing and control problems.
	Apply formal method, testing, verification, validation and simulation techniques and tools in order to engineer reliable and safe embedded systems.	**2.** Use advanced methodology and skills to the formulation and practice of computer science, engineering and control systems.
h. Transferable Skills: Upon successful completion of the **Advanced Embedded Systems Design Course,** the graduates will be able to:		**H. Transferable Skills:** Upon successful completion of the **MSc. In Computer Engineering & Control Program,** the graduates will be able to:
	Establish a high level of skills in writing, presenting and defending research/project activities through course works.	**1.** Prepare complete thesis and reports, present ideas clearly and defend them.
	Balance professional and ethical responsibilities including contemporary issues and environmental awareness in the field of embedded systems design and integration.	Balance professional and ethical responsibilities including contemporary issues and environmental awareness.
		Conduct independently and communicate research that advances and extends computing knowledge and scholarship in relate.

I. Alignment of CILOs to Teaching and Assessment Strategies

Alignment of Knowledge and Understanding CILOs:

Knowledge and Understanding CILOs		Teaching Strategies	Assessment Strategies
a1.	**Discuss hardware/software partitioning in system design and the strategies for embedded firmware design and development.**	Lectures, Self-Learning Problems/Studies, Group/Individual Projects and Studies.	Oral & Writing Exams Reports, Written Exam, Assignments.
	Explain architectural features of 32-bit ARM Microcontrollers, as well as, their instruction sets, programming and applications in sustainable design and development of embedded Systems.	Lectures, Group/Individual Projects and Studies, Active learning.	Oral & Writing Exams Reports, Written Exam, Assignments

Alignment of Intellectual Skills CILOs:

Intellectual Skills CILOs		Teaching Strategies	Assessment Strategies
b1.	**Analyze a system both as whole and in the included parts, for understanding how these parts interact in the functionality and properties of the system.**	Lectures, Project Supervision, Self-Learning, Case Study, Simulation Exercises, Independent Study, Analysis and Problem Solving, Presentations,	Oral & Writing Exams Reports, Survey, Written Exam, Assignments
b2.	**Suggest innovative embedded systems for solving practice problems, related to SoC designing and implementation considering their constituting elements limits.**	Lectures, Project Supervision, Self-Learning, Case Study, Simulation Exercises, Independent Study, Analysis and Problem Solving, Presentations,	Oral & Writing Exams Reports, Survey, Written Exam, Assignments

Alignment of Professional and Practical Skills CILOs:

Professional and Practical Skills CILOs	Teaching Strategies	Assessment Strategies

	Develop an integrated development environment in embedded system based on software and electronical hardware tools.	Lectures, Project Supervision, Case Study, Simulation Exercises, Independent Study, Analysis and Problem Solving, Presentations,	Oral & Writing Exams Seminar Report, Assignments, Written Research Proposal.
	Apply formal method, testing, verification, validation and simulation techniques and tools in order to engineer reliable and safe embedded systems.	Lectures, Project Supervision, Self-Learning, Case Study, Simulation Exercises, Analysis and Problem Solving, Presentations,	Oral & Writing Exams Seminar Report, Assignments, Written Research Proposal.

Alignment of Transferable (General) Skills CILOs:

Transferable (General) Skills CILOs		Teaching Strategies	Assessment Strategies
	Establish a high level of skills in writing, presenting and defending research/project activities through course works.	Dissertation Defenses and Presentation, Independent Study, Presentation, Brainstorming, Presenting Researches.	Written Research Proposal, Assignments, Presentation, Written Report.
	Balance professional and ethical responsibilities including contemporary issues and environmental awareness in the field of embedded systems design and integration.	Dissertation Defenses and Presentation, Independent Study, Presentation, Brainstorming, Presenting Researches.	Written Research Proposal, Assignments, Presentation, Written Report.

I. Course Content

Theoretical Aspect

Order	Topic List / Units	Sub -Topics List	Number of Weeks	Contact Hours	Course ILOs
1	Introduction to Embedded Systems	Course Orientations: Syllabus, Aims, Objectives and LOs. An Overview on ESs & SoC design, implementation, software and applications, Review of Digital Logic and Computer Architecture Concepts, ESs & IoT growth & Advancements.	1	3	a1
2	Advanced Embedded Systems Microcontrollers	Introduction & History of ARM Microcontrollers, ARM's Types & Classifications based on their internal features and Applications. A 32-bit ARM-Cortex M3: Architecture and Internal Organization, Registers, Bus & Advanced Bus and Memories, ARM Instruction Set. ARM Arithmetic, Logic & Shift Instructions, ARM Load Instructions, ARM Timers.	3	9	a2
3	Embedded	Combinational and Sequential	3	9	a1,

	System Design, Management & Control	**Logic Circuit Design, Core of the embedded system, Memory, Sensors (resistive, optical, position, thermal) and Actuators (solenoid valves, relay/switch, opto-couplers), Communication Interface, Embedded firmware (RTOS, Drivers, Application programs), Power-supply, PCB and Passive components, Safety and reliability, environmental issues. Ethical practice.**			**a2, b1, b2, c1**
		Characteristics and quality attributes (Design Metric) of embedded system. Real time system's requirements, real time issues, and interrupt latency, Embedded Product development life cycle, Program modeling concepts: DFG, FSM, Petri-net, UML.			
		Design, Programming of an Embedded System based ARM, ARM Programming in Assembly & High-Level Language: Interrupt service routines, macros, functions, modifiers, data types, device drivers, Multithreading programming. (Laboratory work on J2ME Java mobile			

		application).			
4	Midterm Exam	Midterm Exam include ALL Previous Topics.	1	3	a1, a2, b1, b2, c1
5	Embedded Serial Communication	An overview on Serial Communications: Serial & Parallel Communications, Basic Serial Communication protocols like SPI, SCI (RS232, RS485), I2C, CAN, Field-bus (Profibus). Wireless Communication Protocols like USB (v2.0), Bluetooth, Zig-Bee and Wireless sensor network, Case Study: Embedded Systems & IoT.	2	6	a1, b1, b2, c1
6	Embedded Software, Firmware Concepts and Design	Real time operating system: POSIX Compliance, Need of RTOS in Embedded system software, Multitasking, context switching, IPC, Scheduler policies, Asynchronous and Synchronous Languages, Modeling and	2	6	a1, b1, c1

		Verification of RT Systems, **Architecture of kernel, Real-Time Kernels, Real-Time Scheduling, RM, EDF, Task scheduler, ISR, Timers, Memory Management, RTOS services in contrast with traditional OS.**			
7	Embedded SoC Design & Fault-Tolerance	**Design of the components: Memory, ALU, Datapath, Design and test of the µP, Digital Signal Processing, FIR, IIR, FFT.** **Fault-Tolerance Basics, Fault, Error, Failure, HW Fault-Tolerance, SW Fault-Tolerance.**	**2**	6	**a1, b1, b2, c1, c2**
8	Case Studies & Course Projects Presentation	**Students Presents in an individual and in Groups their course Projects, Programming Implementation and Paper Presentations works.**	1	3	**a1, a2, b1, b2, c1, c2, d1, d2**
9	Final Exam	**ALL Topics Except the Case Study & Course Project works.**	1	3	**a1, a2, b1, b2,**

					c1, c2
Number of Weeks /and Contact Hours Per Semester			**16**	**48**	

Practical Aspect				
Order	**Practical / Tutorials topics**	**Number of Weeks**	**Contact Hours**	**Course ILOs**
1	**NONE**			
2				
Number of Weeks /and Contact Hours Per Semester				

Tutorial Aspect:				
No.	**Tutorial**	**Number of Weeks**	**Contact Hours**	**Learning Outcomes (CILOs)**
1	NONE			
2				
Number of Weeks /and Units Per Semester		**15**	**30**	

II. Teaching Strategies:

Lectures,

Seminars,

Project Supervision,

Self-Learning,

Case Study,

Simulation Exercises,

Dissertation Defenses and Presentation,

Independent Study,

Analysis and Problem Solving,

Brainstorming,

Presenting Researches,

Presentations,

Group/Individual Projects and Studies,

Active learning.

X. Assessment Methods of the Course:

Oral & Writing Exams

Reports,

Survey,

Written Exam,

Assignments

Seminar Report,

Written Research Proposal.

I. Tasks and Assignments:

No	Assignments/ Tasks	Individual/ Group	Mark	Week Due	CILOs (symbols)
1	**Assignments:**	**Individual**	**10**	**5th, 10th,**	**a1, a2, b1, b2,**

	ARM Programming & Interfacing and ARM Interrupts Mechanism Embedded Systems Serial Communication Embedded Systems Software & ROS SoC Design & Implementation using VHDL			10th & 12th	c1, c2, d1, d2
2	Mini/Major Project: Graduates works and submit their individual & group Projects using Web searching, High-Level Programming to design and implement ESs & SoC products.	Individual/ Group	16	From the 4th to 14th	a1, a2, b1, b2, c1, c2, d1, d2
3	Papers presentation & Case studies	Individual/ Group	8	Work from the 4th to 14th weeks	a2, b1, b2, c1, c2, d1, d2
	Total Score		34	==	===

I. Learning Assessment:

No.	Assessment Tasks	Week due	Mark	Proportion of Final Assessment	CILOs
1	Tasks and Assignments	4th to 14th	34	34%	a1, a2, b1, b2, c1, c2,
2	Quizzes	6th & 12th	6	6%	a1, a2, b1, b2
3	Midterm Exam	8th	20	20%	a1, a2, b1, b2, c2
4	Final Exam (Theoretical)	16th	40	40%	a1, a2, b1, b2, c2
	Total			100%	===

I. Learning Resources:

Required Textbook(s):

Joseph Yiu, 2014, "The Definitive Guide to the ARM Cortex-M3 and Cortex-M4 Processors", Newnes, 3rd Ed.

James K Peckol, 2019, "Embedded Systems – A contemporary Design Tool", 2nd Ed, Weily-Blackwell.

David. A.Patterson & John L. Hennessy, 2020, "Computer Organization and Design RISC-V the Hardware Software Interface", 1st Edition, Morgan Kaufmann.

Essential References:

Shibu K V, 2009, "Introduction to Embedded Systems", Tata McGraw Hill Education Private Limited.

F. Vahid, Tony D Givargis, 2001, "Embedded System Design – A unified hardware and software introduction", 1st Ed. Wiley)

Electronic Materials and Web Sites *etc.*

Websites:

Syllabus, lecture notes and other materials can be found at

http://www.iyte.edu.tr/~tolgaayav/courses/ceng563

To access some papers with codes

http://www.githup.com

Journals:

Enquire the search engines by sub-topic mentioned in the course plan to get accurate and up-to-date information.

IEEE Publisher

https://www.ieee.org

Elsevier Publisher

https://www.elsevier.org

Science Direct Publisher

https://www.Sciencedirect.com

Course Policies الضوابط والسياسات المتبعة في المقرر	
بعد الرجوع للوائح الجامعة يتم كتابة السياسة العامة للمقرر فيما يتعلق بالآتي:	
Class Attendance: سياسة حضور الفعاليات التعليمية - يلتزم الطالب بحضور 75% من المحاضرات ويحرم في حال عدم الوفاء بذلك. - يقدم أستاذ المقرر تقريرا بحضور وغياب الطلاب للقسم ويحرم الطالب من دخول الامتحان في حال تجاوز الغياب 25% ويتم اقرار الحرمان من مجلس القسم.	1
Tardy: الحضور المتأخر - يسمح للطالب حضور المحاضرة إذا تأخر لمدة ربع ساعة لثلاث مرات في الفصل الدراسي، وإذا تأخر زيادة عن ثلاث مرات يحذر شفويا من أستاذ المقرر، وعند عدم الالتزام يمنع من دخول المحاضرة.	2
Exam Attendance/Punctuality: ضوابط الامتحان - لا يسمح للطالب دخول الامتحان النهائي إذا تأخر مقدار (20) دقيقة من بدء الامتحان - إذا تغيب الطالب عن الامتحان النهائي تطبق اللوائح الخاصة بنظام الامتحان في الكلية.	3
Assignments & Projects: التعيينات والمشاريع - يحدد أستاذ المقرر نوع التعيينات في بداية الفصل ويحدد مواعيد تسليمها وضوابط تنفيذ التكليفات وتسليمها. - إذا تأخر الطالب في تسليم التكليفات عن الموعد المحدد يحرم من درجة التكليف الذي تأخر في تسليمه.	4
Cheating: الغش - في حال ثبوت قيام الطالب بالغش في الامتحان النصفي أو النهائي تطبق عليه لائحة شؤون الطلاب. - في حال ثبوت قيام الطالب بالغش او النقل في التكليفات والمشاريع يحرم من الدرجة المخصصة للتكليف.	5
Plagiarism: الانتحال - في حالة وجود شخص ينتحل شخصية طالب لأداء الامتحان نيابة عنه تطبق اللائحة الخاصة بذلك	6
Other policies: سياسات أخرى - أي سياسات أخرى مثل استخدام الموبايل أو مواعيد تسليم التكليفات ..... الخ	7

Academic Year: 2021

Course Plan (Syllabus): Advanced Embedded Systems Design

Information about Faculty Member Responsible for the Course:								
Name	Farouk Al-Fahaidy	Office Hours						
Location &Telephone No.	777909815	SAT	SUN	MON	TUE	WED	THU	
E-mail	farouqakh@gmail.com							

General information about the course:					
).	Course Title	Advanced Embedded Systems Design			
.	Course Code and Number	CCE580/MTE531			
2.	Credit Hours	Credit Hours			Total
		ecture	Practical	eminar/Tutorial	
		3	--	--	3
3.	Study Level and Semester	st Semester (Computer) / 2nd Semester (Mechatronics)			
4.	Pre-requisites				
5.	Co –requisite				
6.	Program (s) in which the course is offered	M. S. in Computer Engineering & Control Program M. S. in Mechatronics Engineering Program			
7.	Language of teaching the course	nglish			
8.	Location of teaching the course				

Course Description:

This course provides advanced concepts on Embedded systems design, advanced

microcontrollers architecture and capabilities, as well as, System on Chip (SoC) design. The future of embedded systems and IoT lies in the advancement of technologies that enable faster communication with high interwoven connections between different devices. Course covers, an overview on advanced 32-bit ARM microcontrollers, Embedded System Design concepts & Project Management, ESs Firmware/software, ESs Digital Signal Processing and ESs Communications. Throughout course projects & case study works, students develop their skills in ESs design and implementation.

. Course Intended Learning Outcomes (CILOs):

Upon successful completion of the **Advanced Embedded Systems Design** course, graduate students will be able to:

Discuss hardware/software partitioning in system design and the strategies for embedded firmware design and development.

Explain architectural features of 32-bit ARM Microcontrollers, as well as, their instruction sets, programming and applications in sustainable design and development of embedded Systems.

Analyze a system both as whole and in the included parts, for understanding how these parts interact in the functionality and properties of the system.

Suggest innovative embedded systems for solving practice problems, related to SoC designing and implementation considering their constituting elements limits.

Develop an integrated development environment in embedded system based on software and electronical hardware tools.

Apply formal method, testing, verification, validation and simulation techniques and tools in order to engineer reliable and safe embedded systems.

Establish a high level of skills in writing, presenting and defending research/project activities through course works.

d2. Balance professional and ethical responsibilities including contemporary issues and

environmental awareness in the field of embedded systems design and integration.

Course Content

Theoretical Aspect

Order	Topic List / Units	Sub -Topics List	Number of Weeks	Contact Hours
1	Introduction to Embedded Systems	Course Orientations: Syllabus, Aims, Objectives and LOs. An Overview on ESs & SoC design, implementation, software and applications, Review of Digital Logic and Computer Architecture Concepts, ESs & IoT growth & Advancements.	1	3
2	Advanced Embedded Systems Microcontrollers	Introduction & History of ARM Microcontrollers, ARM's Types & Classifications based on their internal features and Applications. A 32-bit ARM-Cortex M3: Architecture and Internal Organization, Registers, Bus & Advanced Bus and Memories, ARM Instruction Set. ARM Arithmetic, Logic & Shift Instructions, ARM Load Instructions, ARM Timers.	3	9

3	Embedded System Design, Management & Control	**Combinational and Sequential Logic Circuit Design, Core of the embedded system, Memory, Sensors (resistive, optical, position, thermal) and Actuators (solenoid valves, relay/switch, opto-couplers), Communication Interface, Embedded firmware (RTOS, Drivers, Application programs), Power-supply, PCB and Passive components, Safety and reliability, environmental issues. Ethical practice.**	3	9
		Characteristics and quality attributes (Design Metric) of embedded system. Real time system's requirements, real time issues, and interrupt latency, Embedded Product development life cycle, Program modeling concepts: DFG, FSM, Petri-net, UML.		
		Design, Programming of an Embedded System based ARM, ARM Programming in Assembly & High-Level Language: Interrupt service routines, macros, functions, modifiers, data types, device drivers, Multithreading programming. (Laboratory work on		

		J2ME Java mobile application).		
4	Midterm Exam	Midterm Exam include ALL Previous Topics.	1	3
5	Embedded Serial Communication	An overview on Serial Communications: Serial & Parallel Communications, Basic Serial Communication protocols like SPI, SCI (RS232, RS485), I2C, CAN, Field-bus (Profibus). Wireless Communication Protocols like USB (v2.0), Bluetooth, Zig-Bee and Wireless sensor network, Case Study: Embedded Systems & IoT.	2	6
6	Embedded Software, Firmware Concepts and Design	Real time operating system: POSIX Compliance, Need of RTOS in Embedded system software, Multitasking, context switching, IPC, Scheduler policies, Asynchronous and Synchronous Languages, Modeling and Verification of RT Systems, Architecture of kernel, Real-Time Kernels, Real-Time Scheduling, RM, EDF, Task scheduler, ISR, Timers, Memory Management,	2	6

		RTOS services in contrast with traditional OS.		
7	Embedded SoC Design & Fault-Tolerance	Design of the components: Memory, ALU, Datapath, Design and test of the µP, Digital Signal Processing, FIR, IIR, FFT. Fault-Tolerance Basics, Fault, Error, Failure, HW Fault-Tolerance, SW Fault-Tolerance.	2	6
8	Case Studies & Course Projects Presentation	Students Presents in an individual and in Groups their course Projects, Programming Implementation and Paper Presentations works.	1	3
9	Final Exam	ALL Topics Except the Case Study & Course Project works.	1	3
Number of Weeks /and Contact Hours Per Semester			16	48

Practical Aspect				
Order	Practical / Tutorials topics	Number of Weeks	Contact Hours	Course ILOs
1	. NONE			

Number of Weeks /and Contact Hours Per Semester			

Training/ Tutorials/ Exercises Aspects:			
Order	**Tutorials/ Exercises**	**Week Due**	**Contact Hours**
1	**NONE**		
2			
Number of Weeks /and Contact Hours Per Semester			

Teaching Strategies:

Lectures,

Seminars,

Project Supervision,

Self-Learning,

Case Study,

Simulation Exercises,

Dissertation Defenses and Presentation,

Independent Study,

Analysis and Problem Solving,

Brainstorming,

Presenting Researches,

Presentations,

Group/Individual Projects and Studies,

Active learning.

I.Assessment Methods of the Course:

Oral & Writing Exams

Reports,

Survey,

Written Exam,

Assignments

Seminar Report,

Written Research Proposal.

I.Tasks and Assignments:

No	Assignments	Individual /Groups	Mark	Week Due
1	**Assignments:** **RM Programming & Interfacing and ARM Interrupts Mechanism** **mbedded Systems Serial Communication** **mbedded Systems Software & ROS** **Assignment 4: SoC Design & Implementation using VHDL**	**Individual**	**10**	**5th, 10th, 10th & 12th**
2	**Mini/Major Project:** **Graduates works and submit their individual & group Projects using Web searching, High-Level Programming to design and implement ESs & SoC products.**	**Individual/ Group**	**16**	**From the 4th to 14th**
3	**Papers presentation & Case studies**	**Individual/ Group**	**8**	**Work from the 4th to 14th weeks**
	Total Score		**34**	

Learning Assessment:

No	Assessment Method	Week Due	Mark	Proportion of Final Assessment %
1	Tasks and Assignments	4th to 14th	34	34%
2	Quizzes	6th & 12th	6	6%
3	Midterm Exam	8th	20	20%
4	Final Exam (Theoretical)	16th	40	40%
	Total		100	100 %

Learning Resources:

Required Textbook(s):

Joseph Yiu, 2014, "The Definitive Guide to the ARM Cortex-M3 and Cortex-M4 Processors", Newnes, 3rd Ed.

James K Peckol, 2019, "Embedded Systems – A contemporary Design Tool", 2nd Ed, Weily-Blackwell.

David. A.Patterson & John L. Hennessy, 2020, "Computer Organization and Design RISC-V the Hardware Software Interface", 1st Edition, Morgan Kaufmann.

Essential References:

Shibu K V, 2009, "Introduction to Embedded Systems", Tata McGraw Hill Education Private Limited.

F. Vahid, Tony D Givargis, 2001, "Embedded System Design – A unified hardware and software introduction", 1st Ed. Wiley)

Electronic Materials and Web Sites *etc.*

Websites:

Syllabus, lecture notes and other materials can be found at

http://www.iyte.edu.tr/~tolgaayav/courses/ceng563

To access some papers with codes

http://www.github.com

Journals:

Enquire the search engines by sub-topic mentioned in the course plan to get accurate and up-to-date information.

IEEE Publisher

https://www.ieee.org

Elsevier Publisher

https://www.elsevier.org

Science Direct Publisher

https://www.Sciencedirect.com

Course Policies الضوابط والسياسات المتبعة في المقرر	
بعد الرجوع للوائح الجامعة يتم كتابة السياسة العامة للمقرر فيما يتعلق بالآتي:	
Class Attendance: سياسة حضور الفعاليات التعليمية - يلتزم الطالب بحضور 75% من المحاضرات ويحرم في حال عدم الوفاء بذلك. - يقدم أستاذ المقرر تقريرا بحضور وغياب الطلاب للقسم ويحرم الطالب من دخول الامتحان في حال تجاوز الغياب 25% ويتم اقرار الحرمان من مجلس القسم.	1
Tardy: الحضور المتأخر - يسمح للطالب حضور المحاضرة إذا تأخر لمدة ربع ساعة لثلاث مرات في الفصل الدراسي، وإذا تأخر زيادة عن ثلاث مرات يحذر شفويا من أستاذ المقرر، وعند عدم الالتزام يمنع من دخول المحاضرة.	2
Exam Attendance/Punctuality: ضوابط الامتحان - لا يسمح للطالب دخول الامتحان النهائي إذا تأخر مقدار (20) دقيقة من بدء الامتحان - إذا تغيب الطالب عن الامتحان النهائي تطبق اللوائح الخاصة بنظام الامتحان في الكلية.	3
Assignments & Projects: التعيينات والمشاريع - يحدد أستاذ المقرر نوع التعيينات في بداية الفصل ويحدد مواعيد تسليمها وضوابط تنفيذ التكليفات وتسليمها. - إذا تأخر الطالب في تسليم التكليفات عن الموعد المحدد يحرم من درجة التكليف الذي تأخر في تسليمه.	4
Cheating: الغش	5

- في حال ثبوت قيام الطالب بالغش في الامتحان النصفي أو النهائي تطبق عليه لائحة شؤون الطلاب. - في حال ثبوت قيام الطالب بالغش او النقل في التكليفات والمشاريع يحرم من الدرجة المخصصة للتكليف.	
Plagiarism: الانتحال - في حالة وجود شخص ينتحل شخصية طالب لأداء الامتحان نيابة عنه تطبق اللائحة الخاصة بذلك	6
Other policies: سياسات أخرى - أي سياسات أخرى مثل استخدام الموبايل أو مواعيد تسليم التكليفات ..... الخ	7