COMSATS University Islamabad

Registrar Secretariate, Academic Unit (PS)

No: CUI-Reg/Notif- 2581 /24/ 2470 October 10, 2024

NOTIFICATION

Academic Council in its 39th meeting held on August 01, 2024, on the recommendations of the 35th meeting of the Board of Advance Studies and Research (BASAR) held on June 26, 2024, approved the revised Scheme of Studies of Master of Science in Computer Engineering, effective from Fall 2024.

Nomenclature of the Program: Master of Science in Computer Engineering

1. **MS WITH THESIS OPTION**

1(a). Duration:

1.1 Minimum Duration: 02 Years
1.2 Minimum No. of Semesters: 04
1.3 Maximum Duration: 04 Years
1.4 Maximum No. of Semesters: 08

1(b). No. of Courses and Credit Hours in MS with Thesis Option:

Sr. #	Category	SAME DISCIPLINE		INTRADISCIPLINARY	
		No. of Courses	No. of Credit Hours	No. of Courses	No. of Credit Hours
1.	**Deficiency Courses of level 6**	-	-	02-03	06-09
2.	**Core Courses**	02	06	02	06
3.	**Elective Courses**	06	18	06	18
4.	**Research Thesis**	01	06	01	06
5.	**Total**	**09**	**30**	**11-12**	**36-39**
6.	**Prerequisite**	The zero semester of an MS candidate shall not count towards the maximum study duration.			

2. **MS WITH NON-THESIS OPTION IN THE SAME DISCIPLINE / RELEVANT FIELD:** By selecting the MS with Non-Thesis option, a same/relevant discipline student can graduate by passing, in lieu of MS thesis, 02 additional elective courses and submitting a Non-Credit (NC) MS Project/Report. In such case, the course work consists of 11 courses (02 core courses, 08 electives, and 01 NC Project Report) accumulating in total 30 Credit Hours of course work.

MS WITH NON-THESIS OPTION IN THE INTRADISCIPLINARY FIELD: By selecting the MS with Non-Thesis option, an intradisciplinary student can graduate by passing 02-03 deficiency courses in the zero semester and then passing in subsequent semesters, in lieu of MS thesis, 02 additional elective courses and submitting a Non-Credit (NC) MS Project/Report. In such case, the course work consists of 13-14 courses (02-03 deficiency courses, 02 core courses, 08 electives, and 01 NC Project Report) accumulating in total 36-39 Credit Hours of course work.

This supersedes notification No: CUI-Reg/Notif-1939/24/2008 dated August 23, 2024 and issued as per the decision of 35th meeting of the Board of Faculty of Engineering held on October 10, 2024.

Dr. Muhammad Hanif (Ph.D)
Deputy Registrar

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List of Core Courses:

Sr. #	Course Code	Course Title	Credit Hours
1.	EEE610	Engineering Mathematics	3(3, 0)
2.	EEE621	Modeling and Simulation	3(3, 0)

List of Elective Courses:

Networks and Communications			
Sr. #	**Course Code**	**Course Title**	**Credit Hours**
1.	ETN610	Electromagnetic Field Theory	3(3, 0)
2.	ETN611	Microwave Passive Devices and Circuits	3(3, 0)
3.	ETN612	Microwave Active Devices and Circuits	3(3, 0)
4.	ETN613	Introduction to RF Front-End Design	3(3, 0)
5.	ETN614	RF System Engineering and Design	3(3, 0)
6.	ETN616	Radio Engineering	3(3, 0)
7.	ETN620	Antennas Theory, Design and Applications	3(3, 0)
8.	ETN621	Radio Wave Propagation	3(3, 0)
9.	ETN630	Radar Systems	3(3, 0)
10.	ETN631	Satellite Communications	3(3, 0)
11.	ETN640	Communications System Engineering	3(3, 0)
12.	ETN641	Digital Communications	3(3, 0)
13.	ETN642	Information Theory and Coding	3(3, 0)
14.	ETN643	Communication Signal Processing	3(3, 0)
15.	ETN644	Wireless Communication Techniques	3(3, 0)
16.	ETN650	Communication Electronics Design	3(3, 0)

17.	ETN651	Embedded System Design for Telecommunications	3(3, 0)
18.	ETN661	Telecommunication Switching Systems	3(3, 0)
19.	ETN662	Performance Analysis of Communication Systems	3(3, 0)
20.	ETN663	Telecommunication Network Management	3(3, 0)
21.	ETN664	Optical Fiber Networks	3(3, 0)
22.	ETN665	Communication System Design	3(3, 0)
23.	ETN670	Communication Networks-Architectures and Protocols	3(3, 0)
24.	ETN671	Advanced Computer Networks	3(3, 0)
25.	ETN672	Queuing Theory for Performance Modeling	3(3, 0)
26.	ETN673	Graph Theory and Network Optimization	3(3, 0)
27.	ETN675	Internet Architectures and Protocols	3(3, 0)
28.	ETN676	Internetworking: Architectures, Protocols and Applications	3(3, 0)
29.	ETN678	Design of Computer Communication Networks	3(3, 0)
30.	ETN680	Wireless Networks	3(3, 0)
31.	ETN681	Mobile Cellular Systems and Standards	3(3, 0)
32.	ETN682	Mobile and Broadband Networks	3(3, 0)
33.	ETN685	Mobile Communication Systems	3(3, 0)
34.	ETN686	Wireless Sensor Networks	3(3, 0)
35.	ETN689	Internet of Things (IoT)	3(3, 0)
36.	ETN712	Microwave Integrated Circuits	3(3, 0)
37.	ETN713	RF and Microwave Measurement Techniques	3(3, 0)
38.	ETN720	Smart Antennas for Mobile Communications	3(3, 0)
39.	ETN730	Radar Signal Processing	3(3, 0)

40.	ETN740	Advanced Communication Systems Engineering	3(3, 0)
41.	ETN741	Advanced Digital Communications	3(3, 0)
42.	ETN742	Advanced Information Theory and Coding	3(3, 0)
43.	ETN743	Adaptive Techniques for Wireless Communications	3(3, 0)
44.	ETN745	Advanced Channel Coding Techniques	3(3, 0)
45.	ETN746	Channel Estimation and Characterization	3(3, 0)
46.	ETN747	Communication Channel Modeling	3(3, 0)
47.	ETN748	Wireless Channel Modeling	3(3, 0)
48.	ETN750	Advanced Integrated Circuits for Communication	3(3, 0)
49.	ETN761	Broadband Network Architectures	3(3, 0)
50.	ETN764	Modeling and Analysis of Telecommunication Networks	3(3, 0)
51.	ETN765	Transport and Switching Technologies	3(3, 0)
52.	ETN766	Short-Range Communication Systems	3(3, 0)
53.	ETN767	Mobile Computing	3(3, 0)
54.	ETN770	IP Routing Protocols and Internetwork Design	3(3, 0)
55.	ETN771	Advanced Network Programming	3(3, 0)
56.	ETN772	Networks and Computer Security	3(3, 0)
57.	ETN773	Performance Evaluation of Computer Networks	3(3, 0)
58.	ETN774	Cryptography and Secure Communication	3(3, 0)
59.	ETN778	Network Programming Techniques	3(3, 0)
60.	ETN780	RF Network Planning and Design	3(3, 0)
61.	ETN784	Mobile Networking	3(3, 0)
62.	ETN789	Advanced Internet of Things (IoT)	3(3, 0)

Robotics and Machine Vision			
Sr. #	**Course Code**	**Course Title**	**Credit Hours**
63.	ECI624	Microcontroller/Microprocessor based Systems	3(3, 0)
64.	ECI640	Advanced Digital Signal Processing	3(3, 0)
65.	ECI641	Digital Image Processing	3(3, 0)
66.	ECI642	Digital Filters	3(3, 0)
67.	ECI650	Image, Video, and Multimedia	3(3, 0)
68.	ECI653	Fundamentals of Computer Graphics	3(3, 0)
69.	ECI660	Linear Control Systems	3(3, 0)
70.	ECI661	Digital Control Systems	3(3, 0)
71.	ECI663	Robotics	3(3, 0)
72.	ECI664	Industrial Automation and Control	3(3, 0)
73.	ECI665	Linear Systems Theory	3(3, 0)
74.	ECI671	Artificial Intelligence	3(3, 0)
75.	ECI674	Pattern Recognition	3(3, 0)
76.	ECI721	Embedded Software and RTOS	3(3, 0)
77.	ECI723	Embedded Computing Systems	3(3, 0)
78.	ECI726	Design of Real-Time Embedded Systems	3(3, 0)
79.	ECI740	Estimation of Signals and Systems	3(3, 0)
80.	ECI741	Audio Signal Processing	3(3, 0)
81.	ECI742	Adaptive Signal Processing	3(3, 0)
82.	ECI743	Computer Vision	3(3, 0)
83.	ECI744	Advanced Pattern Recognition	3(3, 0)

84.	ECI746	Detection and Estimation Theory	3(3, 0)
85.	ECI747	Advanced Filter Design	3(3, 0)
86.	ECI748	Machine Learning	3(3, 0)
87.	ECI760	Non-Linear Systems and Control	3(3, 0)
88.	ECI762	Advanced Linear Systems	3(3, 0)
89.	ECI770	Intelligent Systems	3(3, 0)
90.	EEE611	Stochastic Processes	3(3, 0)
91.	EEE723	Biologically Inspired Computing	3(3, 0)

Embedded Systems and Internet of Things (IoT)

Sr. #	Course Code	Course Title	Credit Hours
92.	ECI610	Advanced Digital Design	3(3, 0)
93.	ECI611	Logic Design and Switching Theory	3(3, 0)
94.	ECI612	Advanced Microprocessor Systems	3(3, 0)
95.	ECI613	Advanced Operating Systems	3(3, 0)
96.	ECI614	Advanced Computer Architecture	3(3, 0)
97.	ECI615	Operating Systems Fundamentals	3(3, 0)
98.	ECI620	ASIC and FPGA Design	3(3, 0)
99.	ECI621	DSP Hardware Systems Design	3(3, 0)
100.	ECI622	DSP Software Systems Design	3(3, 0)
101.	ECI623	VLSI System Design	3(3, 0)
102.	ECI630	Mobile Devices Programming	3(3, 0)
103.	ECI631	Web Technologies	3(3, 0)
104.	ECI632	Advanced Programming Techniques	3(3, 0)

105.	ECI633	Software Development Methodologies	3(3, 0)
106.	ECI634	Distributed Databases	3(3, 0)
107.	ECI635	Object Oriented Databases	3(3, 0)
108.	ECI636	Web Based Databases	3(3, 0)
109.	ECI637	Data Structures for Computer Graphics	3(3, 0)
110.	ECI710	Computer-Aided Design of Digital Systems I	3(3, 0)
111.	ECI712	Multithreaded Architectures	3(3, 0)
112.	ECI713	Parallel Processing	3(3, 0)
113.	ECI714	Diagnosis and Design of Reliable Digital Systems	3(3, 0)
114.	ECI715	Real Time Computer Systems	3(3, 0)
115.	ECI716	Probabilistic Methods in Computer Systems Modeling	3(3, 0)
116.	ECI717	Compiler Design	3(3, 0)
117.	ECI718	Analysis of Algorithms	3(3, 0)
118.	ECI720	Hardware/Software Co-Design Techniques	3(3, 0)
119.	ECI722	Mixed-Signal VLSI Systems Design	3(3, 0)
120.	ECI724	VLSI Architectures and Algorithms	3(3, 0)
121.	ECI725	Design of Systems on a Chip (SoC)	3(3, 0)
122.	ECI753	Advanced Computer Graphics	3(3, 0)

Data Engineering and Analytics

Sr. #	**Course Code**	**Course Title**	**Credit Hours**
123.	ECI670	Neural and Fuzzy Systems	3(3, 0)
124.	ECI672	Natural Language Processing	3(3, 0)
125.	ECI731	Data Warehousing	3(3, 0)

126.	ECI732	Data Mining	3(3, 0)
127.	EEE720	Modern Data Analysis Methods	3(3, 0)
Biomedical Signal and Image Processing			
Sr. #	**Course Code**	**Course Title**	**Credit Hours**
128.	BME630	Physiological Monitoring and Data Analysis	3(3, 0)
129.	BME640	Introductory Medical Imaging	3(3, 0)
130.	BME650	Bio-Medical Instrumentation	3(3, 0)
131.	BME731	Advanced Medical Imaging	3(3, 0)
132.	BME780	Special Topics in Bio-Medical Engineering	3(3, 0)
General			
Sr. #	**Course Code**	**Course Title**	**Credit Hours**
133.	ECI662	Optimization Control Theory	3(3, 0)
134.	ECI763	Multivariable Control	3(3, 0)
135.	ECI764	Adaptive Control	3(3, 0)
136.	ECI765	Robust Control	3(3, 0)
137.	EEE613	Graph Theory	3(3, 0)
138.	EEE615	Probabilistic Learning: Theory and Algorithms	3(3, 0)
139.	EEE616	Optimization Theory	3(3, 0)
140.	EEE630	Professional Development	3(3, 0)
141.	EEE631	Professional and Technical Communication	3(3, 0)
142.	EEE632	Research Methods	3(3, 0)
143.	EEE640	Innovation and Technology Development	3(3, 0)
144.	EEE641	Sociological Impact of Technology	3(3, 0)

145.	EEE642	Science, Politics and Ethics	3(3, 0)
146.	EEE650	Project Management	3(3, 0)
147.	EEE651	Engineering Project Management	3(3, 0)
148.	EEE690	Industrial Project-I	3(0, 3)
149.	EEE691	Independent Studies-I	3(0, 3)
150.	EEE692	Directed Study-I	3(0, 3)
151.	EEE710	Advanced Engineering Mathematics	3(3, 0)
152.	EEE711	Advanced Stochastic Processes	3(3, 0)
153.	EEE712	Optimization Techniques	3(3, 0)
154.	EEE714	Advanced Numerical Analysis	3(3, 0)
155.	EEE715	Numerical Linear Algebra	3(3, 0)
156.	EEE720	Modern Data Analysis Methods	3(3, 0)
157.	EEE721	Formal Specification and Modeling	3(3, 0)
158.	EEE722	Computational Biology	3(3, 0)
159.	EEE723	Biologically Inspired Computing	3(3, 0)
160.	EEE730	Advanced Professional Development	3(3, 0)
161.	EEE740	Advanced Electrochemistry	3(3, 0)
162.	EEE741	Advanced Thermal Chemistry	3(3, 0)
163.	EEE751	Project Feasibility Study	3(3, 0)
164.	EEE790	Industrial Project-II	3(0, 3)
165.	EEE791	Independent Studies-II	3(0, 3)
166.	EEE792	Directed Study-II	3(0, 3)
167.	ETN615	RF Filter Design	3(3, 0)

168.	ETN616	Radio Engineering	3(3, 0)
169.	ETN622	RF Propagation and Planning for Wireless Communications	3(3, 0)
170.	ETN632	GPS and Navigation Systems	3(3, 0)
171.	ETN660	Digital Telephony	3(3, 0)
172.	ETN674	Network Management and Operational Network Security	3(3, 0)
173.	ETN677	Internet Applications and Services	3(3, 0)
174.	ETN679	Interconnection Networks	3(3, 0)
175.	ETN683	Wireless LANs	3(3, 0)
176.	ETN684	Mobile Applications and Services	3(3, 0)
177.	ETN710	Electromagnetic Interference and Compatibility	3(3, 0)
178.	ETN711	Numerical and Computational Techniques in Electromagnetics	3(3, 0)
179.	ETN731	Modern Radar Systems	3(3, 0)
180.	ETN744	Advanced Wireless Communications	3(3, 0)
181.	ETN760	Teletraffic Engineering	3(3, 0)
182.	ETN762	Broadband Access Networks	3(3, 0)
183.	ETN763	Telecommunication Software Design	3(3, 0)
184.	ETN775	IP Telephony	3(3, 0)
185.	ETN776	Design and Analysis of Computer Communication Networks	3(3, 0)
186.	ETN777	Multimedia Networking	3(3, 0)
187.	ETN779	High-Speed Switched Local Area Networks (LANs)	3(3, 0)
188.	ETN781	Emerging Wireless Networks	3(3, 0)
189.	ETN782	QoS Architectures for Multimedia Wireless Networks	3(3, 0)
190.	ETN783	Mobile Devices Applications Development	3(3, 0)

191.	ETN785	Wireless Medium Access Techniques	3(3, 0)
192.	ETN786	Wireless Wide Area Networks (WWANs)	3(3, 0)
193.	ETN787	Wireless Metropolitan Area Networks (WMANs)	3(3, 0)
194.	ETN788	Wireless Personal and Body Area Networks (WPANs/WBANs)	3(3, 0)

MS with Thesis Option

Sr. #	Course Code	Course Title	Credit Hours
1	ECE800	MS Thesis	6(0, 6)

MS with Non-Thesis Option

Sr. #	Course Code	Course Title	Credit Hours
1	ECE600	MS Project/Report*	3(0, 3)

* For students choosing the MS with Non-Thesis option, the MS Project Report is a Non-Credit mandatory requirement for degree completion.

Tentative Semester Plan:

Semester	Course Title	Credit Hours
1st Semester	Engineering Mathematics	3(3, 0)
	Modeling and Simulation	3(3, 0)
	Elective-I	3(3, 0)
2nd Semester	Elective-II	3(3, 0)
	Elective-III	3(3, 0)
	Elective-IV	3(3, 0)
3rd Semester	Elective-V	3(3, 0)
	Elective-VI	3(3, 0)
	MS Thesis	6(0, 6)
4th Semester	MS Thesis (Continued)	6(0, 6)

Outline of Revised Course in MS Computer Engineering

Course Title: **Modeling and Simulation**
Course Code: **EEE621**
Credit Hours: **3(3, 0)**

Course Objectives:
To understand the fundamental concepts in modelling and simulation of engineering problems.

Course Description:
The modeling component of the course will focus on the principles and techniques of developing mathematical and computational representations of electrical and computer engineering systems. It will cover various types of models, including deterministic, stochastic, and dynamic models for real world problems. Case studies will illustrate practical applications, enabling students to translate real-world engineering problems into solvable mathematical models.

The simulation part of the course will explore methods for analyzing and interpreting the behavior of engineering models over time. It will introduce discrete-event simulation, continuous simulation, and hybrid simulation techniques. Students will learn to develop and implement simulations using state of the art programming and modeling software tools.

Recommended Books:

1. Meerschaert, Mark. Mathematical modeling. Academic press, 2013.

2. Giordano, Frank R., Maurice D. Weir, and William P. Fox. A first course in mathematical modeling. Pacific Grove, CA: Brooks/Cole Thomson Learning, 2003.

3. Sarker, Ruhul Amin, and Charles S. Newton. Optimization modelling: a practical approach. CRC press, 2007.