



دليل
كلية الهندسة
2020

قسم هندسة الحاسب
Computer Engineering Department

The 1st: List of General courses

أولاً:- قوائم مسميات المقررات الدراسية للمرحلة العامة :-

Humanities courses

العلوم الإنسانية

Course No.	Course name	Pre request	Credits	اسم المقرر	رقم المقرر
		المتطلبات	الوحدات		
GH141	English I	Nil	3	اللغة الإنجليزية 1	ع 141
GH142	English II	GH141	3	اللغة الإنجليزية 2	ع 142
GH150	Arabic I	Nil	2	اللغة العربية 1	ع 150
GH151	Arabic II	GH150	1	اللغة العربية 2	ع 151
GH152	Technical Writing in Arabic	GH151	1	كتابة التقارير الفنية	ع 152
Total Credits			10	إجمالي عدد الوحدات	

General Science Course

العلوم الأساسية العامة

Course No.	Course name	Pre request	Credits	اسم المقرر	رقم المقرر
		المتطلبات	الوحدات		
GS101	Mathematics I	Nil	3	الرياضيات 1	ع 101
GS102	Mathematics II	GS101	4	الرياضيات 2	ع 102
GS111	Physics I	Nil	3	الفيزياء 1	ع 111
GS112	Physics II	GS111	3	الفيزياء 2	ع 112
GS112L	Physics Lab	GS111	1	فيزياء معمل	ع 112 م
GS115	Chemistry	Nil	3	الكيمياء العامة	ع 115
GS115L	Chemistry Lab	Nil	1	الكيمياء معمل	ع 115 م
GS203	Mathematics III	GS102	3	الرياضيات 3	ع 203
GS204	Mathematics IV	GS102	3	الرياضيات 4	ع 204
GS206	Probability & Statistics	Nil	3	الإحصاء والاحتمالات	ع 206
M305	Advanced Mathematics		3	رياضيات متقدمة	ر 305
PH317	Modern Physics		3	الفيزياء المتقدمة	ف 317
Total Credits			33	إجمالي عدد الوحدات	



General Engineering Courses

العلوم الهندسية العامة

Course No.	Course name	Pre request	Credits	اسم المقرر	رقم المقرر
		المتطلبات	الوحدات		
GE121	Engineering Mechanics I	Nil	3	ميكانيكا هندسية 1	هـ ع 121
GE125	Engineering Graphics	Nil	2	الهندسة الوصفية	هـ ع 125
GE127	Engineering Drawing	Nil	2	الرسم الهندسي	هـ ع 127
GE129	Workshop Technology	Nil	2	تقنية الورش	هـ ع 129
GE129 L	Workshop Technology Lab	Nil	1	معمل تقنية الورش	هـ ع 129 م
GE133	Properties of Materials	GS101 GS111 GS115	3	خواص المواد	هـ ع 133
GE222	Engineering Mechanics II	GE121	3	ميكانيكا هندسية 2	هـ ع 222
Total Credits			16	إجمالي عدد الوحدات	

ثانياً :- قائمة مسميات المقررات الدراسية الملزمة لجميع طلبة قسم هندسة الحاسب .

The 2nd: List of Departmental Compulsory Courses

Course No.	Course name	Pre request	Credits	اسم المقرر	رقم المقرر
		المتطلبات	الوحدات		
EC201	Systems & Circuits I	GS102 + GS112	3	دوائر ومنظومات كهربائية 1	هـ حس 201
EC202	Systems & Circuits II	EC201	3	دوائر ومنظومات كهربائية 2	هـ حس 202
EC251	Intro. to Computer Programming	GS102 +GS112	3	مقدمة برمجة الحاسوب	هـ حس 251
EC252	Object Oriented Programming	EC251	3	البرمجة الكائنية التوجه	هـ حس 252
EC301	Linear Systems	EC310 + GS204	3	أنظمة خطية	هـ حس 301
EC310	Electronic Material & Devices	EC201	3	مواد ونبائط كهربائية	هـ حس 310
EC312	Electronic Circuits I	EC310 + EC201	3	دوائر إلكترونية 1	هـ حس 312
EC312L	Electronic Circuits I Lab.	EC310	1	معمل دوائر إلكترونية 1	هـ حس 312م



Course No.	Course name	Pre request	Credits	اسم المقرر	رقم المقرر
		المتطلبات	الوحدات		
EC313	Electronic Circuits II.	EC312 + EC312L	3	دوائر إلكترونية 2	ه حس 313
EC313L	Electronic Circuits II Lab.	EC312 + EC312L	1	معمل دوائر الإلكترونية 2	ه حس 313 م
EC331	Intro. To Communication Systems	EC301 + GS206	3	مقدمة منظومات الاتصالات	ه حس 331
EC331L	Intro. To Communication Systems Lab.	EC301 + GS206	1	معمل مقدمة منظومات الاتصالات	ه حس 331 م
EC351	Intro. to Computer Systems	EC251+381	3	مقدمة للأنظمة الحاسوبية	ه حس 351
EC352	Data Structures & Algorithms I	EC252	3	بنية البيانات والخوارزميات	ه حس 352
EC372	Intro. to Numerical Analysis	EC251 + GS204	3	مقدمة التحليل العددي	ه حس 372
EC381	Digital Systems I	EC201	3	منظومات رقمية I	ه حس 381
EC381L	Digital Systems I Lab.	EC201	1	معمل منظومات رقمية	ه حس 381 م
EC383	Digital Systems II	EC381 + EC381L	3	منظومات رقمية II	ه حس 383
EC383L	Digital Systems II Lab.	EC381 + EC381L	1	معمل منظومات رقمية	ه حس 383 م
EC433	Computer Networks	EC331 + EC331L	3	شبكات حاسوبية	ه حس 433
EC433L	Computer Networks Lab.	EC331 + EC331L	1	معمل شبكات حاسوبية	ه حس 433 م
EC441	Data Acquisition & Control	EC313 + EC202+EC313L	3	استحصال البيانات للقياس والتحكم	ه حس 441
EC441L	Data Acquisition & Control I Lab.	EC313 + EC202+EC313L	1	معمل استحصال البيانات للقياس والتحكم 1	ه حس 441 م
EC446	Analog Control Systems	EC313 + EC301+EC313L	3	منظومات التحكم التماثلي	ه حس 446
EC446L	Analog Control Systems Lab.	EC313 + EC301+EC313L	1	معمل منظومات التحكم التماثلي	ه حس 446 م
EC448	Digital Signal Processing	EC301 + EC372	3	معالجة الإشارات الرقمية	ه حس 448



EC451	Operating Systems	EC352+EC383+ EC351	3	نظم التشغيل	ه حس 451
EC482	Microprocessor Systems	EC351 + EC383+EC383L	3	المعالجات الدقيقة	ه حس 482
EC482L	Microprocessor Systems Lab.	EC351 + EC383+EC383L	1	معمل المعالجات الدقيقة	ه حس 482 م
EC483	Microprocessor & Embedded systems	EC482 + EC451 EC482L	3	نظم الحواسيب الصغيرة والدقيقة	ه حس 483
EC499	B.Sc. Project	EC441 + EC483	4	المشروع	ه حس 499
Total Credits			76	إجمالي عدد الوحدات	

قائمة مسميات المقررات الإختيارية لقسم هندسة الحاسب

يلزم الطالب بإختيار عدد 4 مقررات دراسية من القائمة أدناه بواقع 12 وحدة دراسية

Course No.	Course name	Pre request	Credits	اسم المقرر	رقم المقرر
		المتطلبات	الوحدات		
EC501	Adaptive Signal Processing	EC448 + EC547	3	المعالجة التكميفية للإشارات	ه حس 501
EC511	Solid State Electronics	EC310	3	الالكترونيات في الحالة الجامدة	ه حس 511
EC512	Semiconductor Device Manufacturing	EC310	3	تصنيع أشباه الموصلات	ه حس 512
EC513	Optoelectronic Devices	EC313	3	الاجهزة الالكترونية الضوئية	ه حس 513
EC514	Digital Electronics	EC313 + EC381	3	الالكترونيات الرقمية	ه حس 514
EC520	Internet Security	EC433	3	حماية شبكة المعلومات	ه حس 520
EC522	TCP/IP Protocol Design and Programming	EC433	3	تصميم و برمجة بروتوكول TCP/IP	ه حس 522
EC523	Distributed Computing	EC433,EC451	3	الحوسبة الموزعة	ه حس 523
EC530	High speed Networks	EC433	3	شبكات عالية السرعة	ه حس 530
EC531	Data Communications	EC331,EC482	3	اتصالات البيانات	ه حس 531
EC532	Optical Fiber	EC331	3	اتصالات الالياف	ه حس 532



	Communications			البصرية	
EC534	Satellite Communications	EC331	3	اتصالات عبر القمر الصناعي	هـ حس 534
EC537	Digital Communications	EC331	3	الاتصالات الرقمية	هـ حس 537
EC539	Mobile Cellular and Wireless Communications	EC433	3	الاتصالات اللاسلكية الخلوية المتنقلة	هـ حس 539
EC540	System Identification	EC446	3	تحديد النظام	هـ حس 540
EC542	Data Acquisition & Control	EC441	3	استحصال البيانات للقياس والتحكم	هـ حس 542
EC543	Identification and Adaptive Control	EC547	3	التحديد والتحكم التكيفي	هـ حس 543
EC544	Coding Theory	EC331, EC381	3	نظرية التشفير	هـ حس 544
EC545	Fuzzy Engineering	EC446	3	هندسة غامضة	هـ حس 545
EC546	Nonlinear Control	EC446	3	التحكم غير الخطي	هـ حس 546
EC547	Digital Control	EC446	3	التحكم الرقمي	هـ حس 547
EC550	Topics in S/W Engineering	EC451, EC482	3	مواضيع في هندسة البرمجيات	هـ حس 550
EC552	Data Structure & Algorithms II	EC352, EC451	3	هيكل البيانات والخوارزميات	هـ حس 552
EC554	Program Specification & Verification	EC352 + EC451	3	المواصفات والتحقق للبرمجيات	هـ حس 554
EC555	Software Engineering	EC451	3	هندسة برمجيات	هـ حس 555
EC556	Database System Design	EC352, EC451	3	تصميم أنظمة البيانات	هـ حس 556
EC557	Pattern Recognition	EC 301 + GS206	3	تمييز الأنماط	هـ حس 557
EC558	Artificial Intelligence	EC451 + EC482	3	الذكاء الاصطناعي	هـ حس 558
EC559	Advance Programming using JAVA	EC352	3	البرمجة المتقدمة باستخدام جافا	هـ حس 559
EC560	Neural Networks	EC351 + EC446	3	الشبكات العصبية	هـ حس 560
EC561	Distributed Real Time Control Sys	EC451, EC433	3	توزيع أنظمة التحكم في الوقت الحقيقي	هـ حس 561



EC565	Computer Based Instrument	EC441	3	أداة حاسوبية	565 هـ حس
EC572	Numerical Analysis II	EC372	3	التحليل العددي 2	572 هـ حس
EC573	Probabilistic Models	EC351 + GS206	3	نماذج احتمالية	573 هـ حس
EC574	Optimization Techniques	EC372	3	تقنيات الاستمثال	574 هـ حس
EC575	Modeling and Simulation	EC451	3	نمذجة ومحاكاة	575 هـ حس
EC577	Robotics	EC446	3	الانسان الآلي	577 هـ حس
EC578	Soft Computing & Applications	EC451+EC482	3	الحوسبة اللينة وتطبيقاتها	578 هـ حس
EC579	Computer Systems Performance Evaluation	EC451 + EC482	3	تقييم أداء أنظمة الحاسوب	579 هـ حس
EC580	Special Topics in Digital Systems	EC482 + EC451	3	مواضيع خاصة في النظم الرقمية	580 هـ حس
EC582	FPGA Design for Embedded Sys	EC482	3	تصميم FPGA للأنظمة المدمجة	582 هـ حس
EC583	VLSI Systems	EC483	3	أنظمة VLSI	583 هـ حس
EC584	Computer Memory and I/O	EC482	3	ذاكرة الحاسوب وبوابات الإدخال والإخراج	584 هـ حس
EC585	Computer Architecture	EC483 + EC451	3	بنية الحاسوب	585 هـ حس
EC586	Computer Graphics	EC372 + EC352	3	الرسومات الحاسوبية	586 هـ حس
EC587	Digital System Testing & Simulations	EC483	3	اختبار و محاكاة نظم رقمية	587 هـ حس
EC588	Switching Theory	EC482	3	نظرية دوائر الاستبدال	588 هـ حس
EC589	Computer Aided Design	EC313 + EC372	3	حوسبة التصميم	589 هـ حس
EC590	Computer & Society	EC451 + EC482	3	المجتمع والحاسوب	590 هـ حس
EC591	Parallel Processing	EC451 + EC482	3	المعالجة المتوازية	591 هـ حس
EC593	Digital Image Processing	EC301	3	معالجة الصور الرقمية	593 هـ حس



ملخص عدد الوحدات المطلوبة للتخرج لجميع لطلبة القسم

الإجمالي	المقررات التخصصية الإختيارية لطلبة القسم		المقررات التخصصية المأزمة لجميع طلبة القسم		العلوم الهندسية العامة		العلوم الاساسية العامة		العلوم الإنسانية		الشعبة	القسم
	النسبة المئوية من إجمالي عدد الوحدات الكلية	عدد الوحدات	النسبة المئوية من إجمالي عدد الوحدات الكلية	عدد الوحدات	النسبة المئوية من إجمالي عدد الوحدات الكلية	عدد الوحدات	النسبة المئوية من إجمالي عدد الوحدات الكلية	عدد الوحدات	النسبة المئوية من إجمالي عدد الوحدات الكلية	عدد الوحدات		
147	8.2%	12	51.7%	76	10.9%	16	22.4%	33	6.8%	10	القسم شعبة واحدة	الهندسة الحاسب

المحتوى العلمي للمقررات الدراسية التخصصية بقسم هندسة الحاسب

EC 201

Systems and Circuits I

3 Credits

Pre-requisite: GS102 and GS112

.Basic definitions of voltage current and power.Kirchhoff's voltage and current law
.Resistive basic circuit analysis, Advanced circuit analysis techniques
.Capacitors and inductors and their voltage and current relations. And related power and energy relationship, Natural and step response of first order circuit, Natural and step response of second order circuit, .Sinusoidal steady state response
AC power calculations

EC 202

System and Circuits II

3 Credits

Pre-requisite: EC 201

Magnetic fields and circuits (Energy conversion, Magnetic fields, Magnetic circuits). Transformers (AC excitation, Transformer operation, Circuit Models, Performance). Principles of electro mechanics (Translational transducers, Rotational transducers, Moving-iron devices). Direct-current machines (DC generators, DC motors). Alternating-current machines (Alternators, Synchronous motors. Induction motors).

EC 251

Introduction to Computer Programming

3 Credits

Pre-requisite: GS102 and GS112

Computer organization, main hardware components. Machine language versus high level language. Number systems –representation, conversion, and operations. Arithmetic and logical operations and expressions. Basic programming



constructs using C syntax, process, decision and loops. Arrays. Subprograms and modular programming. Input and output techniques. Pointers.

EC 252**Object Oriented Programming****3 Credits****Pre-requisites: EC 251**

This course is an introductory course in object oriented programming. The fundamental concepts of object oriented programming will be studied. It is assumed that students will be familiar with basic programming concepts and programming logic. No prior knowledge of any particular programming language is required. Grades will be assigned based on performance on examinations and programming assignments.

EC 301**Linear Systems****3 Credits****Pre-requisite: EC 310 and GS 204**

Introduction. Continuous-time systems. Laplace Transform. Fourier analysis for continuous-time systems. Discrete-time systems. z-Transform. Fourier analysis for discrete-time systems.

EC 310**Electronic Materials and Devices****3 Credits****Pre-requisite: EC 201**

Electronics in solids - energy bands, carrier density, mobility, resistivity. P-N junctions -properties (Thermal-equilibrium: Built-in potential barrier, Charge density, minority carrier concentration at equilibrium, Space charge width: depletion layer widths for n-side and p-side, Electric field and Current density of pn junction at equilibrium. Reverse bias and Forward bias), Semiconductor diodes (Zener diode, LED, LASER and photodiodes), diode's applications (Rectification, clamping, clipping, voltage regulator and voltage doubler.), characteristic of BJT and FET transistors.

EC 312**Electronic Circuits I****3 Credits****Pre-requisites: EC 201 and EC 310**

BJT and FET Transistors biasing. Stability of BJT and FET transistors, single and multistage BJT and FET amplifiers. Bode plot and transfer function, Frequency-response of single and cascaded amplifiers. IC biasing



EC 312L	Electronic Circuits I Lab.	1 Credits
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Pre-requisite: EC 201 and EC 310

Accompanies EC 312. Some experiments concerning EC 312.

EC 313	Electronics Circuits II	3 Credits
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Pre-requisites: EC 312 and EC312L

Feedback amplifiers and stability. Operational amplifiers; characteristics and applications. Waveform generators (oscillators; sine, square, triangle waves). Wave shaping circuits (multi-stable, stable multi-vibrators, pulse generators).

EC 313L	Electronic Circuits II Lab	1 Credits
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Pre-requisites: EC 312 and EC312L

Accompanies EC 313.

EC 331	Introduction to Communication Systems	3 Credits
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Pre-requisite: EC 301 and GS 206

Spectral analysis. Modulation. Amplitude modulation (AM). Double side band suppressed-carrier (DSB-SC). Single side band (SSB). Frequency division multiplexing (FDM). Angle modulation. Phase and frequency modulation. Pulse Amplitude Modulation (PAM). Pulse Width modulation (PWM). Pulse Position Modulation (PPM). Pulse code modulation (PCM). Multiplexing. Time division multiplexing in PCM. Delta modulation (DM).

EC 331L	Communication Systems Lab.	1 Credits
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Pre-requisite: EC 301 and GS 206

Accompanies EC 331

EC 351	Introduction to Computer Systems	3 Credits
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Pre-requisites: EC 251 and 381

-How are programs written in a high-level language, such as C or Java, translated into the language of the hardware, and how does the hardware execute the resulting program?

-What is the interface between the software and the hardware, and how does software instruct the hardware to perform needed functions?



- What determines the performance of a program, and how can a programmer improve the performance?
- What techniques can be used by hardware designers to improve performance?
- What techniques can be used by hardware designers to improve energy efficiency? What can the programmer do to help or hinder energy efficiency?
- What are the reasons for and the consequences of the recent switch from sequential processing to parallel processing?
- Since the first commercial computer in 1951, what great ideas did computer architects come up with that lay the foundation of modern computing?

EC 352**Data Structures and Algorithms****3 Credits****Pre-requisite: EC 252**

Packed data structures (arrays and files. Creation and retrieval of stable sparse matrices. Internal sorts algorithms. Basic operations on sequential and random files. External sorts algorithms. Strings). Dynamic data structures (linear and nonlinear. Basic operations on stacks. Arithmetic expressions translation using stacks. Linked list, double linked lists, queues, circular lists. Basic operation and application to simulation problems. Trees. Creation and parsing (traveling) algorithms).

EC 372**Introduction to Numerical****3 Credits****Pre-requisite: EC 251 and GS 204**

Computer arithmetic and errors. Conditioning and stability of computations. Real roots finding methods. Methods for solving linear systems: Gaussian elimination, factorization, and iterative methods. Interpolation methods. Approximation by polynomials. Numerical Differentiation and integration, as well as ordinary differential equations.

EC 381**Digital Systems I****3 Credits****Pre-requisite: EC 201**

Binary arithmetic. Boolean algebra. Basic logic elements and their characteristics. Combinational logic functions (adders, decoders, multiplexers, etc.) and their implementation. Flip-flops, gate level realization. Asynchronous counters and registers. Introduction to ROM, RAM, and PLAs. Analysis and design of small sequential logic systems. PLDS, FPGA.

EC 381L**Digital Systems I Lab.****1 Credits**

**Pre-requisite: EC 201**

Design, implementation and testing of combinational and sequential logic circuits using SSI and MSI logic modules (TTL & CMOS) (e.g. adders, counters, encoders, decoders, multiplexers, flip flops... etc.)

Accompanies EC 381

EC 383**Digital Systems II****3 Credits****Pre-requisite: EC 381 and EC381L**

Digital systems. Register Transfer Level Design. Data path and control unit. Control unit structure: hardwired, micro-programmed. ALU structure - integer & floating-point arithmetic functions. CPU structure - basic instructions control design. ALU & simple I/O systems.

EC 383L**Digital Systems II Lab.****1 Credits****Pre-requisites: EC 381 and EC381L**

Design, Implementation, and Testing of Register Level Digital Systems. Emphasizing the use of MSI & LSI devices.

Accompanies EC 383

EC 433**Computer Networks****3 Credits****Pre-requisites: EC 331 and EC331L**

This course will provide an introduction to computer networking technologies, including architectures, protocols, and interfaces. Addressing, routing, flow control, queuing, and routing will be discussed. It covers the concepts, vocabulary, design issues, and techniques currently used in the area of computer networks. Topics include history and evolution, transmission media, interconnection topology, control methods, protocols, types of nodes, network interfaces, performance analysis, diagnosis and maintenance, taxonomy, bridges, and gateways.

EC 433L**Computer Networks Lab.****1 Credits****Pre-requisite: EC 331 and EC331L**

Accompanies EC 433



EC 441	Data Acquisition and Control I	3 Credits
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Pre-requisite: EC 313, EC313L and EC 202

This course covers the organization of data acquisition channels with emphasis on characteristics of channel elements and computation of error budget. Topics includes sensors and transducers, instrumentation amplifiers, signal conditioning techniques, loading effects, considerations of bandwidth and stability, recovery of signals from noise, correlation and sampling techniques, Active and digital filters, in addition to A/D, D/A conversion methods. Also, the course highlights interference and noise, common mode rejection techniques for elimination of ground loops, screening, and guard techniques.

EC 441L	Data Acquisition and Control Lab.	1 Credits
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Pre-requisite: EC 313, EC313L and EC 202

Accompanies EC 441

EC 446	Analog Control Systems	3 Credits
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Pre-requisite: EC 313, EC313L and EC 301

Feedback Control systems concepts, speed and position control systems. Frequency response techniques - use of Bode, inverse Nyquist. root-locus and Nichols charts. Performance criteria, errors, sensitivity, stability and time response. Compensation techniques. State-space representation, analysis and design.

EC 446L	Analog Control Systems Lab.	1 Credits
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Pre-requisites: EC 313, EC313L and EC 301

Accompanies EC 446

EC 448	Digital Signal Processing	3 Credits
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Pre-requisites: EC 301 and EC 372

Concept of orthogonal function. Fourier series, Fourier transform. Fast Fourier transform. Analysis of discrete time systems. Frequency response, impulse response. Design of FIR filters. Window technique. Frequency sampling and



optical filters. Design of MR filters using analog techniques. Butterworth and Chebyshev filters.

EC 451	Operating Systems	3 Credits
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Pre-requisites: EC352, EC351 and EC 383

Computer systems organization. Types and functions of operating systems. Process management, Memory management, I/O management. Case studies of typical operating systems (Unix, DOS).

EC 482	Microprocessor Systems	3 Credits
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Pre-requisites: EC 383, EC383L and EC 351

Microprocessor structure. Internal bus organization. Study of instruction set and its execution process with detailed timing analysis. Various microprocessor states. I/O processors; polled interrupt and DMA driven. System bus concept and simple interface design. Case studies of the contemporary microprocessors.

EC 482L	Microprocessor Systems Lab.	1 Credits
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Pre-requisites: EC 383, EC383L and EC 351

Accompanies EC 482

EC 483	Microprocessor and Embedded Systems	3 Credits
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Pre-requisites: EC 482, EC482L and EC 451

This course is a continuation of the Microprocessor Systems. Include advanced contemporary processors architectures, memory interface, cache and memory management. Embedded systems and microcontroller technology, Microcontroller Architecture, internal RAM and Registers, microcontroller instructions and programming, interfacing the microcontroller with external memory and I/O devices, case study of an embedded system.

EC 499	B.Sc. Project	4 Credits
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Pre-requisites: EC 483 and EC 441

Professional problem - solving methods developed through intensive group and/or individual studies of significant engineering projects. Use of analytic, computer, and experimental techniques where applicable. Lecture and lab. work.



المحتوى العلمي للمقررات الدراسية الاختيارية لقسم هندسة الحاسب

EC 501	Adaptive Signal Processing	3 Credits
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Pre-requisites: EC547,EC448

Modelling: Room acoustics and multipath propagation.

Adaptive filter structures: FIR, IIR, and filter banks. Adaptation and tracking algorithms: RLS and Kalman-based adaptation. Hyper model-based design of Kalman-based trackers and of algorithms with constant gains. LMS and RLS revisited. Analysis of adaptation speed and convergence. Frequency-domain adaptation. Effects of bad excitation and non-stationary signals.

Implementation: Practical aspects, numerical effects, fixed-point calculations, the use of signal processors.

EC 511	Solid State Electronics	3 Credits
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Pre-requisites: EC310

Semiconductor materials, crystal lattice, energy bands and concentrations, carrier transport phenomena, p-n junction diode, different kinds of transistors; bipolar, microwave, power, switching and hetero-junction. Metal-semiconductor contacts, IFET, MESFET, MIS diode, MOS diode, charge-coupled device, MOSFET, nonvolatile memory devices, LED, semiconductor lasers, photoconductors, photodiodes, avalanche photodiodes, phototransistors.

EC 512	Semiconductor Devices	3 Credits
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Pre-requisites: EC313

Elements of solid state physics. Light modulation. Display device, lasers, thermal detectors, photon devices, detector performance parameters, fiber optical wave devices. Crystal growth and epitaxy. Oxidation and film decomposition. Diffusion and ion implantation. Lithography and etching. Integrated devices such as passive components, bipolar technology, MOSFET technology, MESFET technology.

EC 513	Optoelectronic Devices	3 Credits
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Pre-requisites: EC313

Electronic properties of optical semiconductors, effect of temperature and pressure on bandgap, carrier scattering phenomena, density of carries in intrinsic and extrinsic semiconductors. Optical processes in Semiconductors. High speed



lasers. strained Quantum Well Lasers. Quantum wire lasers, Quantum dot lasers current. Topics in semiconductor Lasers.

EC 514	Digital Electronics	3 Credits
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Pre-requisites: EC313, EC381

Steady state and transient analysis of RTL, DTL, TTL, I2L, ECL, and CMOS integrated circuits. Study of internal circuitry of memories (RAM, EPROM etc.). CCD structures, interfacing of IC families and discrete circuits.

EC 520	Internet Security	3 Credits
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Pre-requisites: EC433

Overview: computer hacking. Infections points. Defense mechanisms. Encryption & decryption basics. Secure encryption methods. Software attached security. Designing secure operating systems. Database security. Confidentiality, Integrity and availability. Computer communication networks security.

EC 522	TCP/IP Protocol Design and Programming	3 Credits
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Pre-requisites: EC433

TCP/IP protocol suite in details (network, transport and application layers), protocol formats and interactions, internet routing, IPv6, mobile IP, HMIP, Internet QoSs (Int-Serv, Diff-Serv, RSVP, IOverATM), and Security (IPsec, EDS, RSA) protocols, architectures. Monitor and simulate internet protocols.

EC 523	Distributed Computing	3 Credits
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Pre-requisites: EC433, EC451

Principles of distributed computing; architectures and middleware; servers, processes, and virtualization; upper-layer network protocols, inter-process communication and remote procedure calling; concurrency, synchronization and distributed algorithms, dependable distributed systems and fault tolerance.

EC 530	High Speed Networks	3 Credits
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Pre-requisites: EC433, EC433L



This course address protocols, architectures and technologies of wired and wireless high speed networks, It includes MAC and DLC protocols, Resource management, Flow control, error detection and correction, and access technologies. Topics covered include, Fast and G Ethernets, PPP WANS, Switched WANS (ATM, Frame relay, MPLS), access technologies (SDH/SONET, Wireless LANs, 3G, and WiMAX), and new paradigms in optical switching (circuit, packet, and burst switching).

EC 531	Data Communications	3 Credits
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Pre-requisites: EC331, EC482

Overview and Protocol Architecture, TCP/IP Data Transmission and Transmission Media, Signal Encoding and Digital Data Communication Schemes, Data Link Control Protocols and Multiplexing, Spread Spectrum
Introduction to Circuit and Packet Switching, Introduction to Asynchronous Transfer Mode, Local Area Network Overviews and Introduction to High Speed LANs

EC 532	Optical Fiber Communications	3 Credits
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Pre-requisites: EC331

Optical fiber communication system, advantages of optical fiber communication, spectrum of light, ray theory transmission, electromagnetic mode theory for optical propagation, cylindrical fiber, single-mode and multimode fibers, lenses, numerical aperture. Delay :-Dispersion and Distortion. attenuation and modulation frequency. optical bandwidth. Graded index fiber. Optical fiber in networking.

EC 534	Satellite Communications	3 Credits
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Pre-requisites: EC331

Satellite communication systems. Satellites. Earth stations. Propagation models and Link budget design. Modulation, coding and encryption techniques. Management and regulations of satellite communication systems. Digital broadcasting. Internet using satellite networks. Mobile cellular satellite communications.



EC 537	Digital Communications	3 Credits
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Pre-requisites: EC331

An introduction to digital communications systems and modulation and techniques, along with simulation experiments of communications systems and techniques in Matlab/Simulink. Description of AM and FM modulations, sampling and digitalization of signals, baseband and carrier-modulated digital transmission, signal detection in noise, inter-symbol interference and equalization, channel capacity, data compression techniques, error detection and correction methods.

EC 539	Mobile Cellular and Wireless Communications	3 Credits
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Pre-requisites: EC433

Introduction to wireless communication systems, modern wireless communication systems, the cellular concept-system design fundamentals (frequency reuse, channel assignment strategies, handoff strategies, interference and system capacity, trunking and grade of service). mobile radio propagation:(large-scale path loss, small-scale fading and multi-path), multiple access techniques for wireless communications :- FDMA, TDMA, SDMA, packet radio, spread spectrum multiple access :- FHMA, CDMA, system capacity performance. Wireless systems and standards:- AMPS, N-AMPS, ETACS, IS-54, IS-136, GSM, DECT and PACS.

EC 540	System Identification	3 Credits
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Pre-requisites: EC446

Parametric and nonparametric system identification. Experimental planning. Selection of model structure, parameters estimation. Least squares, stochastic interpretation. Minimum-variance prediction and control. Validation. Experimental design.

EC 542	Data Acquisition & Control	3 Credits
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**Pre-requisites: EC441**

Process control fundamentals. Final control elements (operation actuators and control elements). Data conversion systems. Signal recovery and distribution. Errors in signal processing. Interface components and techniques. Standard interface systems. Real-time computer control. Integrity of computer control systems. Microprocessor-based (simple distillation column control system. position control system, Stepping motors and temperature control system). PLC. Microcontrollers

EC 543**Identification and Adaptive Control****3 Credits****Pre-requisites: EC547**

Transfer function and impulse response identification methods. Least square identification method, maximum likelihood. Recursive identification using least squares. Adaptive control using model reference techniques, self-tuning and self tracking control. Kalman filter and its applications to identification and adaptive control.

EC 544**Coding Theory****3 Credits****Pre-requisites: EC331, EC381**

The Hamming and Lee Metrics, Description of Linear Block Codes by Matrices, Description of Linear Tree codes by Matrices, The Standard Array, step-by-step Decoding of Block Codes, Modular Representation of Linear Block codes, Linear Block Codes Equivalence, Maximum-Distance-Separable Codes Important Linear Block Codes: The Hamming codes, Optimum codes for the Binary Symmetric Channel, binary Codes with large Minimum Distance Read-Muller Codes.

EC 545**Fuzzy Engineering****3 Credits****Pre-requisites: EC446**

Fuzzy function approximation. Learning in SAMS: unsupervised clustering and supervised gradient descent. Fuzzy control and CHAOS. Fuzzy throttle controller. Control surface learning. Fuzzy signal processing. Fuzzy hardware. Fuzzy adaptive resonance theory.



EC 546	Nonlinear Control	3 Credits
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Pre-requisites: EC446

Phase plane construction: the isocline Lienard's methods. Describing functions and its applications. Lyapunov's Stability theory. Popov stability criterion.

EC 547	Digital Control	3 Credits
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Pre-requisites: EC446, EC446L

Introduction to the analysis and design of discrete-time feedback control systems. Topics include: Sampling and reconstruction of signals: S/H circuit, A/D, and D/A conversions, review of the z-transform and its properties, modified Z-transform. Transfer Functions, Block Diagrams, and SFG for digital control systems. State-Variable Technique applied to digital control systems. Controllability, Observability, and Stability. Time-Domain and Z-Domain Analysis, comparison between continuous-data and sampled-data system responses are made, steady-state analysis and root locus. Frequency-Domain Analysis of digital control systems (Nyquist criterion, Bode plot). Design of Discrete-Data Control Systems (PID design, Phase-Lead and Phase Lag Controllers, Disturbance rejection, Pole-Zero cancellation, Deadbeat-response design). State-space feedback control and observer design, pole placement, state estimator design. Quantization effects.

EC 550	Topics in Software Engineering	3 Credits
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Pre-requisites: EC451, EC482

Advanced topics in the area of Industrial applications of computers and microprocessors in process control.

EC 552	Data Structures and Algorithms II	3 Credits
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Pre-requisites: EC352, EC451

Linked stacks and queues - application: the available space list, polynomial arithmetic. Recursion: divide and conquer, postponing the work-backtracking, look-ahead. Binary trees: tree sort, building a binary search tree, height balance - AVL trees, heaps. Expansion trees: Polish notation, Pascal implementation. Graphs: computer representation, graph traversal, topological sorting, shortest path algorithm.

**EC 555****Software Engineering****3 Credits****Pre-requisites: EC252, EC451**

Introduction to Software Engineering: Professional software development, Software engineering ethics. Software Process: Software process models, Process activities, Coping with change, The Rational Unified Process. Agile Software Development: Agile methods, Plan-driven and agile development, Extreme programming. Requirements Engineering: Functional and non-functional requirements, the software requirements document, Requirements specification, Requirements engineering processes, Requirements elicitation and analysis, Requirements validation, Requirements management. System Modeling: Context models, Interaction models, Structural models, Behavioral models, Model-driven engineering. Architectural Design: Architectural design decisions, Architectural views, Architectural patterns, Application architectures.

EC 556**Database systems design****3 Credits****Pre-requisites: EC352**

Part 1: Databases and Database Users (Database System Concepts and Architecture, Data Modeling Using the Entity Relationship Model, Enhanced Entity Relationship and UML Modeling). Part 2: (RELATIONAL MODEL: CONCEPTS, CONSTRAINTS, LANGUAGES, DESIGN, AND PROGRAMMING. The Relational Data Model and Relational Database Constraints, The Relational Algebra and Relational Calculus, Relational Database Design by ER and EER to Relational Mapping, SQL: Schema Definition, Basic Constraints, and Queries, More SQL: Assertions, Views, and Programming Techniques).

EC 557**Pattern Recognition****3 Credits****Pre-requisites: EC 301, GS206**

Sensing, Segmentation, Feature extraction, training and Classification. The Bayesian decision theory, Maximum likelihood and Bayesian parameter estimation of known parametric form probability density functions, Nonparametric techniques of pattern classifications, Linear discriminate functions, and Neural networks, The Unsupervised learning and clustering.

EC 558**Artificial Intelligence****3 Credits**

**Pre-requisites: EC451, EC482**

Artificial intelligence (AI) is a research field that studies how to realize the intelligent human behaviors on a computer. The ultimate goal of AI is to make a computer that can learn, plan, and solve problems autonomously.

The main research topics in AI include: problem solving, reasoning, planning, natural language understanding, computer vision, automatic programming, machine learning, and so on.

EC 559**Advance Programming using JAVA****3 Credits****Pre-requisites: EC451, EC483**

Advanced topics about JAVA micro-edition (JME) and JAVA enterprise edition (JEE).

EC 560**Neural Networks****3 Credits****Pre-requisites: EC 351, EC446**

Biological neural networks and simple models. The artificial neuron model. Hopfield nets. Energy functions and optimization. Perceptions and threshold logic machines. Multiplayer networks and its applications.

Back propagation. Recurrent nets. Tress structured networks. Unsupervised learning. Hebbian learning. Principal component analysis. Competitive learning. Feature mapping. Self-organizing maps. Adaptive resonance theory. Hardware realization of ANNs.

EC 561**Distributed Real Time Control Systems****3 Credits****Pre-requisites: EC446**

Embedded Control systems: Design, implementation and validation of hard and soft real-time embedded control systems. Practical implementation of a modern digital controllers. Real-time operating systems. Distributed Real-Time Systems: The building blocks of a distributed real-Time control systems, performance measures and validation. Current real-time communication systems and timing constraints. Design and implementation of distributed real-time control systems. Micro controllers: Architecture and programming, I/O hardware, real-time programming. Electronic systems that include micro controllers to perform specific dedicated applications are now days in applications use.



EC 572	Numerical Analysis II	3 Credits
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Pre-requisites: EC 372

Sets of nonlinear equations: Newton method and its modifications. Large systems of linear equations: sparse matrix methods. Quadratures: Taylor, Runge-Kutta and multiroots methods. Adaptive quadratures. Initial values and boundary values problems. Stiff differential equations and stability.

EC 573	Probabilistic Models	3 Credits
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Pre-requisites: EC351, GS206

Introduction to probability theory. Random processes. Markov chains. The basic structure of queuing systems. Performance measures of a queuing systems. Little's formula. Birth and death process models. Examples of queuing systems in equilibrium. Queuing systems with finite and infinite server and population models. Erlang blocking formulae. Method of stages.

EC 574	Optimization Techniques	3 Credits
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Pre-requisites: EC372

Linear Programming: LP Formulations, Graphical and algebraic methods for solving LP's with many variables, Simplex and dual Simplex methods, Duality theory and sensitivity analysis, transportation problems, network problems and assignment problems. Nonlinear Programming: Single and multivariable unconstrained optimization, line search methods including bisection, equal interval, golden-section search. Parabolic interpolation and Newton methods; gradient optimization techniques and application including steepest descent and conjugate gradient methods. Lagrange multipliers for constrained optimization. Convexity, basic solutions, extreme values, duality, convergence rate, Lagrangian, KKT conditions. Optimization Solvers: MATLAB Optimization Tool Box, MS Excel Solver, AMPL and others.

EC 575	Modeling and Simulation	3 Credits
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Pre-requisites: EC 372 and EC451

An introduction to modeling and simulation. Discrete and continues models. Discrete-event simulation: event-oriented and process-oriented approaches, time advance mechanisms, queues, queues disciplines and stopping rules, single-server model - case study. More complex models: case studies - memory model, simple batch computer system model. Monte-Carlo simulation. Probability concepts in



modeling and simulation. Simulation languages - short review of GPSS and SIMSCRIPT.

EC 577**Intelligent Control Systems****3 Credits****Pre-requisites: EC447**

Robot Dynamics: Dynamics of flexible and rigid robots, linear parameterization, globally convergent algorithm, singular perturbations, time delay problems. Multiple and redundant robots, computational approaches to robot motion planning, C-space of a single, rigid object, obstacles in C-space. Artificial potential fields. Grasp and task-level planning. Trajectory planning. Position and force control.

Robot Control: Lagrangian and Hamiltonian formulation. Feedback linearization Design via Lyapunov's second method. Singular perturbations and integral manifolds. Robustness of adaptive control.

EC 578**Soft Computing & Applications****3 Credits****Pre-requisites: EC451**

The course provides the comprehensive treatment of the constituent methodologies underlying soft computing, an evolving branch within the scope of computational intelligence that is drawing increasingly more attention as it develops. Its main features include fuzzy set theory, fuzzy systems, neural networks, genetic algorithms, hybrid systems, and fuzzy clustering which is aimed at solving real world problems such as decision-making, modeling, recognition, classification, and control problems. In particular, course put equal emphases on theoretical aspects of covered methodologies, as well as empirical observations and verifications of various applications in practice.

EC 579**Computer Systems Performance Evaluation****3 Credits****Pre-requisites: EC451, EC482**

The course introduces the main concepts and techniques needed to plan the capacity of computer systems, predict their future performance under different configurations, and design new applications that meet performance requirements. The techniques are applied to study the performance of centralized, distributed, parallel, client/server systems. The course provides the students with hands-on experience in performance evaluation through a project.



The concept and applications of software performance engineering are also covered.

EC 580**Special Topics in Digital Systems****3 Credits****Pre-requisites: EC451, EC482**

Computer Architecture: Design methodology. CPU and ALU design. Hardware and micro programmed control. Interrupt and DMA I/O processors. VLSI, VHDL. Logic Circuit Synthesis and Optimization: Advanced design of logic circuits. Multilevel optimization of combinational circuits. Optimization of finite-state machines. Computer- aided design algorithms.

EC 582**FPGA Design for Embedded Systems****3 Credits****Pre-requisites: EC482**

With the advance of semiconductor technology, the complexity of digital circuits has increased to a level that circuit designers cannot handle without the help of modern sophisticated Electronic Design Automation (EDA) tools. This course covers the use of Verilog HDL in high-level synthesis of digital system designs. The language Verilog HDL as well as how it is used for describing, modeling, simulating and synthesizing various digital modules. Verilog HDL coding and synthesis issues on combinational and sequential modules including Finite State Machine will be discussed. In the hands-on sessions, students will synthesize and test the designs with industrial software packages (ModelSim / Quartus II) and FPGA devices. The course comprises lecture sessions on Verilog HDL language, hands-on sessions on coding, synthesis and simulation. The course study will also involve extensive lab experiments to give students hands-on experience on designing digital systems on FPGA platforms and going through a complete cycle of design.

EC 583**VLSI Systems****3 Credits****Pre-requisites: EC483**

VHDL: Modeling systems behavior in VHDL. Automated/ manual synthesis. Testing and design for testability.

Top-down VLSI design methodology. CAD tools in the VLSI CMOS circuit and subsystem design. Design tools. Simulation and verification methods. Advanced VLSI Circuits: Architecture and circuit level design and analysis of integrated A/D



and D/A interfaces in CMOS and BICMOS VLSI technology. CAD tools for analog design including simulation and synthesis.

EC 584	Design of Fault-Tolerant Digital Systems	3 Credits
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Pre-requisites: EC414

Fault-tolerant computing, demonstration of error detection and recovery. Hardware and software models. Fault –tolerant techniques, coding, check pointing recovery. Reliable networked systems. Security. Case studies of reliable system design.

EC 585	Computer Architecture	3 Credits
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Pre-requisites: EC 483 and EC451

This course deals with the design and performance evaluation of advanced/high performance computer systems. The emphasis is on microprocessors, chip-multiprocessors and memory hierarchy design. Historical information is presented as well as along with data storage and low-power dissipation schemes. Special attention is paid to pipelining, ILP (instruction-level parallelism), DLP (data-level parallelism) and TLP (thread-level parallelism) using hardware and software techniques to yield high performance.

EC 586	Computer Graphics	3 Credits
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Pre-requisites: EC372 and EC 352

Computer graphics fundamentals and applications. Computer graphics application: survey. Graphic I/O devices and systems. Graphics output primitives. Two-dimensional transformation. Intro, to interactive graphics: user interface and graphics modeling techniques.

Intro, to three-dimensional graphics transformation: hidden lines, hidden surfaces problems.

Famous graphics packages and CAD software.

EC 587	Digital Systems Testing & Simulation	3 Credits
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Pre-requisites: EC482

Modeling, Logic simulation, Event driven simulator. Automatic test patter generation. Path systemization, D-algorithm, PODEM, FAN. Fault simulation:



Serial, parallel, detective and concurrent. Design for testability: Scan path, LSSD, Signature analysis, and Functional testing.

EC 588**Switching Theory****3 Credits****Pre-requisites: EC482**

Finite state automata. Functional decomposition. Threshold logic. Multistage logic. Synchronous and asynchronous sequential design. Sequential circuit decomposition. Fault detection and diagnosis in combinational and sequential machines.

EC 589**Computer Aided Design****3 Credits****Pre-requisites: EC 313 and EC 372**

Software system for computer-aided design of the electronic circuits - an overview. Computer programs for electronic circuit analysis. Models of the circuit elements: diode, bipolar and transistor. Nodal and modified nodal methods - the realization in computer programs. AC and sensitivity analysis. Mathematical methods in computer analysis of the electronic circuits.

EC 590**Computer & Society****3 Credits****Pre-requisites: EC451 and EC482**

The course is an introductory examination of the effects of computer technology on contemporary society. Topics include productivity applications, creation of Web pages, and societal and ethical issues in computing; privacy, security, censorship, and the changes in work, school, and entertainment fostered by computing. The course is seminar based. Students taking the course will be divided into groups. Topics or mini projects will be assigned to each group, and students will be expected to engage with others in group work activities.

EC 591**Parallel Processing****3 Credits****Pre-requisites: EC 301 and EC 585**

Parallel architecture, dynamic interconnection networks, static interconnection networks, hypercube architecture, routing mechanisms, communication costs, cost-performance trade-offs, communication operations, performance of parallel



systems, parallel algorithms, matrix algorithms, sorting, search algorithms, graph algorithms.

EC 593

Digital Image Processing

3 Credits

Pre-requisites: EC 301

Image enhancement, restoration, and color image processing. Digital image generation, adjacency, connectivity, regions and boundaries, Frequency domain analysis, Image enhancement techniques in spatial and frequency domains, Image restoration in spatial and frequency domain (in presence of noise and other degradations), Color image processing, Image lossless and lossy compression.