الباب السابع

برنامج الإلكترونيات وهندسة الحاسب

اسم البرنامج		برنامج الإلكترونيات وهندسة الحاسب
اسم التخصصات		الإلكترونيات وهندسة الاتصالات هندسة الحاسب
الكلية		الهندسة والعلوم التطبيقية
الجامعة		جامعة النيل الأهلية
عدد ساعات الاتصال		محاضرات: 154.5 / تمارين: 55.5 / معمل: 40.5 250.5
(CH) الساعات المعتمدة		160
(ECTS) النقاط المعتمدة		270
عدد المقررات		58

توزيع المقررات طبقاً لمتطلبات مستويات التعلم

		CH	ECTS
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متطلبات الكلية		48	82
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توزيع المقررات طبقاً لفئات المهارات والمعارف

		CH	ECTS
العلوم الاجتماعية والانسانية		16	25
إدارة الأعمال		5	9
الرياضيات والعلوم الأساسية		29	49
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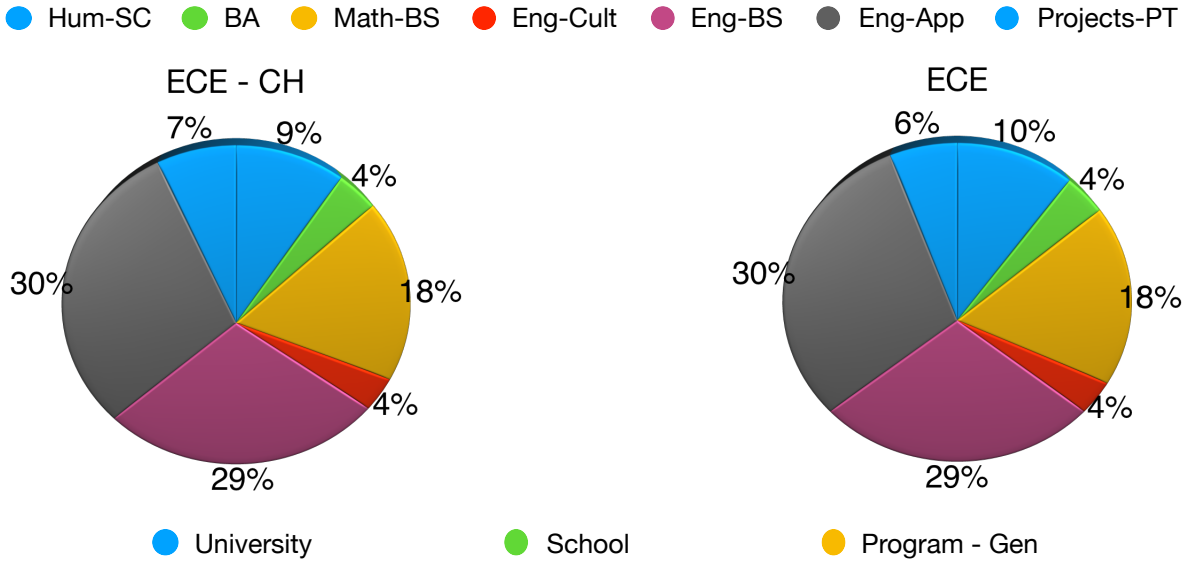
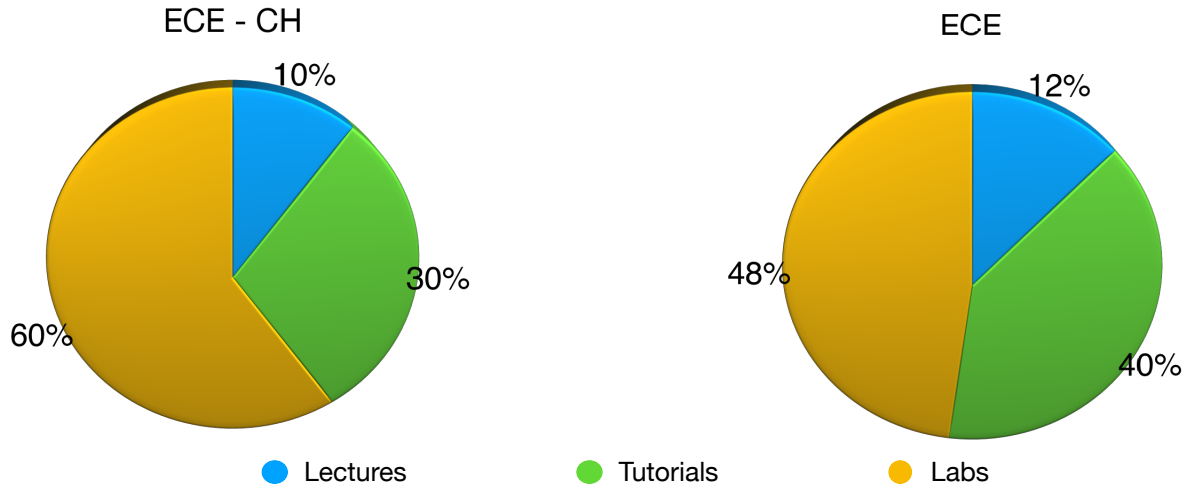
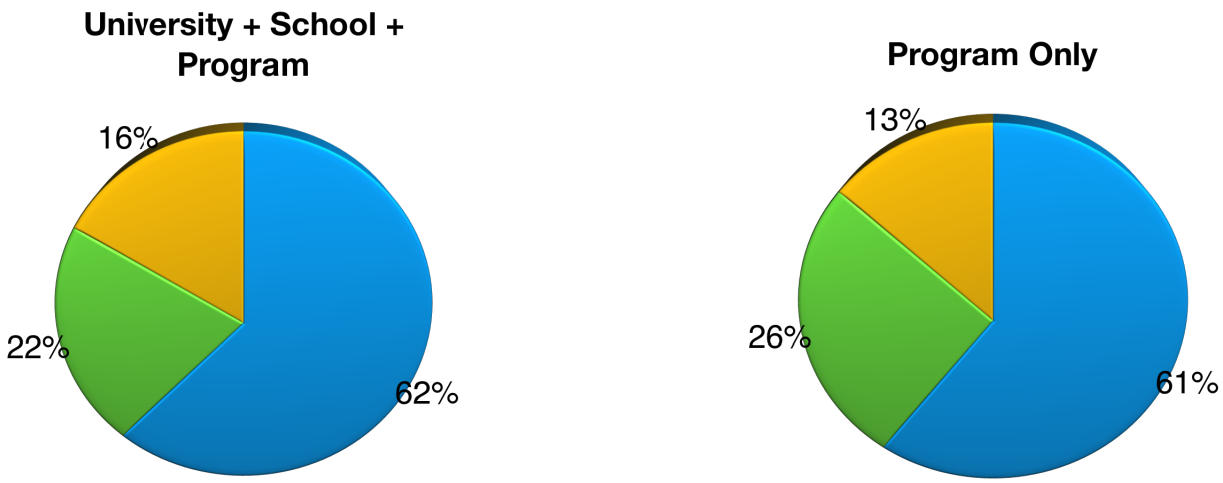
* الساعات المحسوبة في الجدول من مدخلات تخصص الإلكترونيات وهندسة الاتصالات

بيانات إحصائية:







مادة (1): رسالة البرنامج:

يهدف برنامج الالكترونيات و هندسة الحاسب إلى توفير المستوى التعليمى المتميز للطلاب من خلال تزويد الخريجين بالأسس النظرية والتطبيقات اللازمة لحل المشكلات بطريقة علمية والوعى بالدور الهام الذى تقوم به الهندسة المتخصصة للمجتمع الصناعى فى مصر وخارجها.

ويلتزم البرنامج في تحقيقه لرسالته بالتحسين المستمر في الجودة الشاملة للتعلم والبحث العلمى والأكاديمى بمشاركة الطالب بفعالية بحيث يكون هو محور العملية التعليمية. كما يتحمل البرنامج مسئولية المشاركة فى التقدم العلمى والتكنولوجى فى مجال تخصصه عن طريق توفير الأساس النظرى والعملى والتقنى للطلاب ليسمح لهم بممارسة العمل المهنى والبحثى سواءً كان هذا العمل فى المجتمع الصناعى أو فى المجال الأكاديمى أو في مراكز البحوث وبحيث يتحول التعليم بالبرنامج إلى نواة صالحة لاستكمال الدراسات العليا على مستوى الماجستير والدكتوراة. كما يتحمل البرنامج المسئولية المهنية لتقديم وسائل التعليم المستمر والتدريب المتخصص للمهندسين العاملين في الصناعة بهدف تنمية قدراتهم وإكسابهم المهارات اللازمة لتتماشى مع النمو المطرد فى التكنولوجيا الذى يشهده العالم حالياً.

مادة (2): توصيف البرنامج الدراسى بالبرنامج:

يتميز البرنامج الدراسي في الإلكترونيات و هندسة الحاسب بجامعة النيل بالمرونة والشمولية ليتماشي مع معدلات التطورالتكنولوجي من خلال طرح قاعدة عريضة من المقررات الدراسية للطلاب تشمل الالكترونيات الصلبة، والكهرومغناطيسية، والبصريات، والليزر، والضوابط، وهندسة الحاسبات، أسس الدوائر الرقمية والتناظرية، الكيمياء، الإحصاء، الإقتصاد ، تصميم الدوائر المتكاملة ، تنظيم الحاسبات، بنية الحاسبات، برمجة الحاسبات ونظم وإشارات، أسس التحكم، شبكات الحاسبات، نظم التشغيل، قواعد البيانات، هندسة البرمجيات والنظم الدفينة .

ويركز البرنامج على تصميم وتحليل الأجهزة الإلكترونية والدوائر والضوئيات والكهرومغناطيسية والأنظمة الرقمية والرقابية، بما في ذلك أنظمة التحكم والاتصالات ونظم المعلومات.

ويعتمد البرنامج علي توفير أساس علمي وتكنولوجي صلب للطلاب، مستخدما التطبيقات العملية الحديثة من خلال خطط معملية مدروسة تمكن الطالب من ربط الأساس النظرى بالجانب العملى فى تخصصات البرنامج وذلك عن طريق ربط الدراسة الأكاديمية مع احتياجات سوق العمل.

مادة (3): أهداف البرنامج:

يهدف برنامج الالكترونيات و هندسة الحاسب بجامعة النيل إلى تحقيق المستوى الأكاديمى والتقنى اللاَزم للطلاب ليتواكب مع النمو المطرد فى التكنولوجيا الحديثة فى المجتمعات المتطورة وذلك عن طريق تعليم الطلاب المبادئ الأساسية والتقنيات الحديثة فى مجال تخصصات البرنامج مع تدريب الطلاب على ممارسة المنهجية فى التفكير واستخدام الأساليب الحديثة فى حل المشاكل الهندسية مع دراية شاملة بدور هندسة الإلكترونيات والحاسبات فى نمو وتطوير المجتمعات الحديثة، ولتحقيق هذا فإن البرنامج يهدف إلى أن يكون الخريج:

1. مجهزا علمياً وتقنياً لممارسة مهنة الهندسة الكهربائية والحاسبات كمهندس حديث التخرج أو الالتحاق ببرامج دراسات عليا فى
2. مجالات الإلكترونيات والأجهزة الفيزيائية ، الكهرومغناطيسية ، الدوائر الإلكترونية ، والإشارات والأنظمة ، قادرعلى بناء أنظمة الحاسبات وتحليلها وتطويرها وتوصيفها بدقة والتعامل معها بمنهجية للوصول إلى حل لهذه المشاكل الهندسية وأن يكون قادراً على التواصل مع الآخرين بهذه النتائج.
3. تقديم الاستشارات في مجالات علوم الحاسب ونظم المعلومات.
4. قادراً على التدرج الوظيفى الناجح فى مجال تخصصه (الإلكترونيات والأجهزة الفيزيائية ، الكهرومغناطيسية ، الدوائر الإلكترونية ، الإشارات والأنظمة ، وأنظمة التحكم المميكنة) ليتبوأ المناصب القيادية كنتيجة لتمكنه من مهارات العمل المتكامل مع فريق العمل وقدرات التواصل مع الآخرين ومهارات حل المشاكل الهندسية بأسلوب منهجى.

5. تنظيم الندوات وعقد المؤتمرات العلمية بهدف تعميق مفاهيم المعلومات والمعرفة وتبادل الخبرات في مجالات التخصص مع الهيئات والمؤسسات المناظرة، لإكساب الطالب/الخريج مهارات العمل المتكامل مع فريق العمل وقدرات التواصل مع الآخرين ومهارات حل المشاكل الهندسية بأسلوب منهجى.
6. مجهزاً للعمل فى مجالات عريضة فى الهندسةالكهربائية والحاسبات من خلال اكتسابه العلوم والمهارات التقنية فى مجال التخصص الدقيق من خلال المقررات الإجبارية والاختيارية وكذلك العلوم والمهارات التقنية فى مجالات التخصص العام من خلال المقررات الإجبارية ومتطلبات برامج الهندسة بالجامعة

مادة (4): مواصفات الخريج:

المخرج الرئيسى للبرنامج هو تخريج جيل من مهندسى الإلكترونيات والحاسبات المتخصصين في مجالات مختلفة وبصفة عامة يكون الخريج:

1. ملماً بالأساس الرياضى والعلمى والتقنى لحل المشاكل الهندسية فى مجال الإلكترونيات والحاسبات.
2. قادراً على استخدام العلوم المكتسبة وتطويعها لتطوير وتصميم المنتجات والنظم الهندسية فى مجال التخصص بما يتلاءم مع احتياجات السوق والمجتمع.
3. قادراً على التواصل شفهياً وكتابةً بمهنية مع المشاركين فى العمل.
4. قادراً علي التعليم والتعلم والتطور المستمر واكتساب المهارات الجديدة.
5. مقدراً للجوانب الاجتماعية المحيطة والتى تحكمه أحياناً فى تصميم وتطوير المنتجات والخدمات الملائمة للمحيط والمجتمع الذى يعمل فيه.
6. قادراً على استخدام التقنيات الهندسية الحديثة وعلوم الحاسب الآلى.
7. قادراً على مواصلة الحصول على درجات علمية أعلى من مرحلة البكالوريوس (للطلبة المتفوقين المتميزين)

وسيكون الخريج من هذا التخصص مؤهلاً للعمل فى:

- مجالات أنظمة التحكم الإلكتروني والحاسب والذى تعتمد عليها معظم وسائل الانتاج الحديثة.
- عمليات الانتاج والتصنيع فى مجال الصناعات الدقيقة مثال صناعة الطيران والفضاء والصناعات العسكرية المتطورة.
- جميع المجالات الصناعية التى تضم تفاعل وتكامل بين أنظمة الذكاء الصناعي والأنظمة الالكترونية الحياتية وأنظمة الحاسب ومن المتوقع أن يتزايد الطلب على المهندسين المتخصصين فى هندسة الحاسبات مع بلورة الثورة الصناعية الرابعة.
- شركات التصميم و التنفيذ للحلول الالكترونية المتكاملة
- شركات تصميم النظم الالكترونية للشركات و المصانع
- شركات خدمات الإتصالات الأرضية و المحمولة
- شركات البحث و التطوير في مجال الاتصالات ونظم المعلومات
- الشركات العاملة في مجال الأقمار الصناعية و البث الإذاعي و التلفزيوني والتحكم الدقيق
- مراكز البحث العلمى و الهيئات المسئولة عن المشروعات التحكم الالكترونى و ادارة النظم
- شركات الحاسبات الالية وتصميم النظم الإلكترونية والتحكم
- مراكز الابحاث و التطوير فى المصانع و الشركات التكنولوجية.

مادة (5): جدارات خريج البرنامج / Program Graduate Competencies:

يلتزم البرنامج المقدم بالمعايير الأساسية المقترحة من قبل الهيئة القومية لضمان جودة التعليم والاعتماد كحد أدنى. والمعايير الأكاديمية لبرنامج الإلكترونيات وهندسة الحاسب يحدد القدرت والجدارات المتوقعة للخريج.

فبالإضافة إلى (**A-Level** Competencies + **U-Level** Competencies) وبالتوافق مع المعايير الأكاديمية المرجعية الوطنية (NARS-2018) فإن خريجي برنامج الإلكترونيات وهندسة الحاسب بكلية الهندسة والعلوم التطبيقية بجامعة النيل يتعين أن يكونوا قادرين على تحقيق (**B-Level** Competencies) على النحو التالي:

B-ICT Level Competencies for ICT Engineering Graduates

B_{ICT} (1)	Design, model and analyze an electrical, electronic, microwave and optical system or component for a specific ICT application and identify the tools required to optimize this design.
B_{ICT} (2)	Design, model and analyze an electrical, electronic, microwave and optical system or component for a specific ICT application and identify the tools required to optimize this design.
B_{ICT} (3)	Evaluate the performance and suitability of an electrical and electronic system and circuit under specific input excitation.
B_{ICT} (4)	Classify and evaluate the applications and market segments in the ICT market to create a specific ICT product including estimation of the required resources.

متطلبات التخصصات الفرعية في الهندسة الكهربية (الإلكترونيات وهندسة الاتصالات)

(Electronics and Communications Engineering ARS / **$C_{ICT-ECE}$- Level** Competencies)

بالإضافة إلى (**U-Level** Competencies + **A-Level** Competencies + **B-Level** Competencies) فإن خريجي برنامج الإلكترونيات وهندسة الحاسب (شعبة الإلكترونيات وهندسة الاتصالات) بكلية الهندسة والعلوم التطبيقية بجامعة النيل يتعين أن يكونوا قادرين على تحقيق (**C-Level** Competencies) على النحو التالي:

C-ICT-ECE Level Competencies for Electronics and Communications Eng. Graduates

$C_{ICT-ECE}$ (1)	Analyze analog and digital electronic circuits and systems using appropriate mathematical, numerical, and computer-based models and techniques.
$C_{ICT-ECE}$ (2)	Design, integrate, and test analog and digital, discrete and integrated, electronic circuits to realize specific functions, using the right equipment, and under specific design constraints
$C_{ICT-ECE}$ (3)	Assess and evaluate the characteristics, performance, cost benefit analysis failure of components, systems' reliability and processes to solve engineering problems, often based on limited and possibly contradicting information
$C_{ICT-ECE}$ (4)	Understand the key principles of signal processing, control theory, and the main components of analog and digital communication systems. As well as, DSP and embedded systems
$C_{ICT-ECE}$ (5)	Illustrate the key performance indicators in communication systems and networks and analyze the performance of analog and digital communication systems, as well as wireless and optical communication systems and communication networks
$C_{ICT-ECE}$ (6)	Use appropriate specialized software packages, write computer programs, and use relevant laboratory equipment for the analysis and design of electronics and communications components and systems

متطلبات التخصصات الفرعية في الهندسة الكهربية (هندسة الحاسب)

(Computer Engineering ARS / **C_{ICT-CE}- Level** Competencies)

بالإضافة إلى (**U-Level** Competencies + **A-Level** Competencies + **B-Level** Competencies) فإن خريجي برنامج الإلكترونيات وهندسة الحاسب (شعبة هندسة الحاسب) بكلية الهندسة والعلوم التطبيقية بجامعة النيل يتعين أن يكونوا قادرين على تحقيق (**C-Level** Competencies) على النحو التالي:

C-ICT-CE Level Competencies for Computer Engineering Graduates-1

C_{ICT-CE} (1)	Design an Embedded system to meet specific technical requirements especially designed for business applications
C_{ICT-CE} (2)	Apply engineering principles in the fields of logic design, circuit analysis, machine and assembly languages, computer organization and architectures, memory hierarchy, advanced computer architectures, embedded systems, signal processing, operating systems, real-time systems, environmental issues and reliability analysis
C_{ICT-CE} (3)	Assess and evaluate the characteristics, performance, cost benefit analysis failure of components, systems' reliability and processes to solve engineering problems, often on the basis of limited and possibly contradicting information
C_{ICT-CE} (4)	Write computer programs on professional levels achieving acceptable quality measures in software development
C_{ICT-CE} (5)	Use appropriate specialized computer software, computational tools and design packages throughout the phases of the life cycle of system development
C_{ICT-CE} (6)	Professionally merge the engineering knowledge, understanding, and feedback to innovate or improve design, products and/or services using latest technologies
C_{ICT-CE} (7)	Apply numerical modeling methods to engineering problems

مادة (6): تفاعل البرنامج مع احتياجات السوق:

من الأهداف الرئيسية للبرنامج هو التفاعل المستمر مع احتياجات سوق العمل حيث أن ذلك السوق هو ما يمثل المستهلك الحقيقى لنتاج البرنامج. وتماشياً مع نظام الجودة الشاملة فإن مخرجات البرنامج لابد وأن تتوافق مع متطلبات المستهلك وعليه فإن الجامعة ملتزمة بالتواصل مع الغرف التجارية و الصناعية و الممثلة للمجتمع الصناعي للتعرف على الاحتياجات الحقيقية للخريجين من البرنامج وكذلك لتشكيل قنوات مستمرة لتدريب الطلاب فى تلك المصانع.

مادة (7): التشابه والتمايز عن البرامج المشابهة

أوجه التشابه مع البرامج المشابهة:

يقدم برنامج الإلكترونيات وهندسة الحاسب بجامعة النيل نموذجاً للأسلوب المنهجى فى التعليم الجامعى فى تخصص هندسة الالكترونيات و الاتصالات وهندسة الحاسب حيث يستفيد البرنامج من الخبرات المتراكمة فى البرامج المشابهة على المستوى المحلى والمستوى الدولى لتقديم منهج دراسى متكامل يعتمد على:

- توفير الأساس النظرى المناسب للتخصص بما يواكب ما يتم تدريسه فى الجامعات العريقة محلياً وعالمياً وللبرنامج مكونان أساسيان:
- تقديم الأساس النظرى والذى يخدم فئة المهندسين بصفة عامة لتكوين الأرضية الثابتة للتقدم فى علوم التخصص.

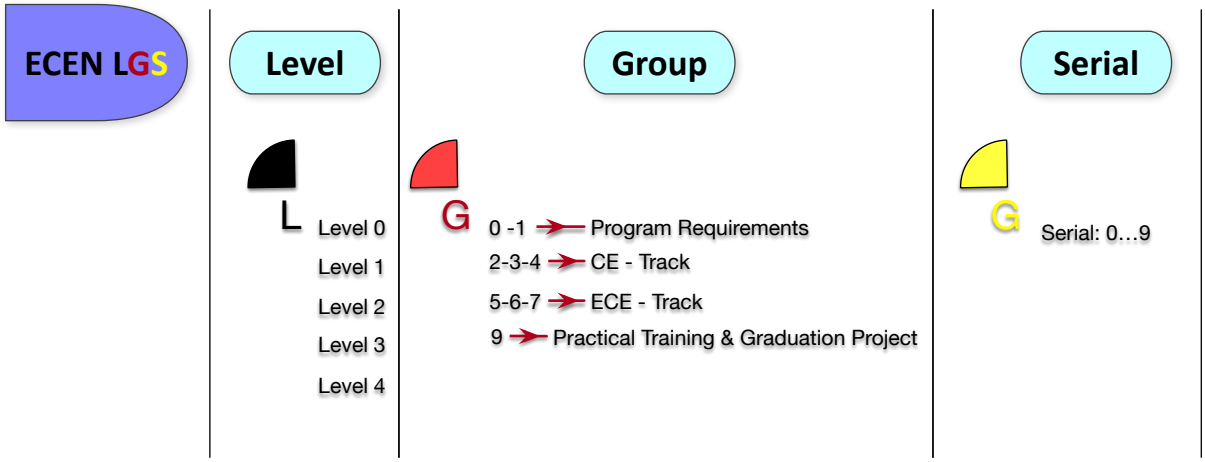
- تقديم المادة العلمية والعملية التى ترتفع بمستوى الطلاب إلى مستوى التخصص معتمداً على دراسة لما يتم تدريسه بالأقسام المماثلة فى مصر وخارجها.

يتمايز البرنامج بكونه يقدم للدارسين رؤية شاملة ومتكاملة في مجال الإلكترونيات وهندسة الحاسب من خلال التركيز على طرق التصميم و التصنيع و الاختبارات المختلفة فى الهندسة الالكترونية ودعم ذلك بنظم الاتصالات الحديثة

- استخدام طرق البحث العلمى لتشجيع الطلاب للاطلاع على الجديد فى مجال هندسة الالكترونيات والاتصالات وهندسة الحاسب.
- وضع الطلاب فى بيئة مشابهة لبيئة العمل اثناء الدراسة من اجل اكتساب المهارات العملية.
- توفير معامل متكاملة للتطبيقات العملية المصاحبة للدراسة النظرية.
- توفير نظام الساعات المعتمدة وكذلك نظام النقاط المعتمدة الأوروبي والذى يتيح للطلبة الاختيار من مجموعة من المقررات للتعمق فى تخصص أكثر دقة من التخصص العام مع الحفاظ على إمكانية المشاركة الفعالة في الأنشطة الأكاديمية والاجتماعية.
- توفير خطة تدريب عملى داخل وخارج الجامعة لتتماشى مع متطلبات المقررات الدراسية والتطور المستمر فى احتياجات سوق العمل.

مادة (8): تصميم كود المقررات في برنامج الإلكترونيات وهندسة الحاسب:

تم تصميم كود المقررات في برنامج لإلكترونيات وهندسة الحاسب ليتوافق مع نظام تكويد المقررات في جامعة النيل والمتوافق مع توصيات لجنة قطاع التعليم الهندسي بحيث يميز الرقم الثاني من الشق العددي من كود المقرر المجال الدقيق في البرنامج على النحو التالي:



مادة (9): المقررات الدراسية ومدى ملاءمتها لمخرجات البرنامج المستهدفة:

وللحصول على درجة بكالوريوس العلوم في الإلكترونيات وهندسة الحاسب ولتحقيق مخرجات التعلم المستهدفة للبرنامج وللتوافق مع قدرات وجدارات الخريج الموصفة من قبل هيئة ضمان الجودة والاعتماد لتخصص ICT Engineer فإنه يتعين على الطالب أن يجتاز بنجاح المقررات التالية المقسمة إلى مستويات (متطلبات الجامعة - متطلبات الكلية - متطلبات البرنامج - متطلبات التخصص).

ECE University Core Requirements (10 courses = 16 CH)

Code No.	Course Title	No. of hours / week			CH	ECTS	SWL	جدارات
		Lec	Tut	Lab				
ENGL 001	Intensive English	0	0	0	0	0	0	U2
ENGL 002	English I	0	0	0	0	0	50	U2
ENGL 003	English II	0	0	0	0	0	50	U2
ENGL 101	Writing Skills	4.5	0	0	3	5	125	U2
ENGL 102	Communication and Presentation Skills	4.5	0	0	3	5	125	U2
HUMA 001	Introduction to Scientific & Critical Thinking	3	0	0	2	3	75	U3
HUMA 002	Introduction to Ethics	3	0	0	2	3	75	U4
HUMA 003	Selected Topics in Humanities & Arts	3	0	0	2	3	75	U1 U5
SSCI 001	Selected Topics in Social Sciences	3	0	0	2	3	75	U1 U5 U6
SSCI 002	Selected Topics in World Cultures and Diversity	3	3	0	2	3	75	U1 U6
Total Number of Credits	**10**	**24**	**3**	**0**	**16**	**25**	**725**	

ECE Engineering Core Requirements (16 courses = 48 CH)

Code No.	Course Title	No. of hours / week			CH	ECTS	SWL	جدارات
		Lec	Tut	Lab				
CHEM 001	Chemical Principles	3	0	1.5	3	5	125	A1 A2 A4
CSCE 001	Computer & Information Skills	1.5	0	4.5	3	5	125	A1 A10
CSCE 002	Introduction to Programming	1.5	0	4.5	3	5	125	A1 A6 A10
ECEN 101	Electric Circuits	3	0	1.5	3	5	125	A1 A3 A5 A6 A9 A10
ENGR 001	Introduction to Engineering	1.5	0	3	3	5	125	A2 A3 A5 A6 A7
ENGR 002	Introduction to Engineering Design	1.5	0	3	3	5	125	A2 A3 A6 A7 A9
MATH 001	Analytical Geometry & Calculus I	3	1.5	0	3	5	125	A1 A4 A7 A8 A10
MATH 002	Calculus II	3	1.5	0	3	5	125	A1 A2 A5 A7 A8 A10
MATH 103	Probability & Statistics for Engineers	3	1.5	0	3	5	125	A3 A4 A6 A8 A9
MATH 104	Linear Algebra	3	1.5	0	3	5	125	A1 A3 A6 A7 A8
MATH 205	Differential Equations	3	1.5	0	3	5	125	A2 A4 A5 A7 A9 A10
MATH 206	Nummerical Methods	3	1.5	0	3	5	125	A1 A2 A4 A6 A8 A10
MENG 101	Engineering Mechanics I - Statics	3	0	0	2	4	100	A1 A2
MENG 102	Engineering Mechanics II - Dynamics	3	0	0	2	4	100	A1 A2
PHYS 001	Physics I	3	1.5	1.5	4	7	175	A1 A3 A4 A7 A8 A10
PHYS 002	Physics II	3	1.5	1.5	4	7	175	A1 A2 A4 A5 A6 A9
Total Number	**16**	**42**	**12**	**21**	**48**	**82**	**2050**	

ECE Program Requirements (16 courses - 48 CH)

Code No.	Course Title	No. of hours / week			CH	ECTS	SWL	Competencies
		Lec	Tut	Lab				
ECEN 202	Fundamentals of Electrical Engineering	3	1.5	1.5	3	5	125	A2 A3 B1 B3
ECEN 203	Fundamentals of Computer Engineering	3	1.5	0	3	5	125	A3 A10 B2 B4
ECEN 204	Fundamentals of Data Structures & Algorithms	3	1.5	0	3	5	125	A1 A6 A9 A10 B1
ECEN 302	Economics and Project Management in ECE Applications	3	1.5	0	3	5	125	A6 A9 B4
ECEN 305	Introduction to Computer Systems	3	1.5	1.5	3	5	125	A3 A5 B1 B4
ECEN 311	Analysis and Design of Analog Circuits	3	1.5	1.5	3	5	125	A1 A4 A8 B1 B3
ECEN 312	Analysis and Design of Digital Circuits	3	1.5	1.5	3	5	125	A1 A8 B1 B2
ECEN 313	Signals and Systems	3	1.5	1.5	3	5	125	A2 A10 B1
ECEN 314	Fundamentals of Communications	3	1.5	1.5	3	5	125	A1 A4 B2
ECEN 315	Fundamentals of Control	3	1.5	1.5	3	5	125	A1 A2 A5 B4
ECEN 316	Electric Machines	3	0	1.5	3	5	125	A3 A4 B3 B4
ECEN 391	Practical Training	0	0	0	3	6	150	A8 A9 A10 B3
ECEN 406	Microprocessor System Design	3	1.5	0	3	5	125	A2 A5 A10 B2
ECEN 493	Graduation Project I	3	0	0	3	6	180	A7 A10 B1 B4
ECEN 495	Graduation Project II	3	0	0	3	6	180	A7 A10 B1 B4
ENTR 301	Selected Topics in Entrepreneurship	1.5	1.5	0	2	4	100	A3 A9 A10 B2 B4 C3
NSCI 102	Selected Topics in Environmental Science	3	3	0	4	6	150	A3 A4 A5 B2
Total Number	**17**	**46.5**	**21**	**12**	**51**	**88**	**2260**	

Specialization Track 1 - Electronics and Communications Eng. (16 courses = 48 CH)

Code No.	Course Title	No. of hours / week			CH	ECTS	SWL	جدارات
		Lec	Tut	Lab				
ECEN 351	Fundamentals of Semiconductor Devices	3	1.5	0	3	5	125	A1 A2 A10 B1 C1 C3
ECEN 371	Fundamentals of Electromagnetics	3	1.5	0	3	5	125	A1 A2 A8 B1 C4
ECEN 372	Applied Electromagnetics	3	1.5	0	3	5	125	B1 C3 C4 C5 C6
ECEN 452	Physical Sensors, Transducers and Instrumentation	3	1.5	1.5	3	5	125	A2 A5 A10 B2 C1 C5
ECEN 453	Analog and Digital Electronics Lab	1.5	0	3	3	5	125	A2 B2 B3 C4 C5 C6
ECEN 454	Analog and Digital Filters and Communications Circuits	3	1.5	0	3	5	125	A2 A3 A5 B1 C6
ECEN 462	Digital Communications	3	1.5	0	3	5	125	A3 A9 B4 C3 C5 C6
ECEN 463	Wireless Communication	3	1.5	0	3	5	125	A2 A9 B2 B4 C4 C6
ECEN 464	Communications Networks	3	1.5	0	3	5	125	A5 A7 B3 C3 C4 C6
ECEN 465	Communications Design Lab	1.5	0	3	3	5	125	A4 B1 C3 C4 C5 C6
ECEN 466	Digital Signal Processing	3	1.5	0	3	5	125	A2 A4 B1 C2 C6
ECEN xxx	Elective-1	3	1.5	0	3	5	150	(from list below)
ECEN xxx	Elective-2	3	1.5	0	3	5	150	(from list below)
ECEN xxx	Elective-3	3	1.5	0	3	5	150	(from list below)
ECEN xxx	Elective-4	3	1.5	0	3	5	150	(from list below)
Total Number	**15**	**42**	**19.5**	**7.5**	**45**	**75**	**1975**	

ECE list of Electives (Track 1 - Electronics and Communications Engineering)

Code No.	Course Title	No. of hours / week			CH	ECTS	SWL	جدارات
		Lec	Tut	Lab				
ECEN 455	Analog Integrated Circuit Design	3	1.5	0	3	5	125	A1 A2 B1 C2
ECEN 456	Digital Integrated Circuit Design	3	1.5	0	3	5	125	A1 A2 B1 C2
ECEN 457	Micro and Nano Systems Fabrication	3	1.5	0	3	5	125	A1 A3 A5 A10 C3
ECEN 458	FPGA and ASIC Design	3	1.5	0	3	5	125	A8 B2 B4 C2 C6
ECEN 459	Introduction to Electronic Design Automation (EDA and CAD)	3	1.5	0	3	5	125	A3 A5 C3 C6
ECEN 468	Advanced Communication Systems	3	1.5	0	3	5	125	B4 C3 C4 C5
ECEN 469	Selected Topics in Communications	3	1.5	0	3	5	125	A5 A8 A10 C4 C5
ECEN 470	Introduction to Optical Communication Systems	3	1.5	0	3	5	125	A4 B2 B4 C4 C5
ECEN 473	Antenna and Propagation	3	1.5	0	3	5	125	A4 B1 C3 C4 C5 C6
ECEN 474	Radio Frequency Integrated Circuit Design and Implementation	3	1.5	0	3	5	125	A2 A4 B1 C2 C6
ECEN 481	Mechatronic Design	3	1.5	0	3	5	125	A3 A4 B1 B2 C2 C6

Specialization Track 2 - Computer Eng. (16 courses = 48 CH)

Code No.	Course Title	No. of hours / week			CH	ECTS	SWL	جدارات
		Lec	Tut	Lab				
ECEN 324	Computer Systems Software	3	1.5	0	3	5	125	A1 A6 B2 C2 C5
ECEN 421	Introduction to Computer Networks	3	1.5	0	3	5	125	A2 A5 B1 B4 C3 C5
ECEN 422	Introduction to Computer Security	3	1.5	0	3	5	125	A7 A10 B3 C4 C6
ECEN 424	Introduction to Databases Systems	3	1.5	0	3	5	125	A2 A5 A8 A10 B2 C4
ECEN 425	Machine Intelligence	3	1.5	0	3	5	125	A1 A5 B1 B3 C7
ECEN 427	Operating Systems	3	1.5	0	3	5	125	A2 A4 B1 B4 C2 C4
ECEN 428	Software Engineering	3	1.5	0	3	5	125	A2 A10 B3 C1 C3
ECEN 432	Introduction To Computer Architecture	3	1.5	1.5	3	5	125	A3 A5 B1 B3 C2 C3
ECEN 433	Introduction to Parallel Computing	3	1.5	0	3	5	125	A2 A10 B2 C2 C6
ECEN 435	Embedded Real-Time Systems	3	1.5	1.5	3	5	125	A3 B1 C1 C4 C6
ECEN 438	Advanced Computer Architecture	3	1.5	0	3	5	125	A2 A5 A9 B3 C2 C4
ECEN XXX	Technical Electives	3	1.5	0	3	5	150	From list below
ECEN XXX	Technical Electives	3	1.5	0	3	5	150	From list below
ECEN XXX	Technical Electives	3	1.5	0	3	5	150	From list below
ECEN XXX	Technical Electives	3	1.5	0	3	5	150	From list below
Total Number	**15**	**45**	**22.5**	**3**	**45**	**75**	**1975**	

ECE list of Electives (Track 2 - Computer Engineering)

Code No.	Course Title	No. of hours / week			CH	ECTS	SWL	جدارات
		Lec	Tut	Lab				
ECEN 430	Selected Topics in Computer Engineering	3	1.5	0	3	5	125	A2 A8 B2 B4 C2 C6
ECEN 448	Numerical Methods and Mathematical Precision of Floating Numbers	3	1.5	0	3	5	125	A1 A2 B3 C3 C7
ECEN 449	Compiler Construction	3	1.5	0	3	5	125	A3 A7 A10 B3 C2 C4
ECEN 452	Physical Sensors, Transducers and Instrumentation	3	1.5	1.5	3	5	125	A2 B1 B2 B3
ECEN 463	Wireless Communication	3	1.5	0	3	5	125	A3 A9 B4 C3 C7
ECEN 466	Digital Signal Processing	3	1.5	0	3	5	125	A2 A3 B2 C2 C4
ECEN 467	Image Processing and Bio-image Informatics	3	1.5	0	3	5	125	A2 A5 A9 B1 B3 C4 C5 C7
ECEN 481	Mechatronic Design	3	1.5	0	3	5	125	A3 B1 B2 C1 C7

مادة (10): توزيع مقررات البرنامج على الفئات المقترحة في (NARS):

ECE Course Mapping to Subject Categories (NARS)

Course Code	Course Title	Hum. & Social Sci.		Business Admin.		Math & Basic Sci.		Eng. Culture		Basic Eng. Sci.		Eng. App. & Design		Project & PT	
		CH	ECTS	CH	ECTS	CH	ECTS	CH	ECTS	CH	ECTS	CH	ECTS	CH	ECTS
	University Requirements														
ENGL 001	Intensive English														
ENGL 002	English I	0	0												
ENGL 003	English II	0	0												
ENGL 101	Writing Skills	3	5												
ENGL 102	Communication and Presentation Skills	3	5												
HUMA 001	Introduction to Scientific & Critical Thinking	2	3												
HUMA 002	Introduction to Ethics	2	3												
HUMA 003	Selected Topics in Humanities & Arts	2	3												
SSCI 001	Selected Topics in Social Sciences	2	3												
SSCI 002	Selected Topics in World Cultures and Diversity	2	3												
	Total University Requirements	**16**	**25**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	Engineering Requirements														
CHEM 001	Chemical Principles					3	5								
CSCE 001	Computer & Information Skills									3	5				
CSCE 002	Introduction to Programming									3	5				
ECEN 101	Electric Circuits									3	5				
ENGR 001	Introduction to Engineering							3	5						
ENGR 002	Introduction to Engineering Design									3	5				
MATH 001	Analytical Geometry & Calculus I					3	5								
MATH 002	Calculus II					3	5								
MATH 103	Probability & Statistics for Engineers					3	5								
MATH 104	Linear Algebra					3	5								
MATH 205	Differential Equations					3	5								
MATH 206	Nummerical Methods					3	5								
MENG 101	Engineering Mechanics I - Statics									2	4				
MENG 102	Engineering Mechanics II - Dynamics									2	4				
PHYS 001	Physics I					4	7								
PHYS 002	Physics II					4	7								
	Total Engineering Requirements	**0**	**0**	**0**	**0**	**29**	**49**	**3**	**5**	**16**	**28**	**0**	**0**	**0**	**0**
	Program Requirements														
ECEN 202	Fundamentals of Electrical Engineering									3	5				
ECEN 203	Fundamentals of Computer Engineering									3	5				
ECEN 204	Fundamentals of Data Structures & Algorithms									3	5				
ECEN 302	Economics and Project Management in ECE Applications			3	5										
ECEN 305	Introduction to Computer Systems									3	5				
ECEN 311	Signals and Systems											3	5		
ECEN 312	Analysis and Design of Digital Circuits											3	5		
ECEN 313	Signals and Systems									3	5				
ECEN 314	Fundamentals of Communications									3	5				
ECEN 315	Fundamentals of Control									3	5				
ECEN 316	Electric Machines											3	5		
ECEN 391	ECEN 391													3	6
ECEN 406	Microprocessor System Design											3	5		
ECEN 493	Graduation Project I													3	6

Course Code	Course Title	Hum. & Social Sci.		Business Admin.		Math & Basic Sci.		Eng. Culture		Basic Eng. Sci.		Eng. App. & Design		Project & PT	
		CH	ECTS	CH	ECTS	CH	ECTS	CH	ECTS	CH	ECTS	CH	ECTS	CH	ECTS
ECEN 495	Graduation Project II													3	6
NSCI 102	Selected Topics in Environmental Science							4	6						
49	**Total Program Requirements**	0	0	3	5	0	0	4	6	21	35	12	20	9	18
	Specialization 1 (Electronics and Communications Engineering)														
ECEN 351	Fundamentals of Semiconductor Devices									3	5				
ECEN 371	Fundamentals of Electromagnetics									3	5				
ECEN 372	Applied Electromagnetics											3	5		
ECEN 452	Physical Sensors, Transducers and Instrumentation									3	5				
ECEN 453	Analog and Digital Electronics Lab											3	5		
ECEN 454	Analog and Digital Filters and Communications Circuits											3	5		
ECEN 462	Digital Communications											3	5		
ECEN 463	Wireless Communication											3	5		
ECEN 464	Communications Networks											3	5		
ECEN 465	Communications Design Lab											3	5		
ECEN 466	Digital Signal Processing											3	5		
ENTR 301	Selected Topics in Entrepreneurship			2	4										
ECEN xxx	Elective - 1											3	5		
ECEN xxx	Elective - 2											3	5		
ECEN xxx	Elective - 3											3	5		
ECEN xxx	Elective - 4											3	5		
47	**Total Specialization 1 Requirements**	0	0	2	4	0	0	0	0	9	15	36	60	0	0
160	**Total ECE**	16	25	5	9	29	49	7	11	46	78	48	80	9	18
	Course Category %	10.0%		3.1%		18.1%		4.4%		28.8%		30.0%		5.6%	
	Specialization 1 (Computer Engineering)														
ECEN 324	Computer Systems Software									3	5				
ECEN 421	Introduction to Computer Networks											3	5		
ECEN 422	Introduction to Computer Security											3	5		
ECEN 424	Introduction to Databases Systems									3	5				
ECEN 425	Machine Intelligence											3	5		
ECEN 427	Operating Systems											3	5		
ECEN 428	Software Engineering											3	5		
ECEN 432	Introduction To Computer Architecture											3	5		
ECEN 433	Introduction to Parallel Computing									3	5				
ECEN 435	Embedded Real-Time Systems											3	5		
ECEN 438	Advanced Computer Architecture											3	5		
ENTR 301	Selected Topics in Entrepreneurship			2	4										
ECEN xxx	Elective - 1											3	5		
ECEN xxx	Elective - 2											3	5		
ECEN xxx	Elective - 3											3	5		
ECEN xxx	Elective - 4											3	5		
47	**Total Specialization 2 Requirements**	0	0	2	4	0	0	0	0	9	15	36	60	0	0
160	**Total ECE**	16	25	5	9	29	49	7	11	46	78	48	80	9	18
	Course Category %	10.0%		3.1%		18.1%		4.4%		28.8%		30.0%		5.6%	

مادة (11): مصفوفة مخرجات المقررات الدراسية ومدى ملاءمتها للمخرجاتها المستهدفة للبرنامج:

ECE Program Requirements Course - Competencies matrix

MENG Core Requirements		U1	U2	U3	U4	U5	U6	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4
		Uni. Competencies (U-Level)						Eng. Competencies (A-Level)										Mechanical. Eng. (B-Level)			
	Program Requirements																				
ECEN 202	Fundamentals of Electrical Engineering								X	X								X		x	
ECEN 203	Fundamentals of Computer Engineering									X							X		X		X
ECEN 204	Fundamentals of Data Structures & Algorithms							x					x			x	x	x			
ECEN 302	Economics and Project Management in ECE Applications												x			x					X
ECEN 305	Introduction to Computer Systems									X		X						X			X
ECEN 311	Analysis and Design of Analog Circuits							X			X				X			X		x	
ECEN 312	Analysis and Design of Digital Circuits							X							X			X	X		
ECEN 313	Signals and Systems								x								x	x			
ECEN 314	Fundamentals of Communications							X			X								X		
ECEN 315	Fundamentals of Control							X	X			X									X
ECEN 316	Electric Machines									x	x									x	x
ECEN 391	Practical Training														X	X	X			X	
ECEN 406	Microprocessor System Design								X			X					X		X		
ECEN 493	Graduation Project I													x			X	X			x
ECEN 495	Graduation Project II													x			X	X			X
NSCI 102	Selected Topics in Environmental Science									x	x	x							x		

ECE Track 1 (Electronics and Com. Eng.) Course - Competencies matrix

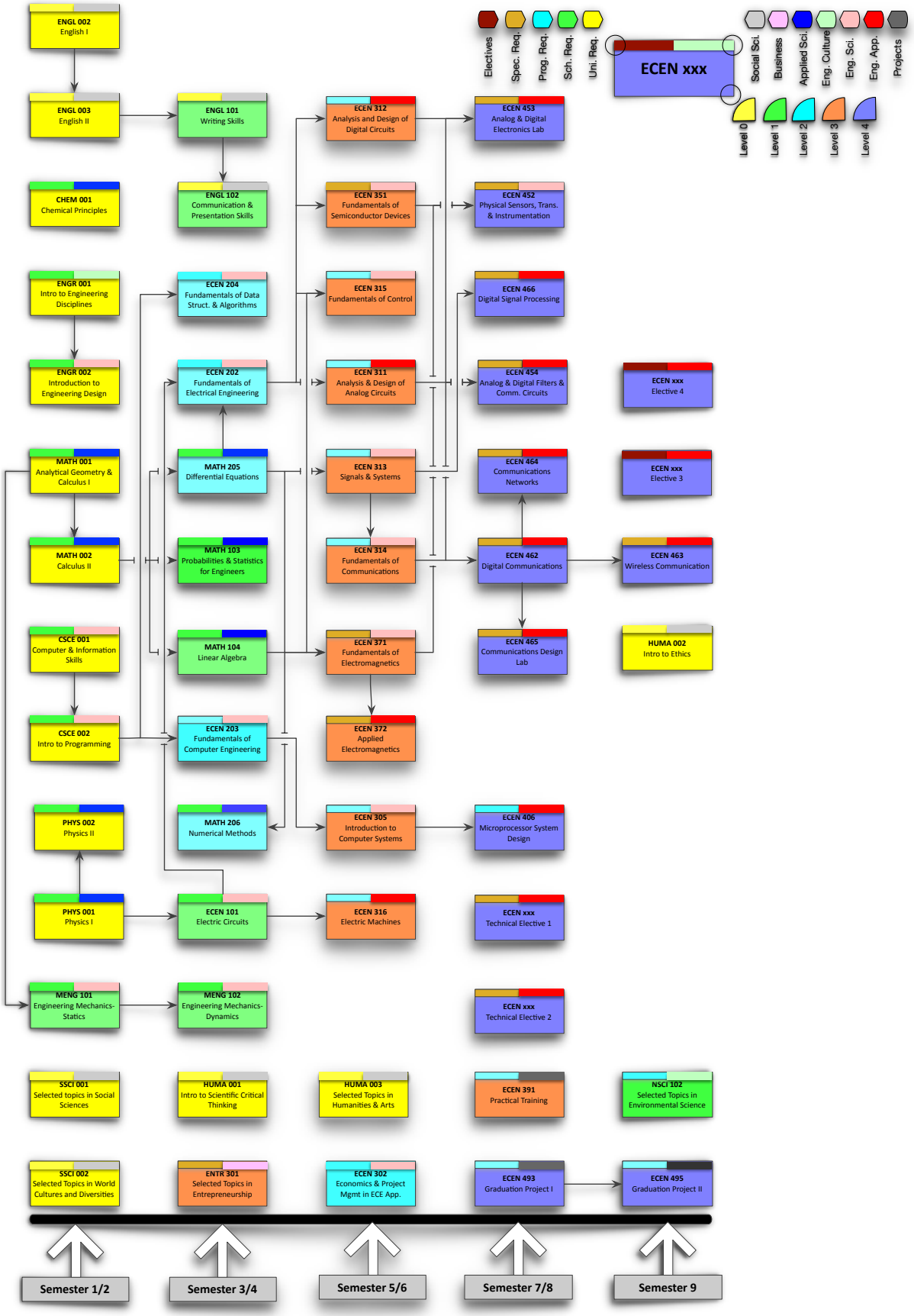
ECE program		U1	U2	U3	U4	U5	U6	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	C1	C2	C3	C4	C5	C6
		Uni. Competencies (U-Level)						Eng. Competencies (A-Level)										Electrical Eng. (B-Level)				Electronics Eng. ($C_{ICT-ECE}$ Level)					
	Specialization																										
ECEN 351	Fundamentals of Semiconductor Devices							x	x								x	x				x		x			
ECEN 371	Fundamentals of Electromagnetics							x	x						x			x							x		
ECEN 372	Applied Electromagnetics																	x						x	x	x	x
ECEN 452	Physical Sensors, Transducers and Instrumentation								X			X					X		X			X				X	
ECEN 453	Analog and Digital Electronics Lab								x										x	x					x	x	x
ECEN 454	Analog and Digital Filters and Communications Circuits								x	x		x						x									x
ECEN 462	Digital Communications									x						x					x			x		x	x
ECEN 463	Wireless Communication								x							x			x		x				x		x
ECEN 464	Communications Networks											x		x						x				x	x		x
ECEN 465	Communications Design Lab										x							x						x	x	x	x
ECEN 466	Digital Signal Processing								x		x							x					x				x
ENTR 301	Selected Topics in Entrepreneurship									x						x	x		x		x			x			
	Electives																										
ECEN 455	Analog Integrated Circuit Design							x	x									x					x				
ECEN 456	Digital Integrated Circuit Design							x	x									x					x				
ECEN 457	Micro and Nano Systems Fabrication							x		x		x					x							x			
ECEN 458	FPGA and ASIC Design														x				x		x		x				x

ECE program		U1	U2	U3	U4	U5	U6	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	C1	C2	C3	C4	C5	C6
		Uni. Competencies (U-Level)						Eng. Competencies (A-Level)										Electrical Eng. (B-Level)				Electronics Eng. ($C_{ICT-ECE}$ Level)					
ECEN 459	Introduction to Electronic Design Automation (EDA and CAD)									x		x												x			x
ECEN 468	Advanced Communication Systems																				x			x	x	x	
ECEN 469	Selected Topics in Communications											x			x		x								x	x	
ECEN 470	Introduction to Optical Communication Systems										x								x		x				x	x	
ECEN 473	Antenna and Propagation										x							x						x	x	x	x
ECEN 474	Radio Frequency Integrated Circuit Design and Implementation								x		x							x					x				x
ECEN 481	Mechatronic Design									x	x							x	x				x				x
COUNT		0	0	0	0	0	0	5	10	6	6	6	0	1	3	3	5	11	7	2	6	2	6	10	10	9	13

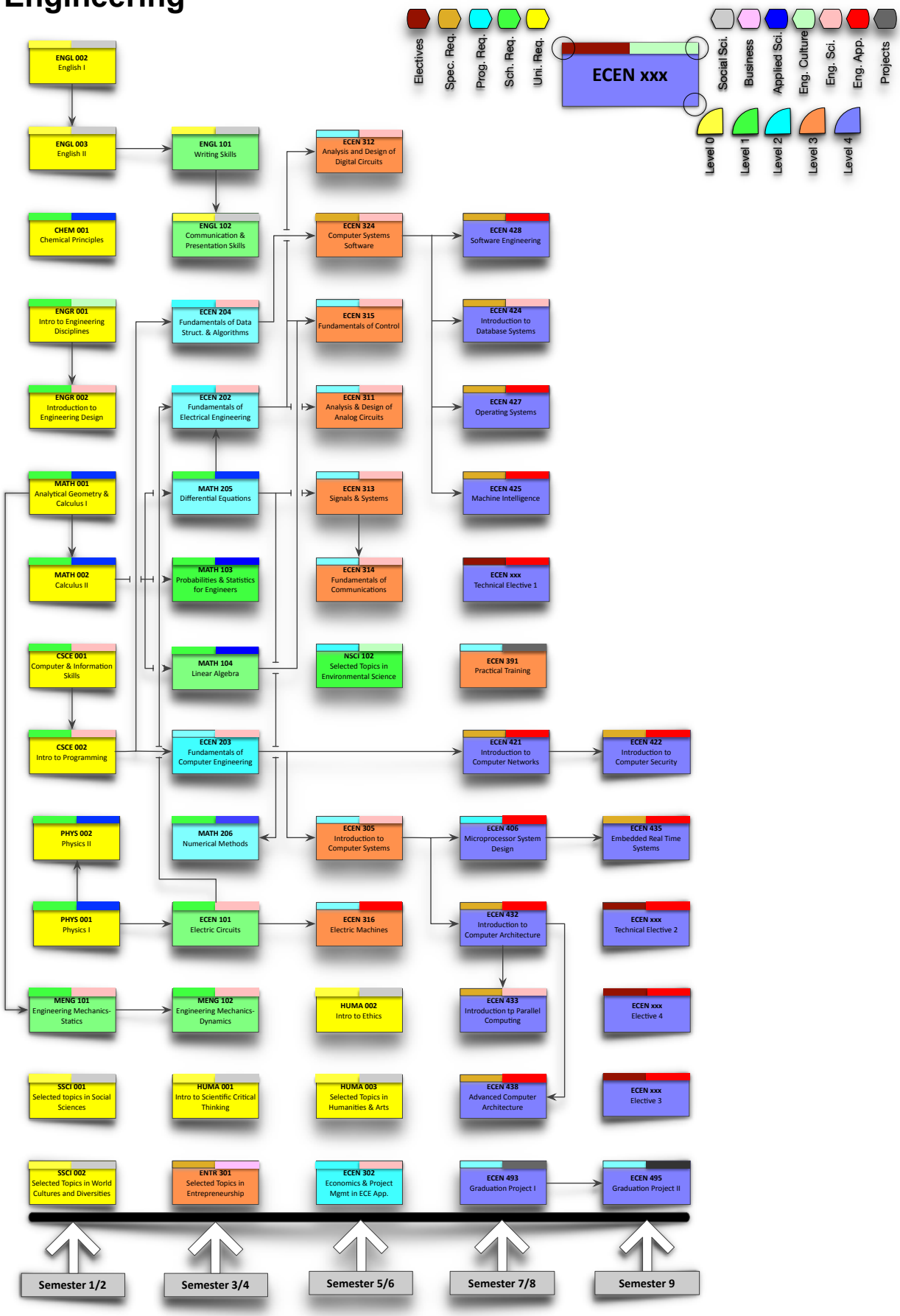
ECE Track 2 (Computer Eng.) Course - Competencies matrix

ECE program		U1	U2	U3	U4	U5	U6	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	C1	C2	C3	C4	C5	C6	C7
		Uni. Competencies (U-Level)						Eng. Competencies (A-Level)										Electrical Eng. (B-Level)				Electronics Eng. ($C_{ICT-ECE}$ Level)						
	Specialization																											
ECEN 324	Computer Systems Software							X					x						X				X			X		
ECEN 421	Introduction to Computer Networks								X			X						X		X			X		X		
ECEN 422	Introduction to Computer Security													X			X			X					X		X	
ECEN 424	Introduction to Databases Systems								X			X			X		X		X						X			
ECEN 425	Machine Intelligence							X				X						X		X								X
ECEN 427	Operating Systems								X		X							X			X		X		X			
ECEN 428	Software Engineering								X								X			X		X		X				
ECEN 432	Introduction To Computer Architecture									X		X						X		X			X	X				
ECEN 433	Introduction to Parallel Computing								X								X		X				X				X	
ECEN 435	Embedded Real-Time Systems									X								X				X			X		X	
ECEN 438	Advanced Computer Architecture								X			X				X				X			X		X			
ENTR 301	Selected Topics in Entrepreneurship									x						x	x		x		x			x				
	Electives																											
ECEN 430	Selected Topics in Computer Engineering								X						X				X		X		X				X	
ECEN 448	Numerical Methods and Mathematical Precision of Floating Numbers							X	X											X				X				X
ECEN 449	Compiler Construction									X				X			X			X			X		X			
ECEN 452	Physical Sensors, Transducers and Instrumentation								X									X	X	X								
ECEN 463	Wireless Communication									X						X					X			X				X
ECEN 466	Digital Signal Processing								X	X									X				X		X			
ECEN 467	Image Processing and Bio-image Informatics								X			X				X		X		X					X	X		X
ECEN 481	Mechatronic Design									X								X	X			X						X
COUNT		0	0	0	0	0	0	3	11	7	1	6	1	2	2	4	6	8	8	9	5	3	8	6	8	3	4	5

Course Dependency Flow Diagram (Track 1) - Electronics and Communications Engineering



Course Dependency Flow Diagram (Track 2) - Computer Engineering



ECE Sample Study Plan

ECE (Specialization 1 - Electronics and Communications Eng.) Study Plan (Year 1)

	Semester 1						
Code	Title	CH	ECTS	SWL	Prerequisite		
ENGL 002	**English I**	0	0	50	A minimum score of 500 on the TOEFL. Students will also be required to pass a written NU test (essay).		
MATH 001	**Analytical Geometry & Calculus I**	3	5	125	None		
CSCE 001	**Computer & Information Skills**	3	5	125	None		
ENGR 001	**Introduction to Engineering**	3	5	125	None		
CHEM 001	**Chemical Principles**	3	5	125	None		
PHYS 001	**Physics I**	4	7	175	None		
SSCI 001	**Selected Topics in Social Sciences**	2	3	75	None		
TOTAL		**18**	**30**	**800**			
	Semester 2						
ENGL 003	**English II**	0	0	50	ENGL 002 - English I		
MATH 002	**Calculus II**	3	5	125	MATH 001 - Analytical Geometry & Calculus I		
CSCE 002	**Introduction to Programming**	3	5	125	CSCE 001 - Computer & Information Skills		
ENGR 002	**Introduction to Engineering Design**	3	5	125	ENGR 001 - Introduction to Engineering		
MENG 101	**Engineering Mechanics I - Statics**	2	4	100	MATH 001 - Analytical Geometry & Calculus I		
PHYS 002	**Physics II**	4	7	175	PHYS 001 - Physics I		
SSCI 002	**Selected Topics in World Cultures and Diversity**	2	3	75	None		
TOTAL		**17**	**29**	**775**			

ECE (Specialization 1 - Electronics and Communications Eng.) Study Plan (Year 2)

	Semester 3						
Code	Title	CH	ECTS	SWL	Prerequisite		
ENGL 101	**Writing Skills**	3	5	125	ENGL 003 - English II - or IELTS 6.5 or equivalent		
MATH 205	**Differential Equations**	3	5	125	MATH 002 - Calculus II		
MATH 103	**Probability & Statistics for Engineers**	3	5	125	MATH 002 - Calculus II		
MENG 102	**Engineering Mechanics II - Dynamics**	2	4	100	MENG 101 - Engineering Mechanics I - Statics		
MATH 104	**Linear Algebra**	3	5	125	MATH 002 - Calculus II		
ECEN 101	**Electric Circuits**	3	5	125	PHYS 001 - Physics I		
HUMA 001	**Introduction to Scientific & Critical Thinking**	2	3	75	None		
TOTAL		**19**	**32**	**800**			
	Semester 4						
ENGL 102	**Communication and Presentation Skills**	3	5	125	ENGL 101 - Writing Skills		
MATH 206	**Nummerical Methods**	3	5	125	MATH 205 - Differential Equations		
ECEN 202	**Fundamentals of Electrical Engineering**	3	5	125	MATH 205 - Differential Equations	ECEN 101 - Electric Circuits	
ECEN 203	**Fundamentals of Computer Engineering**	3	5	125	CSCE 002 - Introduction to Programming		
ECEN 204	**Fundamentals of Data Structures & Algorithms**	3	5	125	CSCE 002 - Introduction to Programming		
ENTR 301	**Selected Topics in Entrepreneurship**	2	4	100	NONE		
TOTAL		**17**	**29**	**725**			

ECE (Specialization 1 - Electronics and Communications Eng.) Study Plan (Year 3)

	Semester 5						
Code	Title	CH	ECTS	SWL	Prerequisite		
ECEN 305	**Introduction to Computer Systems**	3	5	125	ECEN 203 - Fundamentals of Computer Engineering		
ECEN 311	**Analysis and Design of Analog Circuits**	3	5	125	ECEN 202 - Fundamentals of Electrical Engineering		
ECEN 313	**Signals and Systems**	3	5	125	MATH 205 - Differential Equations		
ECEN 316	**Electric Machines**	3	5	125	ECEN 101 - Electric Circuits		
ECEN 351	**Fundamentals of Semiconductor Devices**	3	5	125	ECEN 202 - Fundamentals of Electrical Engineering		
ECEN 371	**Fundamentals of Electromagnetics**	3	5	125	MATH 205 - Differential Equations	MATH 104 - Linear Algebra	
TOTAL		**18**	**30**	**750**			
	Semester 6						
ECEN 312	**Analysis and Design of Digital Circuits**	3	5	125	ECEN 202 - Fundamentals of Electrical Engineering		
ECEN 314	**Fundamentals of Communications**	3	5	125	ECEN 313 - Signals and Systems		
ECEN 315	**Fundamentals of Control**	3	5	125	ECEN 202 - Fundamentals of Electrical Engineering	MATH 104 - Linear Algebra	
ECEN 372	**Applied Electromagnetics**	3	5	125	ECEN 371 - Fundamentals of Electromagnetics		
HUMA 003	**Selected Topics in Humanities & Arts**	2	3	75	None		
ECEN 302	**Economics and Project Management in ECE Applications**	3	5	125	None		
TOTAL		**17**	**28**	**700**			

ECE (Specialization 1 - Electronics and Communications Eng.) Study Plan (Year 4)

	Semester 7						
Code	Title	CH	ECTS	SWL	Prerequisite		
ECEN 391	**Practical Training**	3	6	150	After 6th semester		
ECEN 406	**Microprocessor System Design**	3	5	125	ECEN 305 - Introduction to Computer Systems		
ECEN 452	**Physical Sensors, Transducers and Instrumentation**	3	5	125	ECEN 351 - Fundamentals of Semiconductor Devices	ECEN 371 - Fundamentals of Semiconductor Devices	
ECEN 453	**Analog and Digital Electronics Lab**	3	5	125	ECEN 311 - Analysis and Design of Analog Circuits	ECEN 312 - Analysis and Design of Digital Circuits	
ECEN 454	**Analog and Digital Filters and Communications Circuits**	3	5	125	ECEN 311 - Analysis and Design of Analog Circuits	ECEN 314 - Fundamentals of Communications	
ECEN 462	**Digital Communications**	3	5	125	ECEN 314 - Fundamentals of Communications		
TOTAL		**18**	**31**	**775**			
	Semester 8						
ECEN 464	**Communications Networks**	3	5	125	ECEN 314 - Fundamentals of Communications		
ECEN 465	**Communications Design Lab**	3	5	125	ECEN 462 - Digital Communications		
ECEN 466	**Digital Signal Processing**	3	5	125	ECEN 313 - Signals and Systems		
ECEN 493	**Graduation Project I**	3	6	180	Senior Standing		
ECEN xxx	**Technical Elective 1**	3	5	125			
ECEN xxx	**Technical Elective 2**	3	5	125			
TOTAL		**18**	**31**	**805**			

ECE (Specialization 1 - Electronics and Communications Eng.) Study Plan (Year 5)

	Semester 9						
Code	Title	CH	ECTS	SWL	Prerequisite		
ECEN 463	**Wireless Communication**	3	5	125	ECEN 462 - Digital Communications		
ECEN 495	**Graduation Project II**	3	6	180	ECEN 493 - Graduation Project I		
ECEN xxx	**Technical Elective 3**	3	5	125			
ECEN xxx	**Technical Elective4**	3	5	125			
HUMA 002	**Introduction to Ethics**	2	3	75	None		
NSCI 102	**Selected Topics in Environmental Science**	4	6	150	None		
TOTAL		**18**	**30**	**780**			

ECE (Specialization 1 - Electronics and Communications Eng.) Electives

	Electives					
Code	Title	CH	ECTS	SWL	Prerequisite	
ECEN 455	**Analog Integrated Circuit Design**	3	5	125	ECEN 311 - Analysis and Design of Analog Circuits	
ECEN 456	**Digital Integrated Circuit Design**	3	5	125	ECEN 312 - Analysis and Design of Digital Circuits	
ECEN 457	**Micro and Nano Systems Fabrication**	3	5	125	ECEN 456 - Digital Integrated Circuit Design	
ECEN 458	**FPGA and ASIC Design**	3	5	125	ECEN 456 - Digital Integrated Circuit Design	
ECEN 459	**Introduction to Electronic Design Automation (EDA and CAD)**	3	5	125	ECEN 456 - Digital Integrated Circuit Design	
ECEN 468	**Advanced Communication Systems**	3	5	125	ECEN 462 - Digital Communications	
ECEN 469	**Selected Topics in Communications**	3	5	125	ECEN 314 - Fundamentals of Communications	
ECEN 470	**Introduction to Optical Communication Systems**	3	5	125	ECEN 314 - Fundamentals of Communications	
ECEN 473	**Antenna and Propagation**	3	5	125	ECEN 372 - Applied Electromagnetics	
ECEN 474	**Radio Frequency Integrated Circuit Design and Implementation**	3	5	125	ECEN 311 - Analysis and Design of Analog Circuits	ECEN 372 - Applied Electromagnetics
ECEN 481	**Mechatronic Design**	3	5	125	ECEN 315 - Fundamentals of Control	

ECE (Specialization 1 - Computer Eng.) Study Plan (Year 1)

	Semester 1						
Code	Title	CH	ECTS	SWL	Prerequisite		
ENGL 002	**English I**	0	0	50	A minimum score of 500 on the TOEFL. Students will also be required to pass a written NU test (essay).		
MATH 001	**Analytical Geometry & Calculus I**	3	5	125	None		
CSCE 001	**Computer & Information Skills**	3	5	125	None		
ENGR 001	**Introduction to Engineering**	3	5	125	None		
CHEM 001	**Chemical Principles**	3	5	125	None		
PHYS 001	**Physics I**	4	7	175	None		
SSCI 001	**Selected Topics in Social Sciences**	2	3	75	None		
TOTAL		**18**	**30**	**800**			
	Semester 2						
ENGL 003	**English II**	0	0	50	ENGL 002 - English I		
MATH 002	**Calculus II**	3	5	125	MATH 001 - Analytical Geometry & Calculus I		
CSCE 002	**Introduction to Programming**	3	5	125	CSCE 001 - Computer & Information Skills		
ENGR 002	**Introduction to Engineering Design**	3	5	125	ENGR 001 - Introduction to Engineering		
MENG 101	**Engineering Mechanics I - Statics**	2	4	100	MATH 001 - Analytical Geometry & Calculus I		
PHYS 002	**Physics II**	4	7	175	PHYS 001 - Physics I		
SSCI 002	**Selected Topics in World Cultures and Diversity**	2	3	75	None		
TOTAL		**17**	**29**	**775**			

ECE (Specialization 2 - Computer Eng.) Study Plan (Year 2)

	Semester 3						
Code	Title	CH	ECTS	SWL	Prerequisite		
ENGL 101	**Writing Skills**	3	5	125	ENGL 003 - English II - or IELTS 6.5 or equivalent		
MATH 205	**Differential Equations**	3	5	125	MATH 002 - Calculus II		
MATH 103	**Probability & Statistics for Engineers**	3	5	125	MATH 002 - Calculus II		
MENG 102	**Engineering Mechanics II - Dynamics**	2	4	100	MENG 101 - Engineering Mechanics I - Statics		
MATH 104	**Linear Algebra**	3	5	125	MATH 002 - Calculus II		
ECEN 101	**Electric Circuits**	3	5	125	PHYS 001 - Physics I		
HUMA 001	**Introduction to Scientific & Critical Thinking**	2	3	75	None		
TOTAL		**19**	**32**	**800**			
	Semester 4						
ENGL 102	**Communication and Presentation Skills**	3	5	125	ENGL 101 - Writing Skills		
MATH 206	**Nummerical Methods**	3	5	125	MATH 205 - Differential Equations		
ECEN 202	**Fundamentals of Electrical Engineering**	3	5	125	MATH 205 - Differential Equations	ECEN 101 - Electric Circuits	
ECEN 203	**Fundamentals of Computer Engineering**	3	5	125	CSCE 002 - Introduction to Programming		
ECEN 204	**Fundamentals of Data Structures & Algorithms**	3	5	125	CSCE 002 - Introduction to Programming		
ENTR 301	**Selected Topics in Entrepreneurship**	2	4	100	NONE		
TOTAL		**17**	**29**	**725**			

ECE (Specialization 2 - Computer Eng.) Study Plan (Year 3)

	Semester 5						
Code	Title	CH	ECTS	SWL	Prerequisite		
ECEN 305	**Introduction to Computer Systems**	3	5	125	ECEN 203 - Fundamentals of Computer Engineering		
ECEN 311	**Analysis and Design of Analog Circuits**	3	5	125	ECEN 202 - Fundamentals of Electrical Engineering		
ECEN 313	**Signals and Systems**	3	5	125	MATH 205 - Differential Equations		
ECEN 316	**Electric Machines**	3	5	125	ECEN 101 - Electric Circuits		
HUMA 002	**Introduction to Ethics**	2	3	75	None		
NSCI 102	**Selected Topics in Environmental Science**	4	6	150	None		
TOTAL		**18**	**29**	**725**			
	Semester 6						
ECEN 312	**Analysis and Design of Digital Circuits**	3	5	125	ECEN 202 - Fundamentals of Electrical Engineering		
ECEN 314	**Fundamentals of Communications**	3	5	125	ECEN 313 - Signals and Systems		
ECEN 315	**Fundamentals of Control**	3	5	125	ECEN 202 - Fundamentals of Electrical Engineering	MATH 104 - Linear Algebra	
ECEN 324	**Computer Systems Software**	3	5	125	ECEN 204 - Fundamentals of Data Structures & Algorithms		
HUMA 003	**Selected Topics in Humanities & Arts**	2	3	75	None		
ECEN 302	**Economics and Project Management in ECE Applications**	3	5	125	None		
TOTAL		**17**	**28**	**700**			

ECE (Specialization 2 - Computer Eng.) Study Plan (Year 4)

	Semester 7						
Code	Title	CH	ECTS	SWL	Prerequisite		
ECEN 391	**Practical Training**	3	6	150	After 6th semester		
ECEN 406	**Microprocessor System Design**	3	5	125	ECEN 305 - Introduction to Computer Systems		
ECEN 421	**Introduction to Computer Networks**	3	5	125	ECEN 203 - Fundamentals of Computer Engineering		
ECEN 424	**Introduction to Databases Systems**	3	5	125	ECEN 324 - Computer Systems Software		
ECEN 427	**Operating Systems**	3	5	125	ECEN 324 - Computer Systems Software		
ECEN 432	**Introduction To Computer Architecture**	3	5	125	ECEN 305 - Introduction to Computer Systems		
TOTAL		**18**	**31**	**775**			
	Semester 8						
ECEN 425	**Machine Intelligence**	3	5	125	ECEN 324 - Computer Systems Software		
ECEN 428	**Software Engineering**	3	5	125	ECEN 324 - Computer Systems Software		
ECEN 433	**Introduction to Parallel Computing**	3	5	125	ECEN 432 - Introduction To Computer Architecture		
ECEN 438	**Advanced Computer Architecture**	3	5	125	ECEN 432 - Introduction To Computer Architecture		
ECEN 493	**Graduation Project I**	3	6	180	Senior Standing		
ECEN xxx	**Technical Elective 1**	3	5	125			
TOTAL		**18**	**31**	**805**			

ECE (Specialization 2 - Computer Eng. Eng.) Study Plan (Year 5)

	Semester 9						
Code	Title	CH	ECTS	SWL	Prerequisite		
ECEN 422	**Introduction to Computer Security**	3	5	125	ECEN 421 - Introduction to Computer Networks		
ECEN 435	**Embedded Real-Time Systems**	3	5	125	ECEN 406 - Microprocessor System Design		
ECEN 495	**Graduation Project II**	3	6	180	ECEN 493 - Graduation Project I		
ECEN xxx	**Technical Elective 2**	3	5	125			
ECEN xxx	**Technical Elective 3**	3	5	125			
ECEN xxx	**Technical Elective 4**	3	5	125			
TOTAL		**18**	**31**	**805**			

ECE (Specialization 2 - Computer Eng. Eng.) Electives

	Electives					
Code	Title	CH	ECTS	SWL	Prerequisite	
ECEN 430	**Selected Topics in Computer Engineering**	3	5	125	None	
ECEN 448	**Numerical Methods and Mathematical Precision of Floating Numbers**	3	5	125	ECEN 324 - Computer Systems Software	
ECEN 449	**Compiler Construction**	3	5	125	ECEN 324 - Computer Systems Software	
ECEN 452	**Physical Sensors, Transducers and Instrumentation**	3	5	125	ECEN 351 - Fundamentals of Semiconductor Devices	ECEN 371 - Fundamentals of Semiconductor Devices
ECEN 463	**Wireless Communication**	3	5	125	ECEN 462 - Digital Communications	
ECEN 466	**Digital Signal Processing**	3	5	125	ECEN 313 - Signals and Systems	
ECEN 467	**Image Processing and Bio-image Informatics**	3	5	125	ECEN 313 - Signals and Systems	
ECEN 481	**Mechatronic Design**	3	5	125	ECEN 315 - Fundamentals of Control	

توصيف مقررات برنامج الإلكترونيات وهندسة الحاسب

Color Coding

University Requirements	School Requirements	Program Requirements	Specialization Requirements	Electives Courses

(ECE) - ECEN 202

Course Title	**Fundamentals of Electrical Engineering**	
Course Code	**ECEN 202**	
Prerequisites	MATH 205 - Differential Equations	ECEN 101 - Electric Circuits
Classification within the curriculum	Compulsory (All Tracks)	
Course Position in Study Plan	Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	1.5
	TOTAL	6
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Basic Engineering Sciences	
Topic Level	Program Requirements	

Description

This course covers topics that are fundamental to a wide variety of electrical engineering systems. Topics include circuit analysis techniques, passive and active components modeling, operational amplifiers, energy storage elements, power analysis, time-response of first- and second-order systems, sinusoidal steady-state response, frequency domain analysis, and filters. Other topics may include: diodes and transistors, basic noise analysis, transformers, pole-zero plotting and analysis in the complex plane. Relevant lab experiments are conducted.

(ECE) - ECEN 203

Course Title	**Fundamentals of Computer Engineering**	
Course Code	**ECEN 203**	
Prerequisites	CSCE 002 - Introduction to Programming	
Classification within the curriculum	Compulsory (All Tracks)	
Course Position in Study Plan	Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Basic Engineering Sciences	
Topic Level	Program Requirements	

Description

This course introduces basic issues in design and verification of modern digital systems. Topics include: Boolean algebra, digital number systems and computer arithmetic, combinational and sequential logic design and optimization, register-transfer design, basic processor organization and instruction set issues, assembly language programming and debugging, and a hardware description language. Emphasis is on the levels of abstraction and hardware description language methods that allow designers to cope with hugely complex systems, and on connections to practical hardware implementation problems. Students are introduced to computer-aided digital design software.

(ECE) - ECEN 204

Course Title	**Fundamentals of Data Structures & Algorithms**	
Course Code	**ECEN 204**	
Prerequisites	CSCE 002 - Introduction to Programming	
Classification within the curriculum	Compulsory (All Tracks)	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL)/ Semester	125	
Topic Category	Basic Engineering Sciences	
Topic Level	Program Requirements	

Description
Fundamental concepts of data structures and algorithms for representing and processing information; including the use of linked lists, stacks, queues, directed graphs and trees. Analysis of algorithms, sorting, searching and hashing techniques.

(ECE) - ECEN 302

Course Title	**Economics and Project Management in ECE Applications**	
Course Code	**ECEN 302**	
Prerequisites	None	
Classification within the curriculum	Compulsory (All Tracks)	
Course Position in Study Plan	Spring	
Contact Hours	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL)	125	
Topics Category	Business	
Topics Level	Program Requirements	

Description:
This course prepares the students to be acquainted with rational meaningful approaches to evaluating economically different (alternatives) investment opportunities while accomplishing given objectives. The course will also provide the students with the required tools and techniques to consider economic and non-economic factors in evaluating a wide range of industrial and business applications. In addition, the course addresses the fundamentals of Agile project planning and management, prioritize, and discuss team's work in full context with complete visibility as well as the tools and techniques necessary to manage complex projects.

Lab and Tutorials
The course requires practice and problem solving training during tutorials, in addition to software training.

Literature
Project Management, Harold Kerzner, Wiley Publishing, 2013, 11th Edition, ISBN 9781118022276
Fraser, N. M., Jewkes, E. M., Bernhardt I. & Tajima, M., Global Engineering Economics: Financial Decision Making for Engineers, 4th Edition, Pearson Education, 2009.
Chan S. Park, Fundamentals of Engineering Economics, 3rd Edition, Pearson Education, ISBN 13:978-0273772910

(ECE) - ECEN 305

Course Title	**Introduction to Computer Systems**	
Course Code	**ECEN 305**	
Prerequisites	ECEN 203 - Fundamentals of Computer Engineering	
Classification within the curriculum	Compulsory (All Tracks)	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	1.5
	TOTAL	6
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Basic Engineering Sciences	
Topic Level	Program Requirements	

Description

This course provides a programmer's view of how computer systems execute programs, store information, and communicate. It enables students to become more effective programmers, especially in dealing with issues of performance, portability and robustness. It also serves as a foundation for courses on compilers, networks, operating systems, and computer architecture, where a deeper understanding of systems-level issues is required. Topics covered include: machine-level code and its generation by optimizing compilers, performance evaluation and optimization, computer arithmetic, memory organization and management, networking technology and protocols, and supporting concurrent computation.

(ECE) - ECEN 311

Course Title	**Analysis and Design of Analog Circuits**	
Course Code	**ECEN 311**	
Prerequisites	ECEN 202 - Fundamentals of Electrical Engineering	
Classification within the curriculum	Compulsory (All Tracks)	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	1.5
	TOTAL	6
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Engineering Applications	
Topic Level	Program Requirements	

Description

The course introduces the student to the fundamentals of the analysis and design of basic analog circuits. Topics include: operational amplifier design, basic amplifier feedback theory, frequency stability and compensation, dc bias calculations and circuits, MOSFET and BJT large- and small-signal device models, small-signal gain and frequency response characteristics of amplifiers, large-signal characteristics and non-idealities. In the hardware laboratory the student will gain experience designing, building, and characterizing analog circuits. The students will also learn how to use the SPICE circuit simulation program to compare actual and simulated performance.

(ECE) - ECEN 312

Course Title	**Analysis and Design of Digital Circuits**	
Course Code	**ECEN 312**	
Prerequisites	ECEN 202 - Fundamentals of Electrical Engineering	
Classification within the curriculum	Compulsory (All Tracks)	
Course Position in Study Plan	Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	1.5
	TOTAL	6
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Engineering Applications	
Topic Level	Program Requirements	

Description
Overview of digital logic design. Implementation technologies, timing in combinational and sequential circuits, basic arithmetic units, EDA tools, introduction to simulation and synthesis using VHDL.

(ECE) - ECEN 313

Course Title	**Signals and Systems**	
Course Code	**ECEN 313**	
Prerequisites	MATH 205 - Differential Equations	
Classification within the curriculum	Compulsory (All Tracks)	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	1.5
	TOTAL	6
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Basic Engineering Sciences	
Topic Level	Program Requirements	

Description

The objective of this course is to provide students with an understanding of the relationships between mathematical tools and properties of real signals and systems. Continuous and discrete time signals and systems are treated in a unified manner through the concept of sampling. The course covers the basic concepts and tools needed to perform time and frequency domain transform analyses of signals and linear time-invariant systems, including: impulse and step response and convolution; Fourier transforms and filtering; Laplace transforms, feedback and stability; and a brief introduction to z-transforms in the context of digital filtering.

(ECE) - ECEN 314

Course Title	**Fundamentals of Communications**	
Course Code	**ECEN 314**	
Prerequisites	ECEN 313 - Signals and Systems	
Classification within the curriculum	Compulsory (All Tracks)	
Course Position in Study Plan	Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	1.5
	TOTAL	6
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Basic Engineering Sciences	
Topic Level	Program Requirements	

Description

Fundamental analog and digital communications concepts are presented together with supporting theoretical foundations and practical applications. Signals and bandwidth concepts, spectra, basics of electronics, information and coding, modulation, multiplexing, transmission systems, transmission media, analog versus digital communications, computer networks, and switching techniques.

(ECE) - ECEN 315

Course Title	**Fundamentals of Control**	
Course Code	**ECEN 315**	
Prerequisites	ECEN 202 - Fundamentals of Electrical Engineering	MATH 104 - Linear Algebra
Classification within the curriculum	Compulsory (All Tracks)	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	1.5
	TOTAL	6
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Basic Engineering Sciences	
Topic Level	Program Requirements	

Description

The course is an introduction to the fundamental principles and methodologies of classical feedback control and its applications. Topics include analytical, graphical and computer-aided (MATLAB) techniques for analyzing and designing automatic control systems; analysis of performance, stability criteria, realizability, and speed of response; compensating methods in the frequency domain, root-locus and frequency response design, and pole-zero synthesis techniques; robust controller design; systems with delay and computer control systems; transfer function and state space modeling of linear systems, nonlinearities in control systems; and control engineering software (MATLAB).

(ECE) - ECEN 316

Course Title	**Electric Machines**	
Course Code	**ECEN 316**	
Prerequisites	ECEN 101 - Electric Circuits	
Classification within the curriculum	Compulsory (All Tracks)	
Course Position in Study Plan	Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	
	Labs	1.5
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Engineering Applications	
Topic Level	Program Requirements	

Description

The course covers the basics electromagnetic fields in electromechanical devices: Production of magnetic field, Faraday's law (transformer action), production of induced force on a wire (motor action), Production of induced voltage on conductor moving in magnetic field (generator action).

DC Machines: construction, Theory of operation.

DC Generators: Separately-excited generator, Self-excited generators (shunt, series and compound types) Characteristics of different types of DC generators, Efficiency of DC generators.

DC Motors: Separately-excited Motor, Self-excited Motor (shunt, series and compound types) Characteristics of different types of DC motors, Efficiency of DC motors.

Transformers: Single phase transformers, principle of operation, equivalent circuit, efficiency, three phase transformers, connections of transformers.

AC Machine Fundamentals; Synchronous Machines; Induction Motors: Construction, theory of operation, equivalent circuit. Special Machines.

(ECE) - ECEN 324

Course Title	**Computer Systems Software**	
Course Code	**ECEN 324**	
Prerequisites	ECEN 204 - Fundamentals of Data Structures & Algorithms	
Classification within the curriculum	Compulsory (CE Track)	
Course Position in Study Plan	Spring	
Contact Hours	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL)/ Semester	125	
Topic Category	Basic Engineering Sciences	
Topic Level	Specialization Requirements	

Description
Basics of assembly language programming. Macros. System stack and procedure calls. Techniques for writing assembly language programs. The features of IA-32 based PC will be used. Interfaces between high-level languages and assembly codes will be discussed.

(ECE) - ECEN 351

Course Title	**Fundamentals of Semiconductor Devices**	
Course Code	**ECEN 351**	
Prerequisites	ECEN 202 - Fundamentals of Electrical Engineering	
Classification within the curriculum	Compulsory (ECE Track)	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Basic Engineering Sciences	
Topic Level	Specialization Requirements	

Description

An introduction to the operation and fabrication of the most important semiconductor devices used in integrated circuit technology together with device design and layout. At the end of the course students will have a basic understanding of pn diodes, bipolar transistors, and MOSFETs, light emitting and light detecting devices such as photodiodes, LEDs and solar cells. Students will also receive an introduction to the fundamental concepts of semiconductor physics such as doping, electron and hole transport, and band diagrams. In the laboratory they learn how to lay out both bipolar and MOS devices and design small (2-3 transistor) circuits. Students experimentally evaluate the operation of amplifier and gate circuits fabricated with discrete devices. This course gives the student the understanding of the operation and fabrication of the devices necessary for high-performance analog and digital circuit design.

(ECE) - ECEN 371

Course Title	**Fundamentals of Electromagnetics**	
Course Code	**ECEN 371**	
Prerequisites	MATH 205 - Differential Equations	MATH 104 - Linear Algebra
Classification within the curriculum	Compulsory (ECE Track)	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Basic Engineering Sciences	
Topic Level	Specialization Requirements	

Description

This course introduces electromagnetic principles and describes how they are applied in engineering devices and systems. Topics include: vector calculus, Maxwell's equations in integral and differential forms with associated boundary conditions, quasi static electric fields in free space and in materials, superposition for known charge sources, conduction and polarization, resistance and capacitance, charge relaxation, analytic and numerical methods for electric field boundary value problems, quasi static magnetic fields in free space and in materials, superposition for known current sources, magnetization, inductance, magnetic diffusion, and analytic and numerical methods for magnetic field boundary value problems.

(ECE) - ECEN 372

Course Title	**Applied Electromagnetics**	
Course Code	**ECEN 372**	
Prerequisites	ECEN 371 - Fundamentals of Electromagnetics	
Classification within the curriculum	Compulsory (ECE Track)	
Course Position in Study Plan	Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Engineering Applications	
Topic Level	Specialization Requirements	

Description

This course builds upon the electric and magnetic field foundations established in the fundamentals of electromagnetics course to describe devices and phenomena in which electromagnetic waves are a central issue. Topics include: review of Maxwell's equations, propagation of uniform plane waves in lossless and lossy media, energy conservation as described by the Poynting Theorem, reflection and transmission with normal and oblique incidence, sinusoidal steady state and transients on two-conductor transmission lines, modal descriptions of waveguides, radiation and antennas.

(ECE) - ECEN 391

Course Title	**Practical Training**	
Course Code	**ECEN 391**	
Prerequisites	After 6th semester	
Classification within the curriculum	Compulsory	
Course Position in Study Plan	Fall (Semester 7)	
Contact Hours	Lectures	
	Tutorials	
	Labs	
	TOTAL	0
EG Credit Hours	3	
ECTS	6	
Student Workload (SWL)	150	
Topic Category	Projects and Practical Training	
Topic Level	Program Requirements	

Description
A minimum of four weeks of practical training in off-campus sites elected by the program. Students are required to submit a recognition letter from the site where they received their training, in addition, a report and a presentation are submitted as well. Course is a Pass/Fail course.

Lab and Tutorials
Not Applicable

Literature
Not Applicable

(ECE) - ECEN 406

Course Title	**Microprocessor System Design**	
Course Code	**ECEN 406**	
Prerequisites	ECEN 305 - Introduction to Computer Systems	
Classification within the curriculum	Compulsory (All Tracks)	
Course Position in Study Plan	Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Engineering Applications	
Topic Level	Program Requirements	

Description
Structure and timing of typical microprocessors. Sample microprocessor families. Memories, UARTS, timer/ counters, serial devices and related devices. MUX and related control structures for building systems. Interrupt programming. Hardware/software design tradeoffs.

(ECE) - ECEN 421

Course Title	**Introduction to Computer Networks**	
Course Code	**ECEN 421**	
Prerequisites	ECEN 203 - Fundamentals of Computer Engineering	
Classification within the curriculum	Compulsory (CE Track)	
Course Position in Study Plan	Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / Semester	125	
Topic Category	Engineering Applications	
Topic Level	Specialization Requirements	

Description

This course introduces the fundamental concepts of data networks. Underlying engineering principles of computer networks and integrated digital networks are discussed. Topics include: data networks overview; OSI layers; data link protocol; flow control, congestion control, routing; local area networks (Ethernet, Token Ring and FDDI); transport layer; Introduction to high-speed networks and performance evaluation techniques.

(ECE) - ECEN 422

Course Title	**Introduction to Computer Security**	
Course Code	**ECEN 422**	
Prerequisites	ECEN 421 - Introduction to Computer Networks	
Classification within the curriculum	Compulsory (CE Track)	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / Semester	125	
Topic Category	Engineering Applications	
Topic Level	Specialization Requirements	

Description

This course is an introduction to techniques for defending against hostile adversaries in modern computer systems and computer networks. Topics covered include operating system security; network security, cryptography and cryptographic protocols, firewalls, network denial-of-service attacks and defenses; user authentication technologies; security for network servers; web security; and security for mobile code technologies, such as Java and Javascript.

(ECE) - ECEN 424

Course Title	**Introduction to Databases Systems**	
Course Code	**ECEN 424**	
Prerequisites	ECEN 324 - Computer Systems Software	
Classification within the curriculum	Compulsory (CE Track)	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / Semester	125	
Topic Category	Basic Engineering Sciences	
Topic Level	Specialization Requirements	

Description
Data models and database design. Modeling the real world: structures, constraints, and operations. The entity relationship to data modeling (including network hierarchical and object-oriented), emphasis on the relational model. Use of existing database systems for the implementation of information systems.

(ECE) - ECEN 425

Course Title	**Machine Intelligence**	
Course Code	**ECEN 425**	
Prerequisites	ECEN 324 - Computer Systems Software	
Classification within the curriculum	Compulsory (CE Track)	
Course Position in Study Plan	Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	2
	Labs	
	TOTAL	5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / Semester	125	
Topic Category	Engineering Applications	
Topic Level	Specialization Requirements	

Description
The course covers techniques and applications of artificial intelligence and machine learning; representation retrieving and application of knowledge for problem solving. Topics typically include hypothesis exploration, theorem proving, vision, Bayesian learning, decision trees, genetic algorithms, neural networks.

(ECE) - ECEN 427

Course Title	**Operating Systems**	
Course Code	**ECEN 427**	
Prerequisites	ECEN 324 - Computer Systems Software	
Classification within the curriculum	Compulsory (CE Track)	
Course Position in Study Plan	Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / Semester	125	
Topic Category	Engineering Applications	
Topic Level	Specialization Requirements	

Description

This course provides an overview of fundamental operating system principles, complemented with discussions of concrete modern systems to help you understand how these principles are applied in real OSs . Topics covered include an overview of the components of an operating system, mutual exclusion and synchronization, implementation of processes, scheduling algorithms, memory management and file systems. The course has a strong project component intended to provide essential experience in designing and implementing complex systems and working as part of a team.

(ECE) - ECEN 428

Course Title	**Software Engineering**	
Course Code	**ECEN 428**	
Prerequisites	ECEN 324 - Computer Systems Software	
Classification within the curriculum	Compulsory (CE Track)	
Course Position in Study Plan	Spring/Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / Semester	125	
Topic Category	Engineering Applications	
Topic Level	Specialization Requirements	

Description

The course covers concepts of software processes, implantation techniques, and project management. It focuses on several aspects of the software lifecycle that have significant influence on the overall quality of the software system including techniques and approaches to requirement engineering, software architecture, software design, quantitative measurement and assessment of the system during implementation, testing, and maintenance, and the role of verification and validation in assuring software quality.

(ECE) - ECEN 430		
Course Title	**Selected Topics in Computer Engineering**	
Course Code	**ECEN 430**	
Prerequisites	None	
Classification within the curriculum	Elective (CE Track)	
Course Position in Study Plan	Spring/Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / Semester	125	
Topic Category	Engineering Applications	
Topic Level	Specialization Requirements	

Description
This course is tailored to introduce students to the latest advances in the various fields in computer engineering, and/or to focus on a specific area of particular interest to the discipline.

(ECE) - ECEN 432

Course Title	**Introduction To Computer Architecture**	
Course Code	**ECEN 432**	
Prerequisites	ECEN 305 - Introduction to Computer Systems	
Classification within the curriculum	Compulsory (CE Track)	
Course Position in Study Plan	Fall/Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	1.5
	TOTAL	6
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Engineering Applications	
Topic Level	Specialization Requirements	

Description

This course introduces the basic hardware
structure of a programmable computer and the basic laws underlying performance evaluation. The student learns how to design the control and data path hardware for a processor, how to make machine instructions execute simultaneously through pipelining and simple superscalar execution, and how to design fast memory and storage systems. The principles presented in lecture are reinforced in the laboratory through design and simulation of a register transfer (RT) implementations in verilog.

(ECE) - ECEN 433

Course Title	**Introduction to Parallel Computing**	
Course Code	**ECEN 433**	
Prerequisites	ECEN 432 - Introduction To Computer Architecture	
Classification within the curriculum	Compulsory (CE Track)	
Course Position in Study Plan	Spring/Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / Semester	125	
Topic Category	Basic Engineering Sciences	
Topic Level	Specialization Requirements	

Description
Introduction to parallel computing for scientists and engineers. Shared memory parallel architectures and programming, distributed memory, message-passing data-parallel architectures, and programming.

(ECE) - ECEN 435

Course Title	**Embedded Real-Time Systems**	
Course Code	**ECEN 435**	
Prerequisites	ECEN 406 - Microprocessor System Design	
Classification within the curriculum	Compulsory (CE Track)	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	1.5
	TOTAL	6
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / Semester	125	
Topic Category	Engineering Applications	
Topic Level	Specialization Requirements	

Description

This practical hands-on course introduces the various building blocks and principles behind embedded real-time systems. The course covers the integrated hardware and software aspects of embedded processor architectures, along with topics such as real-time, resource/device and memory management, interaction with devices (buses, memory architectures, memory management, device drivers), concurrency (software and hardware interrupts, timers), real-time principles (multi-tasking, scheduling, synchronization), implementation trade-offs, profiling and code optimization (for performance and memory), embedded software (exception handling, loading, mode-switching, programming embedded systems). Through a series of laboratory exercises with state-of-the art embedded processors and industry-strength development tools, students will acquire skills in the design/implementation/debugging of core embedded real-time functionality.

(ECE) - ECEN 438

Course Title	**Advanced Computer Architecture**	
Course Code	**ECEN 438**	
Prerequisites	ECEN 432 - Introduction To Computer Architecture	
Classification within the curriculum	Compulsory (CE Track)	
Course Position in Study Plan	Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / Semester	125	
Topic Category	Engineering Applications	
Topic Level	Specialization Requirements	

Description
This course examines computer design trade-offs. The topics covered include: advanced processor designs, such as superscalar and out-of-order execution, advanced memory systems, such as non-blocking caches, and multiporting/banking and alternative virtual memory implementations, I/O systems, interconnects, introduction to multiprocessor architectures, performance and cost metrics, and benchmarking.

(ECE) - ECEN 448		
Course Title	**Numerical Methods and Mathematical Precision of Floating Numbers**	
Course Code	**ECEN 448**	
Prerequisites	ECEN 324 - Computer Systems Software	
Classification within the curriculum	Elective (CE Track)	
Course Position in Study Plan	Spring/Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / Semester	125	
Topic Category	Engineering Applications	
Topic Level	Specialization Requirements	

Description
Introduction to numerical methods; numerical differentiation, numerical integration, solution of ordinary and partial differential equations. Consequences of limited precision computing. Students write programs in C++, C, or Matlab using methods presented in class.

(ECE) - ECEN 449		
Course Title	**Compiler Construction**	
Course Code	**ECEN 449**	
Prerequisites	ECEN 324 - Computer Systems Software	
Classification within the curriculum	Elective (CE Track)	
Course Position in Study Plan	Spring/Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / Semester	125	
Topic Category	Engineering Applications	
Topic Level	Specialization Requirements	

Description
Overview of compilers and context-free languages, top-down parsing, LL(1) parser construction, translation grammars, implementation of lexical analyzer, parser and translator, compiler optimization, error handling, and recovery.

(ECE) - ECEN 452

Course Title	**Physical Sensors, Transducers and Instrumentation**	
Course Code	**ECEN 452**	
Prerequisites	ECEN 351 - Fundamentals of Semiconductor Devices	ECEN 371 - Fundamentals of Semiconductor Devices
Classification within the curriculum	Compulsory (ECE Track) and Elective (CE Track)	
Course Position in Study Plan	Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	1.5
	TOTAL	6
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Basic Engineering Sciences	
Topic Level	Specialization Requirements	

Description

The course explores many types of responses to physical stimuli, as well as the instrumentation, electronic detection, signal conversion and signal processing techniques used to capture the physical event electronically. This requires knowledge of the diversity of physical phenomena, and the materials and devices that can be used to convert the various forms of physical energy into electronic signals.

(ECE) - ECEN 453

Course Title	**Analog and Digital Electronics Lab**	
Course Code	**ECEN 453**	
Prerequisites	ECEN 311 - Analysis and Design of Analog Circuits	ECEN 312 - Analysis and Design of Digital Circuits
Classification within the curriculum	Compulsory (ECE Track)	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	1.5
	Tutorials	
	Labs	3
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Engineering Applications	
Topic Level	Specialization Requirements	

Description

Lab activities that reinforce and support the theory covered in ECEN 311 and ECEN 312 course. Design, implementation, and measurement of analog and digital electronic systems. Design of an integrated complete electronic solutions at the system level with an integration between different modules in consideration with reference to various technologies (like, microprocessors, ALUs, Image processors, ...etc.).

(ECE) - ECEN 454

Course Title	**Analog and Digital Filters and Communications Circuits**	
Course Code	**ECEN 454**	
Prerequisites	ECEN 311 - Analysis and Design of Analog Circuits	ECEN 314 - Fundamentals of Communications
Classification within the curriculum	Compulsory (ECE Track)	
Course Position in Study Plan	Fall/Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Engineering Applications	
Topic Level	Specialization Requirements	

Description

Characterization, properties, and analysis of analog filters. Butterworth, Chebyshev, and elliptic approximations. Introduction to the realization of LC one- and two-port circuits; Darlington's method. Active elements such as gyrators and generalized impedance converters, and their representation by singular elements. Design of high-performance, low-sensitivity active filters. The course includes a project in which a complete analog filter is designed. Recursive and nonrecursive digital filters, decimation and interpolation, A/D and D/A conversion as digital filtering problems. Implementation of nonrecursive filters via FFT, quantization problems, e.g., companding and limit.

(ECE) - ECEN 455		
Course Title	**Analog Integrated Circuit Design**	
Course Code	**ECEN 455**	
Prerequisites	ECEN 311 - Analysis and Design of Analog Circuits	
Classification within the curriculum	Elective (ECE Track)	
Course Position in Study Plan	Fall/Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Engineering Applications	
Topic Level	Specialization Requirements	

Description

The Course teaches methods used in the design and analysis of analog integrated circuits, illustrating how to approach design problems in general, and exposing the students to a broad cross-section of analog circuit topologies. The course focuses on learning design through carrying out design projects. Design and implementation details of wide-band amplifiers, operational amplifiers, continuous-time filters, phase lock loops and data converters are covered. The course focuses mainly on analog CMOS, but some aspects of BJT design will be discussed.

(ECE) - ECEN 456		
Course Title	**Digital Integrated Circuit Design**	
Course Code	**ECEN 456**	
Prerequisites	ECEN 312 - Analysis and Design of Digital Circuits	
Classification within the curriculum	Elective (ECE Track)	
Course Position in Study Plan	Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Engineering Applications	
Topic Level	Specialization Requirements	

Description

This course is intended to provide the student with IC design experience. The emphasis is on the IC design process as a whole. The aim is to reach an optimal design through optimization of a
number of variables ranging from the choice of architecture to the details of the IC layout. Typical performance criteria of the design are: throughput, power, signal-to-noise ratio, clock frequency, and gain-bandwidth. Typical constraints will be: die size and minimum feature size.

(ECE) - ECEN 457		
Course Title	**Micro and Nano Systems Fabrication**	
Course Code	**ECEN 457**	
Prerequisites	ECEN 456 - Digital Integrated Circuit Design	
Classification within the curriculum	Elective (ECE Track)	
Course Position in Study Plan	Fall/Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Engineering Applications	
Topic Level	Specialization Requirements	

Description
This course introduces students to the process flow and design methodology for integrated systems fabrication. The course highlights the basic unit processes of micro and nano systems fabrication: deposition, patterning, and etching. Students are exposed to examples from: Semiconductor device fabrication; MicroElectroMechanical systems (MEMS) fabrication; Magnetic device fabrication, and optical device fabrication. Labs allow the students to design, fabricate and test an integrated device.

(ECE) - ECEN 458		
Course Title	**FPGA and ASIC Design**	
Course Code	**ECEN 458**	
Prerequisites	ECEN 456 - Digital Integrated Circuit Design	
Classification within the curriculum	Elective (ECE Track)	
Course Position in Study Plan	Fall/Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Engineering Applications	
Topic Level	Specialization Requirements	

Description
Overview of Computer Aided Design tool flow for ASIC and FPGA Design. Synthesis from hardware description languages and creation of finite state machines. Differences between FPGA and ASIC design flows. Exploration of concepts in several projects.

(ECE) - ECEN 459		
Course Title	**Introduction to Electronic Design Automation (EDA and CAD)**	
Course Code	**ECEN 459**	
Prerequisites	ECEN 456 - Digital Integrated Circuit Design	
Classification within the curriculum	Elective (ECE Track)	
Course Position in Study Plan	Fall/Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Engineering Applications	
Topic Level	Specialization Requirements	

Description
Basic concepts in VLSI CAD with emphasis on physical design, fundamental algorithms for CAD problems, development of CAD tools.

(ECE) - ECEN 462

Course Title	**Digital Communications**	
Course Code	**ECEN 462**	
Prerequisites	ECEN 314 - Fundamentals of Communications	
Classification within the curriculum	Compulsory (ECE Track)	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Engineering Applications	
Topic Level	Specialization Requirements	

Description
The course introduces the fundamentals of digital signaling, information theory and coding, digital transmission and reception. Topics include sampling and time-division multiplexing, baseband digital signals and systems, pulse code modulation, error control, digital modulation systems, information measure and source encoding, and introduction to spread spectrum communications.

(ECE) - ECEN 463

Course Title	**Wireless Communication**	
Course Code	**ECEN 463**	
Prerequisites	ECEN 462 - Digital Communications	
Classification within the curriculum	Compulsory (ECE Track) and Elective (CE)	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Engineering Applications	
Topic Level	Specialization Requirements	

Description

In this course wireless communication channels are introduced, and their peculiarities such as fading and co-channel interference are emphasized. Solutions to combat the problems are described, covering equalization and detection, coding and diversity ideas. Examples will be chosen from existing wireless standards (e.g., W-CDMA). The course also covers basic communication theory.

(ECE) - ECEN 464

Course Title	**Communications Networks**	
Course Code	**ECEN 464**	
Prerequisites	ECEN 314 - Fundamentals of Communications	
Classification within the curriculum	Compulsory (ECE Track)	
Course Position in Study Plan	Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Engineering Applications	
Topic Level	Specialization Requirements	

Description

Basic techniques for modeling and analyzing communication networks. Topics include overview telephone and cellular, and computer networks, layered network architectures and models, protocol specification and correctness, queuing models, loss networks, multi-class queues and scheduling, graph-based and flow-based routing, and congestion control.

(ECE) - ECEN 465

Course Title	**Communications Design Lab**	
Course Code	**ECEN 465**	
Prerequisites	ECEN 462 - Digital Communications	
Classification within the curriculum	Compulsory (ECE Track)	
Course Position in Study Plan	Spring	
Contact Hours (weekly)	Lectures	1.5
	Tutorials	
	Labs	3
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Engineering Applications	
Topic Level	Specialization Requirements	

Description

Lab activities that complement the ECEN 331 and ECEN 462 courses. The lab covers the fundamental elements of communications systems hardware; use of measurement instruments typically encountered in communication systems, analog and digital communication systems including; Amplitude Modulation types and demodulation, angle modulation and demodulation, sampling and quantization, and Pulse code modulation encoder and decoder.

(ECE) - ECEN 466

Course Title	**Digital Signal Processing**	
Course Code	**ECEN 466**	
Prerequisites	ECEN 313 - Signals and Systems	
Classification within the curriculum	Compulsory (ECE Track) and Elective (CE Track)	
Course Position in Study Plan	Fall/Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Engineering Applications	
Topic Level	Specialization Requirements	

Description

The course addresses the mathematics, implementation, design and application of the digital signal processing algorithms used in areas such as multimedia telecommunications and speech and image processing. Topics include discrete-time signals and systems, discrete-time Fourier transforms, Z- transforms and fast Fourier transform, digital filter design and implementation, and multi-rate signal processing. The course also includes introductory discussions of 2-dimensional signal processing, linear prediction, adaptive filtering, and selected application areas. Lectures are supplemented with exercises using MATLAB.

(ECE) - ECEN 467		
Course Title	**Image Processing and Bio-image Informatics**	
Course Code	**ECEN 467**	
Prerequisites	ECEN 313 - Signals and Systems	
Classification within the curriculum	Elective (CE Track)	
Course Position in Study Plan	Spring/Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / Semester	125	
Topic Category	Engineering Applications	
Topic Level	Specialization Requirements	

Description
This course gives an overview of biological and biomedical imaging modalities, such as fluorescent microscopy, electron microscopy, magnetic resonance imaging, ultrasound and others. The focus is on automating and solving the fundamental tasks required for the interpretation of these images, including deconvolution, registration, segmentation, pattern recognition, and modeling, as well as tools needed to solve those tasks (such as Fourier and wavelet methods). The discussion of these topics will draw on many fields including statistics, signal processing, and machine learning.

(ECE) - ECEN 468		
Course Title	**Advanced Communication Systems**	
Course Code	**ECEN 468**	
Prerequisites	ECEN 462 - Digital Communications	
Classification within the curriculum	Elective (ECE Track)	
Course Position in Study Plan	Fall/Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Engineering Applications	
Topic Level	Specialization Requirements	

Description

The course focus on advanced communication systems including the evolution of mobile communication systems from 1G to 4G and beyond, radar systems fundamentals, satellite communication systems. The design of radio networks including link budgets, propagation path losses and transmitter and receiver parameters. Advanced communication technologies such as Orthogonal Frequency-Division Multiplexing (OFDM) and Multiple-Input Multiple-Output (MIMO).

(ECE) - ECEN 469		
Course Title	**Selected Topics in Communications**	
Course Code	**ECEN 469**	
Prerequisites	ECEN 314 - Fundamentals of Communications	
Classification within the curriculum	Elective (ECE Track)	
Course Position in Study Plan	Fall/Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Engineering Applications	
Topic Level	Specialization Requirements	

Description
This course is tailored to introduce students to the latest advances in the various fields in communications, and/or to focus on a specific area of particular interest to the discipline.

(ECE) - ECEN 470		
Course Title	**Introduction to Optical Communication Systems**	
Course Code	**ECEN 470**	
Prerequisites	ECEN 314 - Fundamentals of Communications	
Classification within the curriculum	Elective (ECE Track)	
Course Position in Study Plan	Fall/Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Engineering Applications	
Topic Level	Specialization Requirements	

Description
The course objective is to provide a basic understanding of present optical communication systems as well as future engineering challenges. The course covers the basic concepts of data modulation in optical fiber channels, channel multiplexing, wavelength division multiplexing, and fiber optics. The course also addresses the basic function principles of optical fibers, light emitting diodes, lasers, optical amplifiers, and optical receivers.

(ECE) - ECEN 473		
Course Title	**Antenna and Propagation**	
Course Code	**ECEN 473**	
Prerequisites	ECEN 372 - Applied Electromagnetics	
Classification within the curriculum	Elective (ECE Track)	
Course Position in Study Plan	Fall	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Engineering Applications	
Topic Level	Specialization Requirements	

Description
Introduction to the fundamentals of wave propagation and antenna theory and design. The course covers the theory of radiation, fundamental antenna parameters and concepts, wire antennas such as dipoles and loop antennas, antenna arrays, aperture antennas, microstrip antennas, numerical analysis, and practical configurations in communication and radar systems.

(ECE) - ECEN 474		
Course Title	**Radio Frequency Integrated Circuit Design and Implementation**	
Course Code	**ECEN 474**	
Prerequisites	ECEN 311 - Analysis and Design of Analog Circuits	ECEN 372 - Applied Electromagnetics
Classification within the curriculum	Elective (ECE Track)	
Course Position in Study Plan	Fall/Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Engineering Applications	
Topic Level	Specialization Requirements	

Description

The course covers the design and analysis of radio frequency integrated circuits at the transistor level using CMOS and bipolar technologies. It focuses on system-level trade-offs in transceiver design, practical RF circuit techniques, and physical understanding of device parasitics. Models for active devices, passive components and interconnect parasitics are examined. The course also covers concepts in wireless system design and their impact on design trade-offs in different transceiver architectures. RF transistor models, passive matching networks, noise analysis and low-noise amplifier design are studied. The effects of nonlinearity are treated along with mixer design techniques and practical bias circuits. The importance of phase noise and VCO design will be considered.

(ECE) - ECEN 481		
Course Title	**Mechatronic Design**	
Course Code	**ECEN 481**	
Prerequisites	ECEN 315 - Fundamentals of Control	
Classification within the curriculum	Elective (ECE Track) and Elective (CE Track)	
Course Position in Study Plan	Fall/Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	1.5
	Labs	
	TOTAL	4.5
EG Credit Hours	3	
ECTS	5	
Student Workload (SWL) / semester	125	
Topic Category	Engineering Applications	
Topic Level	Specialization Requirements	

Description

Mechatronics is the synergistic integration of mechanism, electronics, and computer control to achieve a functional system. The course emphasizes system integration in which small teams of students configure, design and implement a succession of mechatronic subsystems, leading to a main project. Lecture will complement the laboratory experience with the operational principles, and integrated design issues associated with mechanism, electronics and control components. Topics include: mechanisms, actuators, motor drives, sensors and electronic interfaces, microcontroller hardware and programming and basic controllers.

(ECE) - ECEN 493

Course Title	**Graduation Project I**	
Course Code	**ECEN 493**	
Prerequisites	Senior Standing	
Classification within the curriculum	Compulsory	
Course Position in Study Plan	Spring (Semester 8)	
Contact Hours	Lectures	3
	Tutorials	
	Labs	
	TOTAL	3
EG Credit Hours	3	
ECTS	6	
Student Workload (SWL)	180	
Topic Category	Projects and Practical Training	
Topic Level	Program Requirements	

Description
Application-oriented capstone project to show competence in major academic area, where an independent research project is conducted under the guidance of a faculty member in the ECE program. The research should contribute to the advancement of knowledge in the field. Written report and formal presentation are required.

(ECE) - ECEN 495

Course Title	**Graduation Project II**	
Course Code	**ECEN 495**	
Prerequisites	ECEN 493 - Graduation Project I	
Classification within the curriculum	Compulsory	
Course Position in Study Plan	Fall (Semester 9)	
Contact Hours	Lectures	3
	Tutorials	
	Labs	
	TOTAL	3
EG Credit Hours	3	
ECTS	6	
Student Workload (SWL)	180	
Topic Category	Projects and Practical Training	
Topic Level	Program Requirements	

Description
The continuation and completion of the capstone project**.**

(ECE) - ENTR 301

Course Title	**Selected Topics in Entrepreneurship**	
Course Code	**ENTR 301**	
Prerequisites	NONE	
Classification within the curriculum	Compulsory (All Tracks)	
Course Position in Study Plan	Fall	
Contact Hours	Lectures	1.5
	Tutorials	1.5
	Labs	
	TOTAL	3
EG Credit Hours	2	
ECTS	4	
Student Workload (SWL)	100	
Topic Category	Business	
Topic Level	Program Requirements	

Description

In this course, students get an overview about the definition of entrepreneurship, examples of successful innovations, and the prospects of starting a company. The course covers idea generation and identifying opportunities, business model canvas, and an overview of some business fundamentals such as types of businesses and business functions, in addition to communication and presentation skills.

(ECE) - NSCI 102

Course Title	**Selected Topics in Environmental Science**	
Course Code	**NSCI 102**	
Prerequisites	None	
Classification within the curriculum	Compulsory (All Tracks)	
Course Position in Study Plan	Spring	
Contact Hours (weekly)	Lectures	3
	Tutorials	3
	Labs	
	TOTAL	6
EG Credit Hours	4	
ECTS	6	
Student Workload (SWL) / semester	150	
Topic Category	Engineering Culture	
Topic Level	Program Requirements	

Description
A course in any of the fields of environmental sciences related to the discipline it is offered to.