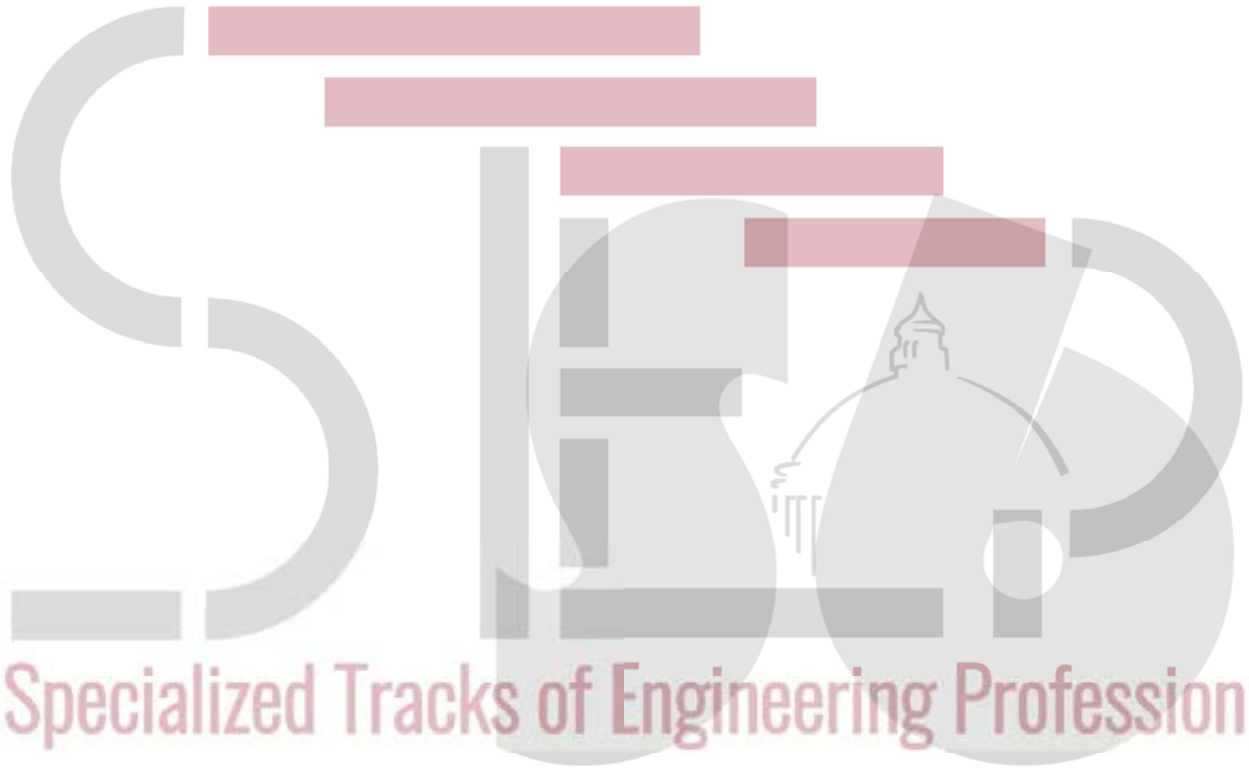

PART [C]: SPECIALIZED PROGRAMS

(6) Electrical Energy Engineering Program (EEE)

برنامج هندسة الطاقة الكهربية

(6) Electrical Energy Engineering Program (EEE)

برنامج هندسة الطاقة الكهربية

This program is designed to allow for international collaboration with similar international credit hours programs.

VISION رؤية البرنامج

Excellence in engineering education in the area of electrical energy both locally and internationally.

ريادة التعليم الهندسي في مجال الطاقة الكهربية محليا ودوليا

MISSION رسالة البرنامج

The program aims at providing Egypt and the Arab and African regions with excellent graduates in electrical energy engineering, renewable energy and their applications. Program graduates will be able to devote their advanced knowledge and their communication and practical skills to achieving sustainable development and serving the community and the environment.

نسعى إلى إمداد الوطن والمنطقة العربية والافريقية والعالم بخريج متميز في مجال هندسة الطاقة الكهربية والطاقة المتجددة وتطبيقاتهما المختلفة يكون قادرا على استخدام المعرفة العلمية المتقدمة وكافة مهارات الاتصال والعمل الفعال بما يساهم في تحقيق التنمية المستدامة وخدمة المجتمع والبيئة.

GRADUATE ATTRIBUTES مواصفات الخريج

In addition to the Competencies for the BASIC ELECTRICAL Engineering graduate and similar programs, Electrical Energy Engineering program graduate must be able to:

1. Design, supervise, operate, and maintain systems to generate traditional as well renewable electrical energy.
2. Design, supervise, operate, and maintain systems to generate, transmit, control and use of electrical energy and smart micro electrical energy systems.
3. Design and develop electrical generators, electrical motors, protection systems, and transmission systems.
4. Develop, design, and maintain low voltage distribution systems.
5. Design, supervise, operate, and maintain industrial control systems and industrial instrumentation.

6. Plan and manage different phases of electrical engineering projects, from construction to operation.
7. Prepare and review sketches, specifications, documentations and data sheets for electric power generation, protection, control, and delivery systems.
8. Design and operate information systems for electrical energy systems.

بالإضافة للمهارات الهندسية العامة التي يكتسبها خريج كلية الهندسة جامعة القاهرة، سوف يتمكن خريج برنامج هندسة الطاقة الكهربية من الآتي:

1. التصميم والاشراف والتشغيل والصيانة لنظم توليد الطاقة الكهربية التقليدية والمتجددة.
2. التصميم والاشراف والتشغيل والصيانة لنظم نقل وتوزيع واستخدام الطاقة الكهربية ونظم الطاقة الكهربية الذكية والمصغرة.
3. تصميم وتطوير المولدات الكهربية والمحركات الكهربية ونظم الوقاية ونظم نقل الطاقة.
4. تطوير وتصميم وصيانة نظم التوزيع ذات الجهد المنخفض.
5. التصميم والاشراف والتشغيل والصيانة لنظم التحكم الصناعي وأجهزة القياس الصناعية.
6. تخطيط وإدارة مختلف مراحل مشروعات الهندسة الكهربية من الانشاء إلى التشغيل.
7. تحضير ومراجعة الرسوم والمواصفات والوثائق والبيانات الخاصة بنظم توليد الطاقة الكهربية، ونظم الوقاية، والتحكم، والتوزيع.
8. تصميم وتشغيل نظم المعلومات المتعلقة بنظم الطاقة الكهربية.

PROGRAM BENCHMARK مرجعية البرنامج

The program is designed to meet the National Academic Standards NARS2018 in addition to meeting the Accreditation Board for Engineering and Technology ABET standards and the Canadian Engineering Accreditation Board CEAB standards.

يستند تصميم البرنامج للمعايير الاكاديمية القومية للعام 2018 بالإضافة إلى المعايير المرجعية الأمريكية ABET والمعايير المرجعية الكندية CEAB

NARS 2018	LEVEL A	LEVEL B	LEVEL C	LEVEL D
	Totally Adopted	Totally Adopted	The program adopted level C Competencies-See below	NA

In addition to the Competencies for the BASIC ENGINEER, the ELECTRICAL Engineering graduate, the Electrical Energy Engineering program graduate must be able to:

Level C

1. Design, supervise, operate and maintain systems to generate, transmit, control and use of electrical energy.
2. Design and develop electrical generators, electrical motors, protection systems, and transmission systems.
3. Develop, design, and maintain low voltage distribution systems.
4. Design, supervise, operate, and maintain industrial control systems and industrial instrumentation.
5. Plan and manage different phases of electrical engineering projects, from construction to operation.
6. Prepare and review sketches, specifications, documentations and data sheets for electric power generation, protection, contro and delivery systems.
7. Design, maintain and manage information systems for electrical energy systems.

SPECIALIZED COURSES CONTENTS توصيف المقررات

Code	Name	Credit Hours	Category	Pre-requisite
EEES280	Engineering Seminar	1	DR	30 CR.HRS. + AA APPROVAL
EEES281	Industrial Training-1	1	FR	60 CR.HRS. + AA APPROVAL
EEES381	Industrial Training-2	2	DR	EEES281 + AA Approval
EEES481	Graduation Project-1	1	FR	110 CRHs + AA Approval
EEES482	Graduation Project-2	3	DR	EPES481
Total		2+6		

COURSES CONTENTS توصيف المقررات

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
Faculty Requirements										
EEES280	Engineering Seminar	1	1	0						1
	Pre-requisites: 30 CR.HRS. + AA Approval									
	Talks and presentations are invited from industrial establishments relevant to the program. The guest speaker should discuss the organization, management, and recent technologies implemented in his/her industrial establishment. Students exercise writing brief technical reports on the guest presentation and deliver their own presentation about the topic. The course is graded as Pass/Fail grade-system.									
EEES281	Industrial Training-1	1	0	0						0
	Pre-requisites: 60 credits + AA Approval									
	Training on industrial establishments relevant to the program. Training lasts for a total of 90 hours, during a minimum period of three weeks. The program training advisor schedules at least one follow-up visit to the training venue and formally reports on performance of trainee(s). A Mentor in the industrial establishment provides a formal report on the student's performance during training. The student submits a formal report and presentation to be evaluated by a panel of three members with one member being an external examiner appointed from industry or other colleges of engineering. The course is graded as Pass/Fail grade-system.									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
EEES381	Industrial Training-2	2	0	0						0
	Pre-requisites: EEES281 + AA APPROVAL									
	Training on industrial establishments relevant to the program. Training lasts for total of 180 hours, during a minimum period of six weeks. The program training advisor schedules at least two follow-up visits to the training venue and formally report on performance of trainee(s). A Mentor in the industrial establishment provides a formal report on the student's performance during training. The student submits a formal report and presentation to be evaluated by a panel of three members with one member being an external examiner appointed from industry or other colleges of engineering. The course is graded as Pass/Fail grade-system.									
EEES481	Graduation Project 1	1	0	0		3				3
	Pre-requisites: 110 CR.HRS. + All Sophomore courses + AA Approval									
	Students – in groups (or individually in some programs) - undertake a final project as part of the program. In GP1, students provide a clear identification of a real-life problem that represents an actual need for the industry or the community and reflects the mission and strategic objective of CUFE. Students are expected to survey the related literature, collect, and interpret market data, and proposed an approach for the solution, using the engineering knowledge and skills acquired. The course is graded as Pass/Fail based upon a report/oral presentation stating the expected cost and required material, tools, and facilities as well as a timed list of deliverables.									
EEES482	Graduation Project-2	3	1					6		7
	Pre-requisites: EEES481 + AA Approval									
	Graduation Project-2 is the second phase of the graduation project. The aim is to develop innovative solutions to problems encountered during the implementation process thus fulfilling the deliverables stated in Graduation Project-1. A dissertation on the project is submitted taking into consideration technical, economic, social, and environmental requirements while analysing the major results and presenting direct conclusions.									

PROGRAM REQUIREMENTS متطلبات البرنامج

Category		No. of courses	Course Credit Hour	Total Credit Hours
Discipline Requirements (DR)	core/ compulsory	1	4	4
		18	3	54
		3	2	6
		1	1	1
Total DR courses		23		65
Program Requirement (PR)	core/ compulsory	7	3	21
	Elective	8	3	24
Total PR courses		15	3	45
Total Elective courses (DR & PR)		8	3	24

- **Discipline Requirements (DR) core/compulsory courses list**

Code	Name	Credit Hours	Pre-requisite
CMPS102	Programming Techniques	3	INTS005
CMPS103	Data Structures and Algorithms	3	INTS005+ CMPS102
CMPS118	Introduction to Logic Design	3	INTS005
CVES125	Civil Engineering	2	EMCS002
EECS102	Circuits-1	3	MTHS003 + PHYS002
EECS112	Circuits-2	3	EECS102 + MTHS102
EECS101	Electronics-1: Basic Electronic Circuits	3	EECS102 + PHYS102
EECS202	Operational Amplifiers circuits and applications	3	EECS101
EECS203	Signal Analysis	3	EECS102 + MTHS102
EECS306	Communications-1: Analogue Communications	3	MTHS204 + EECS203

Code	Name	Credit Hours	Pre-requisite
EPES200	Basic Laboratory	2	EECS102
EPES203	Electromagnetic Fields	3	PHYS002+ MTHS104
EPES301	Electrical Machines-1	3	EPES203+ EECS112
EPES307	Electrical Measurements	3	EPES200
EPES311	Microprocessors Applications	4	EECS202 + CMPS118
INTS125	Introduction to Mechanical Engineering	3	PHYS001
MEPS219	Mechanical Power Engineering	3	INTS125
MTHS104	Differential Equations	3	MTHS003
MTHS114	Numerical Analysis	3	MTHS102 + MTHS104
PHYS102	Modern Physics	3	PHYS001 + PHYS002
EEES280	Engineering Seminar	1	30 CR.HRS. + AA Approval
EEES381	Industrial Training-2	2	EEES281 + AA Approval
EEES482	Graduation Project (2)	3	EPES481
Total		**65**	

- **Program Requirements (PR) core/compulsory courses list**

Code	Name	Credit Hours	Pre-requisite
EPES204	Energy Conversion	3	PHYS002
EPES302	Elements of Power Systems	3	EECS102
EPES304	Electrical Machines-2	3	EPES301
EPES306	Power Electronics (1)	3	EECS202
EPES308	Control Systems	3	MTHS104+EECS203
EPES402	Power System Analysis	3	EPES302
EPES404	Digital Control Systems	3	EPES308
Total		**21**	

- **Program Requirements (PR) elective courses list**

Code	Name	Credit Hours	Pre-requisite
ELECTIVE Courses Group A1 (EPES40X)			
EPES401	Special Electrical Machines	3	EPES304+ AA Approval
EPES403	Power System Protection	3	EPES302+ AA Approval
EPES405	Power Electronics (2)	3	EPES306+ AA Approval
EPES406	High Voltage Engineering	3	EPES302 + EPES307 + AA Approval
ELECTIVE Courses Group B1 (EPES40X)			
EPES407	Digital Signal Processing Fundamentals	3	EECS203 + AA Approval
EPES408	Device design and Integration	3	EECS101 + AA Approval
EPES409	Fiber optics communication	3	EECS203 + AA approval
EPES412	Electrical Power Distribution	3	EPES403 + AA Approval
ELECTIVE Courses Group A2 (EPES4XX)			
EPES411	Power Quality	3	EPES302 + AA Approval
EPES412	Electrical Power Distribution	3	EPES403 + AA Approval
EPES413	Power Systems Economics	3	EPES302 + EPES308 + AA Approval
EPES414	Smart Power Grid	3	EECS306 + EPES302 + AA Approval
EPES415	Power System Planning	3	EPES302 + EPES308 + AA Approval
EPES416	Power Stations	3	MEPS219 + EPES204 + AA Approval
EPES417	Renewable Energy Systems	3	MEPS219 + EPES204+AA Approval
EPES418	Power System Switchgear	3	EPES403 + AA Approval
EPES419	Protection Systems and Digital Relaying	3	EPES403 + AA Approval
EPES420	Electrical Machines Design	3	EPES304 + AA Approval
EPES421	Electrical Machines Drives	3	EPES304 + EPES405 + AA Approval
EPES422	Electric Traction and Mobility Systems	3	EPES304 + EPES405 + AA Approval
EPES423	Electrical Installation	3	EPES302 + AA Approval
EPES424	Introduction to Mechatronics	3	EPES311 + EPES308 + AA Approval

Code	Name	Credit Hours	Pre-requisite
EPES425	Process Control and Robotics	3	EPES404 + AA Approval
EPES426	Computer Control in Energy Systems	3	EPES311 + EPES404 + AA Approval
EPES427	Intelligent Control	3	EPES308 + AA Approval
EPES428	Power System Operation and Control	3	EPES402 + AA Approval
EPES429	Environmental Impact of Electricity	3	70 CRH + AA approval
EPES430	Operations Research	3	70 CRH + AA approval
EPES431	Electrical Generators for Renewable Energy Applications	3	EPES304 + AA Approval
EPES432	Super Conductor Applications	3	EPES203 + AA Approval
EPES433	Power Electronics Applications in Power Systems	3	EPES405 + AA Approval
EPES434	Embedded Systems Applications in Power Electronics	3	EPES405 + AA Approval
EPES435	Power Electronics for electric vehicles	3	EPES405 + AA Approval
EPES436	Electrical Substations Design	3	EPES406 + AA Approval
EPES437	Special Topics in High Voltage Engineering	3	EPES406 + AA Approval
EPES438	Energy Storage Systems	3	EPES204 + AA Approval
ELECTIVE Courses Group B2 (EPES4XX)			
EPES439	Wireless Networking	3	EECS203 + AA approval
EPES440	Introduction to Digital Computer Architecture	3	EPES311 + AA approval
EPES441	Microcomputer structure and interfacing	3	EPES311 +AA approval
EPES442	Introduction to Digital Image Processing	3	EECS203 + AA approval
EPES443	Digital Speech Processing	3	EECS203 + AA approval
EPES444	Biometric Systems	3	CMPS103 + AA approval
EPES445	Introduction to Microfabrication	3	EECS101 + AA Approval

The student of track A: (EEE-P) EEE-Power Systems, chooses three courses from group (A1), and five courses from group (A2), while student of track B: (EEE-I) EEE-Information Systems, chooses three courses from grcup (B1) and five courses from group (B2). Registration is subject to academic approval.

يختار طالب المسار A : EEE-Power Systems (EEE-P) ثلاث مقررات من المجموعة (A1) وخمس مقررات من المجموعة (A2) ويختار طالب المسار B : EEE-Information Systems (EEE-I) ثلاث مقررات من المجموعة (B1) وخمس مقررات من المجموعة (B2) ويخضع التسجيل للموافقة الاكاديمية.

Proposed Study Plan - 8 semesters - Including Freshman Level

S	Code	Name	Credit Hours	Contact Hours							
				Lec	Tut (2)	App Tut	Lab	Stud	Off. Tut.	Off. Hrs	Total
SEMESTER 1	PHYS001	Mechanical Properties of Matter and Thermodynamics	3	2		2	1				5
	MTHS002	Calculus I	3	2	2						4
	EMCS001	Engineering Mechanics – Dynamics	3	1	2		1				4
	CHES001	Chemistry for Engineers	2	1	2						3
	PHYS002	Electricity and Magnetism	3	2		2	1				5
	INTS005	Information Technology	2	1			3				4
	GENS004	Proficiency and Capacity Building	1	1							1
	GENS001	Critical and Creative Thinking	2	2							1
		Sub-Total	**19**	**13**	**6**	**4**	**5**	**0**	**0**	**0**	**28**

S	Code	Name	Credit Hours	Contact Hours							
				Lec	Tut (2)	App Tut	Lab	Stud	Off. Tut.	Off. Hrs	Total
SEMESTER 2	MTHS003	Calculus 2	3	2	2						4
	EMCS002	Engineering Mechanics – Statics	2	1	2						3
	INTS001	Engineering Graphics	3	2				3			5
	E-A (GENS005)	Elective E-A (Writing and Presentation Skills)	2	2	0						2
	PHYS102	Modern Physics	3	2		2	1				5
	CMPS118	Introduction to Logic Design	3	2	2						4
	INTS125	Introduction to Mechanical Engineering	3	2		2	1				5
		Sub-Total	**19**	**13**	**6**	**4**	**2**	**3**	**0**	**0**	**28**

S	Code	Name	Credit Hours	Contact Hours							
				Lec	Tut (2)	App Tut	Lab	Stud	Off. Tut.	Off. Hrs	Total
SEMESTER 3	MTHS102	Linear Algebra and Multivariable Integrals	3	2	2						4
	CVES125	Civil Engineering	2	1	2						3
	MTHS104	Differential Equations	3	2	2						4
	CMPS102	Programming Techniques	3	2			3				5
	EPES204	Energy Conversion	3	2		2	1				5
	EECS102	Circuits-1	3	2		2	1				5
	GENS00X	Elective Course UR	2	2							2
		Sub-Total	**19**	**13**	**6**	**4**	**5**	**0**	**0**	**0**	**28**

S	Code	Name	Credit Hours	Contact Hours							
				Lec	Tut (2)	App Tut	Lab	Stud	Off.Tut.	Off. Hrs	Total
SEMESTER 4	EECS112	Circuits-2	3	2		2	1				5
	EPES200	Basic Laboratory	2	1			3				4
	MTHS204	Advanced Probability and Statistics	3	2	2						4
	EECS203	Signal Analysis	3	2		2	1				5
	EECS101	Electronics-1: Basic Electronic Circuits	3	2	2						4
	GENS120	Fundamentals of Economics and Accounting	2	2							2
	EPES203	Electromagnetic Fields	3	2	2						4
		Sub-Total	**19**	**13**	**6**	**4**	**5**	**0**	**0**	**0**	**28**

S	Code	Name	Credit Hours	Contact Hours							
				Lec	Tut (2)	App Tut	Lab	Stud	Off. Tut.	Off. Hrs	Total
SEMESTER 5	EPES307	Electrical Measurements	3	2		2	1				5
	EEES280	Engineering Seminar	1	1							1
	EPES301	Electrical Machines-1	3	2		2	1				5
	EPES302	Elements of Power Systems	3	2	2						4
	CMPS103	Data Structures & Algorithms	3	2			3				5
	EECS202	Operational Amplifiers circuits and applications	3	2		1	1				4
	MEPS219	Mechanical Power Engineering	3	2	2						4
		Sub-Total	**19**	**13**	**4**	**5**	**6**	**0**	**0**	**0**	**28**

S	Code	Name	Credit Hours	Contact Hours							
				Lec	Tut (2)	App Tut	Lab	Stud	Off.	Off. Hrs	Total
SEMESTER 6	EPES311	Microprocessors Applications	4	3		2	1				6
	EECS306	Communications-1: Analogue Communications	3	2		2	1				5
	MTHS114	Numerical Analysis	3	2	2						4
	EPES304	Electrical Machines-2	3	2		2	1				5
	EPES308	Automatic Control Systems	3	2		2					4
	EPES306	Power Electronics (1)	3	2		1	1				4
		Sub-Total	**19**	**13**	**2**	**9**	**4**	**0**	**0**	**0**	**28**

S	Code	Name	Credit Hours	Contact Hours							
				Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut.	Off. Hrs	Total
SEMESTER 7	EPES402	Power System Analysis	3	2	2						4
	EPES404	Digital Control Systems	3	2		2	1				5
	EPES40X	Elective Course (1) A1/B1	3	2		2					4
	EPES40X	Elective Course (2) A1/B1	3	2		2					4
	EPES40X	Elective Course (3) A1/B1	3	2		2					4
	EPES4XX	Elective Course (1) A2/B2	3	2		2					4
	EEES481	Graduation Project (1)	1	0	0		3				3
		Sub-Total	**19**	**12**	**2**	**10**	**4**	**0**	**0**	**0**	**28**

S	Code	Name	Credit Hours	Contact Hours							
				Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
SEMESTER 8	EPES4XX	Elective Course (2) A2/B2	3	2		2					4
	EPES4XX	Elective Course (3) A2/B2	3	2		2					4
	EPES4XX	Elective Course (4) A2/B2	3	2		2					4
	EPES4XX	Elective Course (5) A2/B2	3	2		2					4
	EEES482	Graduation Project (2)	3	1			6				7
	E-A (GENS110)	Elective E-A (Fundamental of Management, Risk and Environment)	2	2							2
	GENS3XX	Elective Course UR	2	2							2
		Sub-Total	**19**	**13**	**0**	**8**	**6**	**0**	**0**	**0**	**27**

COURSES CONTENTS توصيف المقررات

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
Discipline Requirements										
CMPS102	Programming Techniques	3	2			3				5
	Pre-requisites: INTS005									
	Introduction to software design - evolution and comparison of programming languages - types and characteristics of translators - structured programming - function versus object-oriented programming- introduction to parallel programming- program maintenance & testing - documentation - numerical and non-numerical examples-programming project.									
Textbook	-Programming and Problem Solving with C++: Comprehensive 6th Edition. Jones & Bartlett Learning, 2016. -Programming: principles and practice using C++, 2nd edition. Pearson Education, 2014.									
CMPS103	Data Structures and Algorithms	3	2			3				5
	Pre-requisites: INTS005+ CMPS102									
	Data types and representation – file structures- data structures representation in storage media and memory allocation- linear lists -stacks - queues - memory allocation - trees - graphs - Hashing -searching, sorting algorithms and their analysis-programming project.									
Textbook	* Data Abstraction & Problem Solving with C++ Walls and Mirrors, By Frank M. Carrano, 6th edition, Pearson International Edition, Addison Wesley , Copyright © 2013 * Data Structures, A Pseudocode Approach in C By Richard F. Gilberg & Behrouz A. Forouzan, second edition Thomson Course Technology 2005, 2007 and later editions									
CMPS118	Introduction to Logic Design	3	2	2						4
	Pre-requisites: INTS005									
	Number systems and data representation - Boolean algebra - simplification of Boolean functions - logic gates - combinational and sequential logic circuits – Registers, counters, and adders – Memory									
Textbook	Brock J. LaMeres, Introduction to Logic Circuits & Logic Design with VHDL, 2019									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
CVES125	Civil Engineering	2	1	2						3
	Pre-requisites: EMCS002									
	Buildings: types of buildings, items within a building, types of foundations, building materials with emphasis on concrete and testing, insulation against heat moisture, noise and pollution, Principles of fire protection, tender document. Surveying: Principles & applications of surveying sciences with emphasis on plane surveying, Popular techniques and engineering uses of distance, angles and height difference measurements. Applications of mapping, integrated digital surveying and mapping using total station, Internet resources. Structures: Types of structures, loads, supports, reactions, internal forces, analysis of beams, frames, trusses.									
Textbook	Sheng-Taur Mau, Sami Maalouf, Introduction to Civil Engineering, Revised 1st ed. Edition, 2014 Russell C. Hibbeler - Structural Analysis in SI Units (2019)									
EECS102	Circuits-1	3	2		2	1				5
	Pre-requisites: MTHS003 + PHYS002									
	Analysis of resistive circuits by simp ifications –Network theorems –Analysis of circuits with AC excitation in the time domain –Analysis of AC circuits in the frequency domain – Analysis of AC circuits using circuit theorems, loop and node analysis –Maximum power transfer –RLC circuits –Magnetically coupled circuits -Three phase circuits.									
Textbook	C. Alexander and M. Sadiku, Fundamental of Electric Circuits, 7th edition, Mc Graw Hill, 2021. J. W. Nilson, and S.A. Riedel, Electric Circuits, 11th Edition, Pearson Education Limited, 2020.									
EECS112	Circuits-2	3	2		2	1				5
	Pre-requisites: EECS102 + MTHS102									
	Series and parallel resonant circuits – Application on passive filters – Two port circuits – Fourier and harmonic analysis – Application of Laplace transforms to circuit analysis – Circuit synthesis – Synthesis of lossless Circuits.									
Textbook	"Fundamentals of Electric Circuits", Alexander and Sadiku, 7th edition, 2020, McGraw Hill.									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
EECS101	Electronics-1: Basic Electronic Circuits	3	2	2					1	4
	Pre-requisites: EECS102 + PHYS102									
	Diode circuit applications – Bipolar junction transistor (BJT) - Metal oxide semiconductor transistor (MOST): physical structure, basic configuration, I-V characteristics, biasing - small signal equivalent circuit - Biasing techniques (current source biasing) – Single stage amplifiers – Active Load.									
Textbook	1. Behzad Razvi, "Fundamentals of Microelectronics", 3rd Edition, 2021, Wiley. 2. Sedra and Smith, "Microelectronic Circuits", 8th edition, 2019, Oxford University Press.									
EECS202	Operational Amplifiers circuits and applications	3	2		1	1				4
	Pre-requisites: EECS101									
	Designs and applications of basic electronic circuits, including power amplifiers and various output stages using MOSFETs and BJTs. Operational Amplifiers: feedback, op-amp circuit analysis, application circuits (e.g. followers, amplifiers, integrators, differentiators, summers, differential amplifiers, power amplifiers, instrumentation amplifiers, active rectifiers, comparators, Schmitt triggers, relaxation oscillator, and active filters). Non-ideal effects in op-amps and effects on performance. Multistage amplifier designs. Voltage regulators.									
Textbook	Paul Horowitz , Winfield Hill , The Art of Electronics, 3rd Edition, 2015									
EECS203	Signal Analysis	3	2		2	1				5
	Pre-requisites: EECS102 + MTHS102									
	Continuous time and discrete time signals and systems - basic system properties - Linear Time Invariant Systems – The C.T and D.T. convolution - Properties of LTI systems - Fourier Series Representation of C.T. and D.T. Periodic Signals - Parseval's relation - The C.T. Fourier Transform for periodic and aperiodic signals - Properties of continuous time F.T. – The D.T. Fourier Transform – Properties of D.T. Fourier Transform - Complex exponential and sinusoidal Amplituce Modulation-Demodulation for Sinusoidal AM - Frequency Division Multiplexing - Representation of continuous time signal by its samples - The sampling Theorem - The effect of under-sampling or aliasing - sampling with zero order hold - The Z Transform									
Textbook	A. V. Oppenheim, A. S. Willsky, and A.H. Nawab, "Signals and Systems", 2nd edition, Pearson Education Limited, 2014. Luis Chaparro, and Aydin Akan, Signals and Systems Using MATLAB, 3rd Edition, Academic Press, Nov. 2018.									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
EECS306	Communications-1: Analogue Communications	3	2		2	1				5
	Pre-requisites: EECS203 + MTHS204									
	All Types of AM (DSB-LC, DSB-SC, SSB, VSB, QAM) – AM modulators, and demodulators, adv. and disadv.-Synchronization circuits - AM applications: Telephone channel multiplexing and superheterodyne receiver -Angle Modulation - Narrow band angle modulated signals - Spectrum of sinusoidal signal (N.B and W.B) - Generation of wide band FM (Indirect and Direct methods)-Demodulation (slope detector, PLL) - De-emphasis and pre-emphasis filtering -compatible stereo - Intersystem comparison – Sampling process – PAM – Quantization (uniform and non-uniform) – PCM – Time division multiplexing – Delta, and adaptive delta modulation – Differential PCM – random process – Stationary and ergodic processes – Mean, correlation, and covariance functions – Power spectral density – Narrow band noise.									
Textbook	B. Lathi, Modern Digital and Analog Communication (The Oxford Series in Electrical and Computer Engineering) 5th Edition, 2018, Oxford University Press.									
EPES200	Basic Laboratory	2	1		3					4
	Pre-requisites: EECS102									
	Basic circuit components (resistors, capacitors, inductors, diodes), Use of measuring instruments such as multi-meters and oscilloscopes, Construction and debugging of simple electric circuits, Soldering of components, Basic analog electronic components, Simple electric/electronic circuit projects									
Textbook	N/A									
EPES203	Electromagnetic Fields	3	2	2						4
	Pre-requisites: MTHS104 + PHYS002									
	Electrostatic Fields: - Electric field intensity – Gauss's Law and its applications – Electric Potential – Dielectric Materials – Electric flux density – Boundary conditions – Capacitance and capacitors – Electric Energy and Forces. Magnetostatic Fields: Magnetic flux density - Ampere's Law & Vector Magnetic Potential - Biot-Savart Law - Magnetic Dipoles & Scalar Magnetic Potential - Magnetization & Magnetic Materials - Boundary Conditions -Inductances and Inductors - Magnetic Energy - Magnetic Forces & Torque Time varying Fields: Faraday's Law and its applications – Maxwell's Equations – Electromagnetic Waves in different media – Quasi static magnetic fields applications									
Textbook	Andrew Zangwill, Modern Electrodynamics, 2013, 1st Edition									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
EPES311	Microprocessors Applications	4	3		2	1				6
	Pre-requisites: EECS202 + CMPS118									
	Introduction to computing. Microprocessors and Microcontrollers. Instruction set and Assembly language programming. Programming in C. Minimum system Hardware Configuration. Timer, Serial communication, and Interrupt programming. Display and Keyboard Interfacing. Signal conditioning. A/D and D/A conversion. Sensors and actuators Interfacing. Applications: Demand Side Management, Electric Machine Drives, Electric Vehicles, Renewable Energy applications, Digital protection. Laboratory experiments on the course topics									
Textbook	Jan Friso Groote, Rolf Morel, Julien Schmaltz, Adam Watkins, Logic Gates, Circuits, Processors, Compilers and Computers, Springer, 2021.									
EPES307	Electrical Measurements	3	2		2	1				5
	Pre-requisites: EPES200									
	Errors in measurements - Electronic measurement, Oscilloscopes - Signal generators - Noise sources and reduction techniques - Troubleshooting with instruments - Analog to digital converter, Electronic digital counters, Digital multi-meter - Temperature transducers, Mechanical Transducers, Optical transducers - Analog and Digital Signal Conditioning - Fiber optic in instrumentation, acoustic detectors – Partial discharge detection – High voltage measurements – High current measurements - Electromagnetic field meters. Laboratory experiments on the course topics.									
Textbook	Prithwiraj Purkait, Electrical and Electronics Measurements and Instrumentation, McGraw Hill Education (India), 2013									
EPES301	Electrical Machines-1	3	2		2	1				5
	Pre-requisites: EECS112 + EPES203									
	Transformers: Construction – theory of operation – equivalent circuit – Per Unit System- Tests - Efficiency & Regulation - Special Transformers– No-load current and inrush current - Three-phase transformers – Three phase transformer connection groups - Parallel operation – Transformer cooling – Transformer sizing. Principles of Electromechanical energy conversion: process of conversion – Force and torque in electromagnetic systems – rotating machines. DC Machines: Construction – theory of operation of generators and motors – Magnetic characteristics – Classification and performance characteristics of DC Motors – Stability – Starting, speed control and braking of DC Motors, application in Traction Systems									
Textbook	Ion Boldea, Lucian N. Tutelea, Electric Machines, 2022, 2nd Edition									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
INTS125	Introduction to Mechanical Engineering	3	2		2	1				5
	Pre-requisites: PHYS001									
	Ideal gas properties; First law of thermodynamics and its applications; Second law of thermodynamics and its applications; Chemical equilibrium of combustion reactions; Internal combustion engines; Engine parameters; Introduction to heat transfer (Conduction, convection, and radiation), Degree of freedom, Mechanisms. Introduction to the dynamics of machinery. Power transmission elements: gears, shafts, clutches and brakes, pulleys, belts, chain and sprocket, power screws. Bearings. Introduction to manufacturing engineering: casting, forming, machining, and welding.									
Textbook	An Introduction to Mechanical Engineering 4th Edition, by J. Wickert and K. Lewis (2016)									
MEPS219	Mechanical Power Engineering	2	1		3					4
	Pre-requisites: INTS125									
	Standard cycles of internal combustior engines; Gas power cycles; Properties of pure substances; Steam power plants; Standard Rankine cycle; Modified Rankine cycles; Combined cycles; Cogeneration; Concentrating solar power									
Textbook	Yunus A. Cengel, John Cimbala, Afsh n Ghajar. "Fundamentals of thermal-fluid sciences", 6th edition, 2021, McGraw-Hill									
MTHS102	Linear Algebra and Multivariable Integrals	3	2	2	0					4
	Pre-requisites: MTHS003									
	Solving Linear Systems, Vector Spaces and Subspaces, Inner Product Spaces and Orthonormal Bases, The Eigenvalue Problem; Diagonalization of Matrices, Computing Functions of Matrices. Functions of Several Variables, The Gradient of a Scalar Function and its Applications, Vector Fields, Curl and Divergence, Double and Triple Integrals with Applications, Line and Surface Integrals with Applications.									
Textbook	1. "Calculus Early Transcendentals", by James Stewart, 8th edition, 2015, Cengage Learning. 2. "Elementary Linear Algebra with Applications" by B. Kolman and D. Hill, 2013, Pearson international edition.									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
MTHS104	Differential Equations	3	2	2						4
	Pre-requisites: MTHS003									
	First-order differential equations, separable, exact, linear, homogeneous and Bernoulli equations; modeling with first order differential equations; higher-order differential equations; method of undetermined coefficients; variation of parameters; modeling with higher order differential equations; series solutions; Laplace transform; properties and applications, shifting theorems, convolution theorem; solutions of differential equations using Laplace transform; Fourier series.									
Textbook	1. "A First Course in Differential Equations with Modeling Applications" 11th Edition 2017, by Dennis G. Zill 2. "Fundamentals of Differential Equations", 9th Edition, 2017,by R. Nagle, Edward Saff , Arthur Snider 3. "Advanced Engineering Mathematics", John Wiley & Sons, Inc., 10th Edition, 2011, by Erwin Kreyszig.									
MTHS114	Numerical Analysis	3	2	2						4
	Pre-requisites: MTHS102 + MTHS104									
	Types of Errors. Linear systems: direct methods (Gauss elimination, Choleski) – Iterative methods (Gauss-Seidle , SOR, etc..). Approximation of Functions: polynomials and piecewise polynomial interpolation, splines. Discrete Least Squares Approximation. Nonlinear equations (Newton's method and its discrete variants, fixed point iteration). Power Method and Power method with Deflation to solve the Eigen Value problem. Numerical integration (Newton- Cotes formulas, Gaussian quadrature rules, composite rules). Initial value problems for ordinary differential equation: one-step methods (Runge-Kutta method) and multistep predictor corrector methods (Adams, Milne, etc ..). Stiff problems. Solution of Partial Differential Equations using finite difference method.									
Textbook	Numerical Methods for Engineers, Seventh edition, by Steven C. Chapra and Raymond P. Canale. Publisher: McGraw Hill.2014									
PHYS102	Modern Physics	3	2		2	1				5
	Pre-requisites: PHYS001 + PHYS002									
	Introduction to relativistic mechanics - Introduction to quantum mechanics - The Schrodinger Equation and some of its applications - Atomic Physics - Molecules and solids - Energy states - Bonding in solids, introduction to crystalline properties and Miller indices - Band theory of solids - Metals, insulators and semiconductors - Electrical conduction in metals and semiconductors - Introduction to some electronic devices.									
Textbook	Modern Physics for Scientists and Engineers", Stephen Thornton, Andrew Rex, 4th edition, Cengage Learning, 2013. SBN: 978-1-133-10372-1									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
Program Requirements										
EPES204	Energy Conversion	3	2		2	1				5
	Pre-requisites: PHYS002									
	Energy sources (Depleted and Renewable Sources)– energy and sustainable development - energy utilization and growth rates -energy reserve – economics of energy systems -fuels – energy conversion devices for production of various types of energy (Thermal, Mechanical, Electrical) - energy storage – environmental impact of various generating stations.									
Textbook	George G. Karady, Keith E. Holbert, Electrical Energy Conversion and Transport: An Interactive Computer-Based Approach, 2013, 2nd Edition									
EPES302	Elements of Power Systems	3	2	2						4
	Pre-requisites: EECS102									
	Transmission line Analysis: Calculations of Transmission Line Parameters – Performance of Transmission Lines – A, B, C and D General Constants of Transmission Lines – Reactive Power and Voltage Control of Transmission Lines – Transmission Line Design. Power Transformer Modelling: Three-Winding Transformers - Transformers in Three-Phase Connections – Regulating Transformers for Voltage Magnitude and Angle – Per Unit Representation of Transformers. Symmetrical Components. Short Circuit Studies: Fault Analysis Model Simplification – Fault Calculation Assumptions – Fault Calculations during different fault conditions – DC offset Calculations during Short Circuit.									
Textbook	Muhammad H. Rashid, Power Electronics Handbook, 3rd Edition, 2013.									
EPES304	Electrical Machines 2	3	2		2	1				5
	Pre-requisites: EPES301									
	Three-phase induction motors: Construction, Equivalent Circuit, Torque-speed characteristic, Testing, Performance, Loading & Stability, Modes of Operation, Starting, speed control and Braking, Motor Selection, applications in electrical traction. Single-Phase Induction Motors: Two-phase machines, Construction, Theory of Operation, Effect of Main and Auxiliary windings characteristics on starting, Applications. Synchronous Generators: Construction, Space and Time Phasor Diagram, Characteristics & Tests, Synchronous Reactance, Voltage and speed Regulation, Generator Modes of Operation, Synchronization, Generator Rating and Power Capability Curve, Generator Selection and Specifications.									
Textbook	Ion Boldea, Lucian N. Tutelea, Electric Machines, 2022, 2nd Edition									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
EPES306	Power Electronics (1)	3	2		1	1				4
	Pre-requisites: EECS202									
	Power Semiconductor Devices: (Power Diodes, Power BJTs – Thyristors) Basic Structure – Output Characteristics. Rectifier Circuits: Analysis and Design of Single-Phase and Three-phase Rectifiers (Uncontrolled, Fully Controlled, Semi-Controlled Rectifiers). Thyristor Firing Circuits: Analog and Digital Firing Circuits. DC/DC Converters: Basic Switching Converters (Buck Regulator – Boost Regulator – Buck/Boost Regulator). Different configuration of DC Drive applications - Starting of DC machines and basics of speed control - sizing and design of dc drives - DC choppers for speed regulation of dc machines - braking and reversing techniques of dc machines - speed control algorithms.									
Textbook	Andrzej M. Trzynadlowski, Introduction to Modern Power Electronics, 3rd Edition, 2015.									
EPES308	Automatic Control Systems	3	2		2					4
	Pre-requisites: MTHS104 + EECS203									
	This is a fundamental course on modern control systems in continuous time. By completing this course, students should be able to model and analyze linear time-invariant systems in time and frequency domains. Also, students must be able to design compensators and state feedback controllers to achieve both transient and steady state specifications. The course syllabus includes: modeling simple electric and mechanical systems, transfer functions, state space models, block diagram simplification, transient response, error analysis, stability analysis, root locus, bode diagrams, compensator design, controllability, observability, state feedback, control applications using MATLAB. Laboratory experiments on the course topics									
Textbook	Norman S. Nise, Control Systems Engineering, 8th Edition, 2019									
EPES402	Power System Analysis	3	2	2						4
	Pre-requisites: EPES302									
	Formation of Bus Admittance Matrix by Inspection and by Singular Transformation – Power System Graph – Incidence Matrices. Load Flow Study: – Importance and Problem Formulation – Bus Loading and Network Performance Equations – Line Flows and Power Loss Calculations – Different Solution Methods –Applications. Representation of Power Systems under Faults – Matrices of different Fault types. Economic Operation of Power Systems: Input-output Characteristic – Active Power Loss Matrix – Distribution of Loads among Generators with and without Transmission Losses – Iterative Solution of Economic Dispatch Problem. Swing equation – Equal area criteria. Power System Reliability									
Textbook	J. Duncan Glover, Mulukutla S. Sarma, Thomas Overbye, Power System Analysis and Design ,2017, 6th Edition									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
EPES404	Digital Control Systems	3	2		2	1				5
	Pre-requisites: EPES308									
	Sampling continuous-time systems, time-delay systems, transfer functions in z-domain, block diagram simplification, stability analysis, transformation techniques, compensator designs, PID controllers, digital filters, state space models, controllability, observability, state feedback, output feedback, and introduction to system identification. Laboratory experiments on the course topics.									
Textbook	Phillips, Nagle, and Chakrabortty, Digital Control System Analysis & Design, 4th Edition, 2015									
Elective Courses										
EPES401	Special Electrical Machines	3	2		2					4
	Pre-requisites: EPES304 + AA Approval									
	Introduction to the unified theory of machines, permanent-magnet AC synchronous motors, permanent-magnet brushless DC motors, servo motors, stepper motors, switched-reluctance motors, synchronous reluctance motors, hysteresis motors, linear motors, micro motors.									
Textbook	Austin Hughes, Bill Drury, Electric Motors and Drives: Fundamentals, Types and Applications, 2019, 5th Edition									
EPES403	Power System Protection	3	2		2					4
	Pre-requisites: EPES302									
	Introduction to protective relaying - Power system bus configurations - Elements of a protection system - International practices- Relay operating principles – Fault detection - Relay designs - Electro-mechanical relays - Faults in Networks and Machines (Short-circuits , Other types of faults) - Protection Functions: over-current protection , Earth fault protection, Directional over-current protection, Directional earth fault protection , Differential protection, Negative phase unbalance protection, Positive sequence under-voltage and phase rotation direction protection, Under or over-frequency protection									
Textbook	Power System Protection and Switchgear, McGraw-Hill Education, 2010. Switchgear & Protection, by J.B Gupta – 2019									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
EPES405	Power Electronics (2)	3	2		2					4
	Pre-requisites: EPES306									
	Power Semiconductor Devices (Power MOSFET): Basic Structure, Output Characteristics, Switching Characteristics and Losses - Inverters: Full Bridge Inverter Structure, Square Wave Output, Fourier Series Analysis and THD, Amplitude and Harmonics Control, Half Bridge Inverter Structure – Pulse Width Modulated Output Techniques – PWM Harmonics Analysis – Multi-level Inverter Topologies and Operation – Three-Phase Inverter Structure – Switching Techniques in Three-Phase Inverter: 180 Conduction and PWM - AC Machines Drives: Structure and Modelling of AC Machines – Power Electronics Circuits for AC Machine Drives – AC Drives Modelling and Control - Machine Drives Practical Considerations.								
Textbook	Muhammad H. Rashid, Power Electronics Handbook, 3rd Edition, 2013.									
EPES406	High Voltage Engineering	3	2		2					4
	Pre-requisites: EPES302 + EPES307+ AA Approval									
	Generation of AC, DC, and Impulse high voltages – Direct and indirect methods of measuring high voltages – Grounding systems – Types of transmission system over-voltages – Travelling waves along overhead transmission lines and underground cables - Classification, construction, and specifications of underground high voltage cables - Gas-insulated substations and switchgear.									
Textbook	"High Voltage Engineering" M S Naidu and V Kamaraju. 5th edition 2013									
EPES407	Digital Signal Processing Fundamentals	3	2		2					4
	Pre-requisites: EECS203 + AA Approval									
	Theories, techniques, and procedure used in analysis, design, and implementation of digital and sampled data filters. Algorithms and computer programming for software realization. Digital and sampled data realizations, switched capacitor and charge-coupled device IC's.									
Textbook	Emmanuel Ifeachor, Digital Signal Processing, 2014									
EPES408	Device design and Integration	3	2		2					4
	Pre-requisites: EECS101 + AA Approval									
	Fundamentals of semiconductor materials, p-n junctions, metal-semiconductor junctions, JFET's, MESFET's, MOSFET's, physical device design, device simulation, gate level & CMOS design and layout.									
Textbook	Badih El-Kareh, Lou N. Hutter, Silicon Analog Components : Device Design, Process Integration, Characterization, and Reliability, 2020.									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
EPES409	Fiber optics communication	3	2		2					4
	Pre-requisites: EECS203 + AA Approval									
	Fundamentals of optics and light wave propagation, guided wave propagation and optical wave guides, light sources and light detectors, couplers, connections, and fiber networks, modulation noise and detection in communication systems.									
Textbook	Govind P. Agrawal, Fiber-Optic Communication Systems, 5th Edition, 2021.									
EPES411	Power Quality	3	2		2					4
	Pre-requisites: EPES302 + AA Approval									
	Relevance of Power Quality and the cost of poor power quality - Disturbances on AC mains: Sags, Dips, and Swells - Transient Over-voltages – Low, medium and high frequency transients frequency transients - Voltage and current harmonics -.Voltage flicker - Voltage regulation - Frequency variations – Power quality monitoring for high reliability systems including Web-based power quality monitoring – power quality mitigation devices - On-site surveys of power quality - A system approach to grounding - Measurement and mitigation techniques - IEEE, IEC Standards - Utility power quality standards									
Textbook	Surya Santoso , Fundamentals Of Electric Power Quality, 2010									
EPES412	Electrical Power Distribution	3	2		2					4
	Pre-requisites: EPES403 + AA Approval									
	Components of distribution systems - underground cables grading - design of sub-distribution lines and distribution substations - design of primary and secondary distribution - voltage drop and power loss calculations - voltage regulation concepts in distribution systems- Distribution economics- Management system (DMS).									
Textbook	Turan Gonen, Electric Power Distribution Engineering, 2014									
EPES413	Power Systems Economics	3	2		2					4
	Pre-requisites: EPES302 + EPES308 + AA Approval									
	Basics of power system economics – Demand side management alternatives – Modeling the Consumers and Producers - Electricity Tariff - power pools – Transmission Networks and Electricity Markets - Power System Operation- deregulation of power industry –E-system security and ancillary services.									
Textbook	Daniel S. Kirschen, Goran Strbac , Fundamentals of Power System Economics, 2nd Edition, 2018									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
EPES414	Smart Grids	3	2		2					4
	Pre-requisites: EECS306 + EPES302 + AA Approval									
	Benefits and definitions relating to Smart Grids – Electric power regulation and tariffs – Load management – Peak power curtailment (leveling) - Power network interconnection – Remote area generation and smart grid's role in renewable energy generation – Automation and monitoring of bulk power transmission – Power line communications (PLC) and Broad-band over power lines communications (BPL) – Smart energy meters – Load control switches - Interoperability between power grids - The international perspective [Europe's Super Smart Grid].									
Textbook	James Momoh, Smart Grid: Fundamentals of Design and Analysis 1st Edition, Wiley, 2012									
EPES415	Power System Planning	3	2		2					4
	Pre-requisites: EPES302 + EPES308 + AA Approval									
	Demand Side Management - Energy Efficiency - Generation Expansion - Integrated Resource Planning - Investment Analysis - Load Information and trends - Principles of Load Forecasting- Regulatory and Market Constraints - Renewable Energy Technologies - Transmission Expansion									
Textbook	Fawwaz Elkarmi, Nazih Abu Shikhah, Power System Planning Technologies and Applications: Concepts, Solutions and Management, 1st Edition, 2012									
EPES416	Power Stations	3	2		2					4
	Pre-requisites: MEPS219 + EPES204 + AA Approval									
	Electric Energy Demand- Electric Energy Sources- Power Plant Economics- Selection of Plant Location and Size- Gas Turbine, Thermal, Hydro-Electric and Nuclear Power Stations- Economic Operation of Steam Plants- Hydro-Thermal Coordination- Major Electrical Equipment in Power Plants									
Textbook	S. Sivanagaraju, D. Srilatha, Generation and Utilization of Electrical Energy, 2010									
EPES417	Renewable Energy Systems	3	2		2					4
	Pre-requisites: MEPS219 + EPES204 +AA Approval									
	Sources of renewable energy - Fundamentals of : wind energy, tidal wave energy , solar-thermal energy, geothermal energy - photovoltaic sources - hydro and other common electrical renewable generation schemes - Selection and sizing of systems components - Detailed design of a typical photovoltaic inverter battery system - Renewable energy integration with existing grid connected power									
Textbook	Radian Belu , Renewable Energy Systems: Fundamentals and Source Characteristics, 2022									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
EPES418	Power System Switchgear	3	2		2					4
	Pre-requisites: EPES403 + AA Approval									
	Substation components - Dimensioning of switchgear installations – Low Voltage, Medium Voltage, and High Voltage apparatus – Conductor materials – Accessories for switchgear installations – Types of circuit breakers – Circuit breakers ratings - Arc extinction methods – Surge arresters- Compact Switchgear – Mixed Technology Switchgear (MTS)- switching transients – fast transients in GIS – Controlled switching									
Textbook	Power System Protection and Switchgear, McGraw-Hill Education, 2010. Switchgear & Protetion, by J.B Gupta – 2019									
EPES419	Protection Systems and Digital Relaying	3	2		2					4
	Pre-requisites: EPES403 +AA Approval									
	Bus-bar protection - Transformer protection - Motor protection - Generator protection- Distance protection - Monitoring the performance of power systems (Oscillographic analysis, Synchronized sampling, Fault location, Alarms, etc) - Solid-state relays , Computer relays - Digital systems (Signal Processing, Filtering Overview, Discrete Domain , Digital Filtering, Performance Measurements, Bandwidth, Aliasing) - The Cosine Filter - Relay Ladder Logic.									
Textbook	Power System Protection and Switchgear, McGraw-Hill Education, 2010. Switchgear & Protection, by J.B Gupta – 2019									
EPES420	Electrical Machines Design	3	2		2					4
	Pre-requisites: EPES304 + AA Approval									
	Magnetic, electric and thermal properties of materials used in the construction of electrical machines. Single- and Three-Phase Transformers design: relation between dimensions and rating as well as performance, estimating design details to meet particular requirements. Three-Phase Induction Motor design: relation between dimensions and rating as well as performance, estimating design details to meet particular requirements. Single-Phase Induction Motor design: similarity and differences with three-phase induction motors, design details of auxiliary winding corresponding to a particular starting strategy. Using software packages for electrical machines design.									
Textbook	Alexander Gray, Electrical Machine Design: The Design and Specification of Direct and Alternating Current Machinery–2018									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
EPES421	Electrical Machines Drives	3	2		2					4
	Pre-requisites: EPES304 + EPES405 + AA Approval									
	Drive Requirements and Specifications, Drive Classifications and Characteristics, Load Profiles and Characteristics, Variable-Speed Drive Topologies, Vector control and scalar control, Direct torque control, Applications: DC Motor Drives, Induction Motor Drives, Synchronous Motor Drives. Special Motors Drives: Permanent Magnet ac Synchronous Motor Drives, Permanent-Magnet Brushless dc Motor Drives, Servo Drives, Stepper Motor Drives, Switched-Reluctance Motor Drives, and Synchronous Reluctance Motor Drive.									
Textbook	Ion Boldea, Lucian N. Tutelea, Electric Machines, 2022, 2nd Edition									
EPES422	Electric Traction and Mobility Systems	3	2		2					4
	Pre-requisites: EPES304 + EPES405 + AA Approval									
	Evolution of electric traction systems and electric vehicles – DC Traction Systems – AC Traction Systems – Selection of Motors for Electric Traction and Mobility systems – DC Traction Motors - AC Traction motors- AC Commutator Machines (Principle of operation – equivalent circuit – performance) - linear Induction Motor - Special Motors for Traction and Mobility systems: construction, theory of operation, performance – Control systems of Traction and Mobility motors: speed control and braking									
Textbook	Andreas Steimel, Electric Traction: Motive Power and Energy Supply, 2014, 2nd Edition									
EPES423	Electrical Installations	3	2		2					4
	Pre-requisites: EPES302 + AA Approval									
	Load characteristics - Load Assessment - Electric Supply Regulations- Conductors and cables - Installation methods - Design of electrical systems for residential, commercial, and industrial installations -Protection equipment and coordination of protective devices - Voltage drop and short circuit calculations - Electrical safety and Grounding - Electrical drawing.									
Textbook	Brian Scaddan, Electrical Installation Work, 2018, 9th Edition									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
EPES424	Introduction to Mechatronics	3	2		2					4
	Pre-requisites: EPES311 + EPES308 + AA Approval									
	Introduction to mechatronics system design, Mechanisms for motion transmission systems, Actuators and Sensors with mixed disciplines, Interfacing, Microcontroller-based control systems, Microcontroller-based instrumentation systems, Systems with mixed disciplines, Analogue active filters.									
Textbook	W. Bolton, Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering 7th Edition, 2018									
EPES425	Process Control and Robotics	3	2		2					4
	Pre-requisites: EPES404 + AA Approval									
	Piping and instrumentation diagrams, cascade controllers, feed forward controllers, control design of time-delay processes, internal model control, two-degree of freedom controllers, hybrid controllers, introduction to model predictive control, Smith predictor, implementation of industrial controllers, introduction to nonlinear controllers, robots kinematics, robots inverse kinematics, path planning, joint control of robotic arms.									
Textbook	Peter Corke, Robotics and Control, Springer, 2022									
EPES426	Computer Control in Energy Systems	3	2		2					4
	Pre-requisites: EPES311 + EPES404 + AA Approval									
	Evolution of distributed control systems (DCS) – local control units architectures – programmable logic controllers – programming techniques- discrete input output modules – analog input-output modules – serial communication interfacing – data measurements and transducers - function blocks – local control units languages – communication requirements – network topologies – input/output bus networks - operator interface – SCADA systems – process controllers and loop tuning.									
Textbook	Industrial Automation Technologies by Chanchal Dey, Sunit Kumar Sen · CRC press, 2020									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
EPES427	Intelligent Control	3	2		2					4
	Pre-requisites: EPES308 + AA Approval									
	Artificial intelligence basics, fuzzy set theory, fuzzy logic, Fuzzy reasoning, Fuzzy controllers, Fuzzy PID control, Neural networks introduction, perception model, classification problem, multilayer networks, Feed forward networks, back propagation learning algorithms, recurrent networks, radial basis networks, neural network control. Neuro-fuzzy systems, introduction to optimization methods such as swarm optimizations and ants colony, application examples.									
Textbook	Anastasios Dounis, Intelligent Control in Energy Systems, August 2019									
EPES428	Power Systems Operation and Control	3	2		2					4
	Pre-requisites: EPES402 + AA Approval									
	Modelling of Synchronous Generator - Load Frequency Control - Voltage and Reactive Power Control - Power System Optimization – Power system Economic Dispatch - Unit Commitment - Power Systems State Estimation – Load Forecasting of power systems. Optimal power flow problem. Design and select of the rating of voltage control equipment. Shunt FACTS devices (STATCOM, SVC) – Series FACTS devices (TCSC, SSSC).									
Textbook	John Fuller, Pamela Obiomon, Samir I. Abood, Power System Operation, Utilization, and Control, 2022									
EPES429	Environmental Impact of Electricity	3	2		2					4
	Pre-requisites: 70 CRH + AA approval									
	Air impacts: Climate change, Acid rain, Ozone (smog) and fine particulates, Air toxics (mercury), Water impacts: Consumption of water resources, Pollution of water bodies, Land impacts: On-site land impacts, Off-site land impacts, Generation of wastes: Solid waste, Radio-active waste from nuclear power stations, Effects on wild life, Electric and magnetic fields, Environmental assessment requirements for electric power projects.									
Textbook	Paul Breeze, Electricity Generation and the Environment,2017									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
EPES430	Operations Research	3	2		2					4
	Pre-requisites: 70 CRH + AA approval									
	Operations research historical background, Overview of Mathematical programming models, Linear programming problem formulation, Fundamentals of algebraic solution of Simplex method, the Transportation Model, the Assignment Model, Integer Programming Techniques, and Introduction to Multi-objective Mathematical Programming, fundamentals of network for a project management, Critical Path Method, Inventory Control, and Decision Making under Uncertainties.									
Textbook	Hamdy A. Taha, "Operations Research: An Introduction", 10th edition, Pearson Education Limited, England, 2017									
EPES431	Electrical Generators for Renewable Energy Applications	3	2		2					4
	Pre-requisites: EPES304 + AA Approval									
	Wind energy conversion principles - General introduction - Types and classification of wind energy conversion systems - Power, torque and speed characteristics – Maximum power point tracking of wind turbines. nduction generators: electrical characteristics - slip - speed torque characteristics - Self excited induction generator - Constant speed Induction generators - Variable speed Induction generators - Doubly fed Induction generators. Permanent magnet synchronous generators. Advanced Modeling of electrical generators - Generators control.									
Textbook	Ion Boldea, Electric Generators Handbook - Two Volume Set, 2016, 2nd edition.									
EPES432	Super Conductor Applications	3	2		2					4
	Pre-requisites: EPES203 + AA Approval									
	Historical note on the discovery of superconductivity, difference between a perfect conductor and a superconductor, Type-I and Type-II superconductors, Meissner effect, diamagnetism, conduction theory of superconductivity, superconductor applications in power engineering; superconducting transformers, superconducting motors and generators, superconducting network current limiters, superconducting cables, other applications (superconducting magnetic levitation vehicles, super-conducting bearings), superconducting magnetic energy storage system for power quality mitigation - future trends in superconductor usage.									
Textbook	Paul Seidel (Editor), Applied Supercorductivity: Handbook on Devices and Applications, 2015.									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
EPES433	Power Electronics Applications in Energy Systems	3	2		2					4
	Pre-requisites: EPES405 + AA Approval									
	Thyristor Based FACTS Devices: Conventional Reactive Power Compensators – Saturated Reactor (SR) – Thyristor-Controlled Reactor (TCR) – Thyristor-Controlled Transformer (TCT) – Fixed Capacitor/Thyristor-Controlled Reactor (FC–TCR) – Thyristor-Switched Capacitor (TSC) – Thyristor-Controlled Series Capacitor (TCSC) – Back-to-Back HVDC Conversion System. Voltage Source Inverters: Static Synchronous Compensator (STATCOM) – Static Synchronous Series Compensator (SSSC) – Shunt Active Power Filters – Series Active Power Filter – Hybrid Active Power Filter – Back-to-Back HVDC VSC Conversion System.									
Textbook	Neeraj Vyas Saifullah Khalid, Applications of Power Electronics in Power System, 2010									
EPES434	Embedded Systems Applications in Power Electronics	3	2		2					4
	Pre-requisites: EPES405 + AA Approval									
	Common Processor Architectures – Basic Microcontroller Hardware Systems – Interfacing Techniques – Microcontroller programming Using C-Language and MATLAB and Simulink – Software Development, Debugging and Testing. Basic Analog Circuits for Digital Applications – Microcontroller-based Phase Control Triggering circuits (AC/DC Rectifiers and AC/AC Voltage Controllers) – Microcontroller-based PWM Control Drive Circuits (DC/DC Converters and DC/AC Converters) – Analog to Digital Conversion – Voltage Sensing and Measurement – Current Sensors and Current Measurement – Speed Sensors and Speed Measurement – Common Isolation Techniques – Implementation of Common Digital Controllers and Filters – Mini-project.									
Textbook	Ahmet Bindal, Electronics for Embedded Systems, Springer, 2017									
EPES435	Power Electronics for electric vehicles	3	2		2					4
	Pre-requisites: EPES405 + AA Approval									
	Drivetrain Architecture and dynamics of hybrid and electric vehicles - rating and sizing of drivetrain components - Analysis, modeling, simulations and design considerations for: Battery systems, battery management electronics, Bidirectional dc-dc converters, Inverters and ac motor drives, Battery chargers - complete system modeling									
Textbook	L. Ashok Kumar, S. Albert Alexander, Power Converters for Electric Vehicles 1st Edition, 2020									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
EPES436	Electrical Sub-Stations Design	3	2		2					4
	Pre-requisites: EPES406 + AA Approval									
	Overhead transmission line design – Cable design – High Voltage Insulators description – Disconnector and circuit breaker selection – Earth switches – Current and voltage transformers selection - Relay coordination – Busbar design – Grounding design – learning Software used in substation design									
Textbook	John D. McDonald, Electric Power Substations Engineering (The Electrical Engineering Handbook) 3rd Edition, 2012									
EPES437	Special Topics in High Voltage Engineering	3	2		2					4
	Pre-requisites: EPES406 + AA Approval2									
	Corona discharge - High voltage insulators for transmission lines - Electrical breakdown in solids - Electrical breakdown in gases - destructive and non-destructive tests –leakage currents in high voltage insulators - Electrical breakdown in liquid insulators									
Textbook	"High Voltage Engineering" M S Naidu and V Kamaraju. 5th edition 2013."									
EPES438	Energy Storage Systems	3	2		2					4
	Pre-requisites: EPES204 + AA Approval									
	Types of electrical energy storage and key characteristics – Battery Types - Parameters for electrical energy storage - Operational characteristics of electrical storage - Costs and pricing - Integration of energy storage into electrical grids - Off-grid systems, architecture and sizing - Small scale battery storage systems - Types and applications of thermal energy storage - Future developments in energy storage – Applications: Electric vehicles – off Grid PV systems – Protection Systems									
Textbook	Satyender Singh, Energy Storage Systems: An Introduction, 2020.									
EPES439	Wireless Networking	3	2		2					4
	Pre-requisites: EECS203 + AA Approval									
	Design and analysis of modern wireless data networks. Digital modulation techniques, wireless channel models, design of cellular networks, spread spectrum, carrier sense multiple access, ad-hoc networks routing, error control coding, automatic request strategies.									
Textbook	Gordon Colbach, Wireless Networking: Introduction to Bluetooth and WiFi, 2017.									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
EPES440	Introduction to Digital Computer Architecture	3	2		2					4
	Pre-requisites: EPES311 + AA approval									
	Control, data, and demand-driven computer architecture; parallel processing, pipelining, and vector processing; structures and algorithms for array processors, systolic architectures, design of architectures.									
Textbook	David Harris, Sarah L. Harris, Digital Design and Computer Architecture 2nd Edition, 2012.									
EPES441	Microcomputer structure and interfacing	3	2		2					4
	Pre-requisites: EPES311 + AA Approva									
	Design of computer systems with emphasis on interface hardware including communications, high power interface devices, line driver/receiver circuits, A/D and D/A devices, and utilization of software techniques for programmed, interrupt, and direct memory access.									
Textbook	David L. Prowse, Mark Edward Soper, et al., Computer Structure and Logic, 2011.									
EPES442	Introduction to Digital Image Processing	3	2		2					4
	Pre-requisites: EECS203 + AA Approva									
	Introduction to the vision process fundamental mathematical characterization of digitized images, two-dimensional transform methods used in image processing, histogram analysis and manipulation, image and filtering techniques, image segmentation, and morphology.									
Textbook	Rafael Gonzalez, Richard Woods, Digital Image Processing, 4th Edition, 2017.									
EPES443	Digital Speech Processing	3	2		2					4
	Pre-requisites: EECS203 + AA Approva									
	Covers fundamentals in digital speech processing including production, speech analysis, speech coding, speech enhancement, speech recognition and speaker recognition. Emphasize hand-on experience of processing speech signals using MATLAB.									
Textbook	Lawrence Rabiner (Author), Ronald Schafer, Theory and Applications of Digital Speech Processing, 2010.									
EPES444	Biometric Systems	3	2		2					4
	Pre-requisites: CMPS103 + AA approval									
	This course presents an introduction to the principles of operation, design, testing, and implementation of biometric systems, and the legal, social, and ethical concerns associated with their use.									
Textbook	Anil K. Jain, Arun A. Ross, Karthik Nancakumar, Introduction to Biometrics, 2011.									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
EPES445	Introduction to Microfabrication	3	2		2					4
	Pre-requisites: EECS101 + AA Approva									
	Introduction to the physical processes underlying current and emerging microfabrication technology and their selective use in the technology computer aided design (TCAD) and fabrication of electrical, optical, and micromechanical devices and systems.									
Textbook	Sami Franssila, Introduction to Microfabrication, Second Edition, 2010									