NAZARBAYEV UNIVERSITY
SCHOOL OF ENGINEERING AND DIGITAL SCIENCES

Department of Electrical and Computer Engineering

Program Handbook

BEng (Hons) Degree Program in Electrical and Computer Engineering

Academic year 2020-21

Bachelor of Engineering (Honors) Degree Program
in
Electrical and Computer Engineering

Full-time Credit-based

Program Booklet 2020/2021

1. GENERAL INFORMATION

1.1 Cohort of Intakes and readership

This program handbook is the definitive program document for the 2018/19 cohort. Just in case any updated information is necessary after the publication of this handbook, students are requested to refer to the www.seng.nu.edu.kz for the most updated information. Should there be any discrepancy between the contents of this handbook and Nazarbayev University (NU) regulations, University regulations always prevail.

1.2 Program Information

Title of Program	Bachelor of Engineering (Honors) in Electrical and Computer Engineering
Host Department	Department of Electrical and Computer Engineering
Program Structure	Credit-based
Final Award	Bachelor of Engineering (Honors) in Electrical and Computer Engineering
Mode of Attendance	Full-time
Professional Recognition	The program has been designed based on the ABET accreditation requirements.

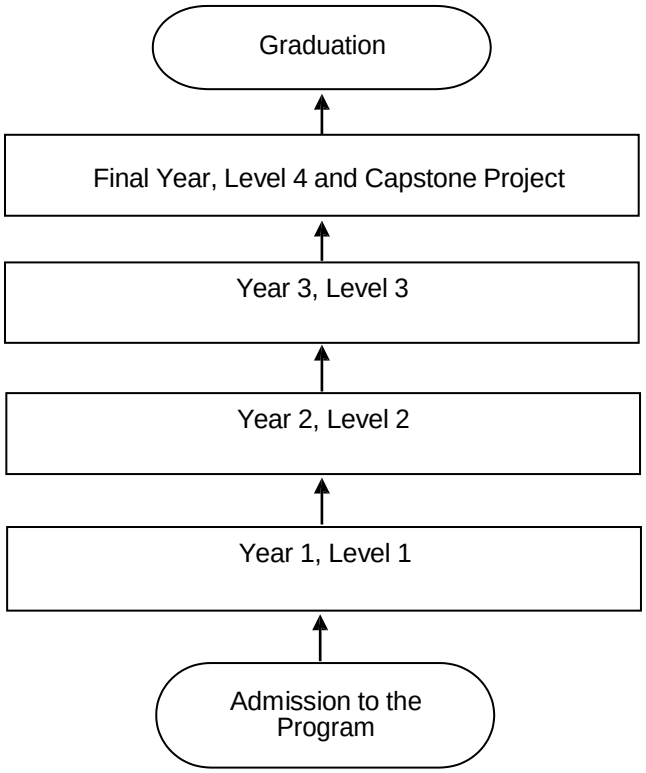
Duration	Normal Year 1 Intake Full-time Mode: 4 years nominal, 5 years maximum
Total Credits for Graduation	248 ECTS credits

1.3 Modes of Study

A mode of study is characterized by the credits, courses required and the progression pattern in Year 1 to Year 4. Currently the program can only be pursued in the "Normal full-time" study mode.

Normal Full-time Mode

The students will normally pursue their study by going through Year 1, Year 2, Year 3 and Year 4 in full time and then graduate at the end of Year 4 after having satisfied all program requirements. Each year of study is split into discrete interlinked courses. The courses of earlier years can be pre-requisites to subsequent courses in later years. Some courses are common between programs offered by other departments.



2. RATIONALE, AIMS AND LEARNING OUTCOMES OF THE PROGRAM

2.1 Background and Rationale

The Strategy of Nazarbayev University defines the main strategic goals and directions for the development of the University toward the goal of becoming a leading model of higher education, which will establish a benchmark for other Higher Education institutions of the country. The Strategy sets out the mission, vision, strategic goals, stages of development and the results of the joint efforts of faculty, students, researchers and staff of the University for 2013-2020.

Vision:

To give Kazakhstan, region, and the world the engineers, scientists, academics, managers and entrepreneurs they need to prosper and develop.

Mission:

To be a model for higher education reform and modern research in Kazakhstan and to contribute to the establishment of Astana as an international innovation and knowledge hub.

The BEng in Electrical and Computer Engineering program follows the outcome-based teaching and learning approach. Given the special emphasis of the Nazarbayev University to be a leader in the Education within Kazakhstan and to be respected internationally, the program will focus on skill development that enables our graduates to compete internationally in the job market, research, and to be entrepreneurs who lead change in the local contexts. The program positions itself as the leading ECE program in Kazakhstan, by integrating inquiry, research and projects in solving relevant problems facing society today. The students in the program get exposed to the research activities in any of the four research groups in the department: (1) Devices and Circuits, (2) Signal Processing and Communication Systems, (3) Power Engineering and Control Systems, and (4) Computer Engineering.

2.2 Aims

The B.Eng. program in Electrical and Computer Engineering (ECE) aims to provide the education and training that will enable its graduate to:

- Systematically investigate in the field of ECE using analytical reasoning and state-of-the-art approaches derived from the engineering sciences and engineering practice;
- Create useful systems, components, or processes through agile, skillful, and innovative analysis and design, while respecting economic, environmental, cultural, and ethical standards or constraints;
- Complete advanced graduate and professional programs of study, continually learn, and adapt to technological and cultural change;
- Acquire technical and managerial leadership positions in their chosen fields;
- Be valued in their careers for their professionalism, judgment, and experience;
- Engage with their communities, profession, and the world.

2.3 Relationship of Program Aims to University Mission

The mission of the University is: “To be a model for higher education reform and modern research in Kazakhstan and to contribute to the establishment of Astana as an international innovation and knowledge hub”.

The Program Aims are aligned to the University Mission.

2.4 University Graduate Attributes

It is NU's educational mission to nurture competent professionals who are also critical thinkers, effective communicators, innovative problem solvers, lifelong learners, and ethical leaders. The university graduate attributes are as follows:

- Possess an in-depth and sophisticated understanding of their domain of study;
- Intellectually agile, curious, creative, and open-minded;
- Thoughtful decision-makers who know to involve others;
- Entrepreneurial, self-propelling and able to create new opportunities;
- Fluent and nuanced communicators across languages and cultures;
- Cultured and tolerant citizens of the world while being good citizens of their respective countries;
- Possess high personal integrity; and
- Prepared to take a leading role in the development of their country.

2.5 Learning Outcomes of the Program

On successful completion of the BEng (Hons) in Electrical and Computer Engineering program, students will be able to:

PLO 1: identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics

PLO 2: apply the engineering design process to produce solutions that meet specified needs with consideration for public health and safety, and global, cultural, social, environmental, economic, and other factors as appropriate to the discipline

PLO 3: develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

PLO 4: communicate effectively with a range of audiences

PLO 5: recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts

PLO 6: recognize the ongoing need to acquire new knowledge, to choose appropriate learning strategies, and to apply this knowledge

PLO 7: function effectively as a member or leader of a team that establishes goals, plans tasks, meets deadlines, and creates a collaborative and inclusive environment

2.6 Relationship of Program Learning Outcomes to Program Aims

Program Learning Outcomes	Program Aims					
	1	2	3	4	5	6
1	X	X		X		X
2	X		X		X	
3	X			X		X
4	X		X		X	
5		X		X		X
6	X	X	X		X	
7		X		X	X	X

2.7 Relationship of Program Learning Outcomes to University Graduate Attributes

NU Graduate Attributes	Program Learning Outcomes						
	1	2	3	4	5	6	7
1. Possess an in-depth and sophisticated understanding of their domain of study.	X	X	X				
2. Be intellectually agile, curious, creative and open-minded						X	
3. Be thoughtful decision makers who know how to involve others		X					
4. Be entrepreneurial. Self-propelling and able to create new opportunities.		X				X	
5. Be fluent and nuanced communicator across languages and cultures				X			X
6. Be cultured and tolerant citizen of the world				X			X
7. Demonstrate personal integrity			X		X		
8. Be prepared to take a leading role in the development of their country					X		X

3. ADMISSION REQUIREMENTS

3.1 Progression from the NU Foundation Year Program (NUFYP)

Upon completion of the NUFYP, students may be eligible to continue their studies in one of the undergraduate programs at the School of Engineering. Any student who is progressed and then decides not to attend NU Undergraduate (UG) program must notify the university as quickly as possible by submitting a completed withdrawal form. NUFYP student who do not submit the withdrawal form will be automatically dismissed after a certain period.

Unconditional progression: Those students who satisfy the requirements for unconditional progression as described in the Criteria below are automatically eligible for progression subject to the availability of space in the program. Progression decisions are recommended by the School's Progression Committee.

UNCONDITIONAL PROGRESSION REQUIREMENTS

	Abbreviations	Course Title	Score
	FMAT 020	Foundation Statistics	
	FMAT 030	Foundation Mathematics for Life Science (Biology & Chemistry)	70
	FMAT 040	Foundation Mathematics for Physical Science	
AND	FEAP 020	Foundation English for Academic Purposes 2	65
	FHUM 030	Foundation of Humanities & Social Sciences 2	
OR	FSCI 030	Essential Biology & Chemistry 2	65
	FPHY 030	Foundation 'Physics'	

GPA conditional progression: Students who do not meet the requirements for unconditional progression may be progressed on a GPA conditional basis as explained below:

A student, whose NUFYP subject scores do not meet the minimum unconditional progression criteria but meet the criteria for conditional progression (see table on Conditional Progression GPA), may be recommended to progress on a GPA conditional basis at the discretion of the School Progression Committee;

Student progressed as a GPA Conditional basis must achieve a minimum GPA of 2.00 at the end of his or her first semester of undergraduate study or the student is subject to dismissal;

CONDITIONAL PROGRESSION (GPA)

	Abbreviations	Course Title	Score
	FMAT 020	Foundation Statistics	60
	FMAT 030	Foundation Mathematics for Life Science (Biology & Chemistry)	
	FMAT 040	Foundation Mathematics for Physical Science	
AND	FEAP 020	Foundation English for Academic Purposes 2	65
OR	FHUM 030	Foundation of Humanities & Social Sciences 2	60
	FSCI 030	Essential Biology & Chemistry 2	
	FPHY 030	Engineering Physics	

As some majors are in more demand than others, the Schools have the right to limit their progression decisions based on the capacity of any individual program. Non-progressed students will be processed in accordance with University internal regulations on dismissal and withdrawal.

3.2 Direct Entry Admission Requirements

3.2.1 Admission to the undergraduate program is based on selection process

3.2.2 One of the following categories of applicants may participate in the selection process:

Secondary school graduates with certificate or its foreign equivalent or certificates/diploma on completion of a college or IB Diploma Program, A-level, UK Foundation Program or NIS Grade 12 Certificate;

Students of the final year of secondary school or its foreign equivalent, or final year college or IB Diploma Program or UK Foundation Program or NIS Grade 12 Certificate students;

Applicants who completed at least one academic year of an undergraduate program at a university with CGPA not less than 3.0 out of 4.0. They shall be considered for admission to the first or second year of the undergraduate program as transfer students. Transfer credits are identified by Admission committee based on detailed course descriptions in accordance with the Academic Policies and Procedures for Undergraduate Schools of NU and internal rules of individual schools. The maximum number of transferable credit hours shall be 60 ECTS. No grades will be assigned to transfer courses, only credits. The grades received at the previous institution(s) will not be calculated into student's grade point average.

3.2.3 Applicants listed in 3.2.2 must meet the entry requirements with the exception of cases when:

An applicant is a winner/prize winner of the International Subject Olympiads awarded by gold, silver and bronze medals for the last three years. In order to participate in selection competition these candidates must submit the results of IELTS or TOEFL test and be interviewed by the Admission Committee.

The International Subject Olympiads include International Mathematics Olympiad – IMO; International Physics Olympiad – IPHO; International Chemistry Olympiad – IChO; International Biology Olympiad – IBO; International Olympiad in Informatics – IOI; International Zhautykov Olympiad in Mathematics, Physics and Informatics; and International Mendeleyev Chemistry Olympiad;

An applicant is a winner/prize winner of the awarded by gold and silver medals for the current academic year. To participate in selection competition these candidates must submit the results of IELTS or TOEFL test and be interviewed by the Admission Committee.

The Republican Olympiads include Republican Mathematics Olympiad; Republican Physics Olympiad; Republican Chemistry Olympiad; Republican Biology Olympiad; and Republican Informatics Olympiad;

Applicants who have successfully completed at least one academic year of an undergraduate program at a university with English language as an official language of instruction and included into the list of top 200 universities according to the Times Higher Education World University or QS World University ranking at the time of application. These candidates are exempt from submitting test reports on ACT/SAT Reasoning Test and SAT Subject test as well as IELTS/TOEFL;

Applicants who have been studying in English last three years at a secondary school in a country with English as an official language or in an institution with English as a primary language of instruction are exempted from submission of IELTS/TOEFL certificates.

3.2.4 The minimum requirements for graduates of secondary school (or its foreign equivalent), students of the final year of secondary school (or its foreign equivalent) and higher education institution's students are as follow:

Minimum requirements for SAT Subject Test	Minimum requirements for IELTS and TOEFL	Minimum requirements for SAT Reasoning Test and ACT
SAT Subject Test – Math and Physics with at least 600 in each subject	IELTS – no less than 6.5 overall (with at least 6.0 in each sub-score) or TOEFL iBT = 79-93 or TOEFL PBT* = 574-599	SAR reasoning Test – no less than 1240 (starting from March 2016). Essay is required, no minimum score Or ACT – composite score no less than 27. Writing part is required, no minimum score

Note: *TOEFL PBT are admitted only from the international applicants from the countries where an official IELTS and TOEFL iBT are not available

3.2.5 The minimum requirements for graduates and current students of IB Diploma are as follow:

Minimum requirements for IELTS and TOEFL	Minimum requirements for IB DP scores
IELTS – no less than 6.5 overall (with at least 6.0 in each sub-score) or TOEFL iBT = 79-93 or TOEFL PBT* = 574-599	Not less than 30 total score and 4, 4, 5 for 3 subjects of HL

Note: *TOEFL PBT are admitted only from the international applicants from the countries where an official IELTS and TOEFL iBT are not available

3.2.6 The minimum requirements for scores for graduates and holders of NIS Grade 12 are as follow:

Minimum requirements for IELTS and TOEFL	Minimum requirements for NIS Grade 12 Certificate scores
IELTS – no less than 6.5 overall (with at least 6.0 in each sub-score) or TOEFL iBT = 79-93 or TOEFL PBT* = 574-599	Not less than ABB

Note: *TOEFL PBT are admitted only from the international applicants from the countries where an official IELTS and TOEFL iBT are not available

3.2.7 Internal Transfers between NU Schools:

After entering NU, students may discover that their initial choice of major does not correspond to their interests or intellectual abilities. Those students may seek to change their degree. NU supports these decisions by allowing internal transfers between undergraduate Schools.

Internal transfer students must bring along their educational transcripts to meet the Head of the Department which offers the program. An internal transfer student will only be accepted for transfer based on the decision of the Head of the Department which offers the program in the receiving School's. The course transfer information that details how previously completed courses will be assigned to the new degree plan must be determined if the applicant satisfies the transfer requirements. The internal transfer must be endorsed by the Dean of the receiving School. The transfer of student will become effective in the semester following approval of the application by the receiving School.

4. PROGRAM, COURSES, AND CREDITS

4.1 Program Specified Courses

Nazarbayev University has adopted the Bologna Accord and the School of Engineering therefore uses the European Credit Transfer System (ECTS). Most courses to be studied at Year 1, Year 2, Year 3 and Year 4 are of standard credit value carrying 6 ECTS each, except for some courses, such as Calculus 1, etc. which carry ECTS other than 6. A student is expected to spend about 25 to 30 hours of study per semester (inclusive of class contact and other study effort) for 1 ECTS. The following Table lists the subjects, their ECTS values, and the category they belong to (Compulsory, Optional, or Elective). All discipline-specific courses shown as compulsory are non-deferrable and must be taken in accordance to the progression pattern. The courses offered will be updated from time to time according to the need of society and the profession.

Students admitted to the program are required to complete a minimum of 248 or more ECTS to satisfy the degree requirements. However, they may choose to take additional courses beyond the basic requirements. Please refer to Section 24 for detailed information on the requirements for graduation.

Course Code	**Course Title**	**ECTS**	**Comments**	**Category of Courses**
Nazarbayev University Undergraduate Core Curriculum Requirements				
Communicate fluently in the English Language				
SHSS150	Rhetoric and Composition	6		Compulsory
SHSS210	Technical Writing	6		Compulsory
Demonstrate competence in the Kazakh Language				
Select 2 courses at appropriate level in Kazakh Language, Literature or Culture		12	Based on diagnostic test	Compulsory
Describe and interpret major events in Kazakh and Kazakhstani history				
HST100	History of Kazakhstan	6		Compulsory
Demonstrate knowledge of the natural and social sciences				
ECON323	Managerial Economics	6		Compulsory
PHYS161	Physics I for Scientists and Engineers	8		Compulsory
Apply numerical and digital literacy skills				
MATH161	Calculus I	8		Compulsory
ENG101	Programming for Engineers	6		Compulsory
Apply skills in business, design and entrepreneurial thinking				
	Fundamentals of Entrepreneurship and Management	6		Compulsory
Use research skills and methods to complete projects				
ENG100	Introduction to Engineering	6		Compulsory
Identify ethical and leadership issues and take appropriate leadership actions				
Select 1 among 3 SHSS offered courses on Ethics		6		Compulsory

Course Code	Course Title	ECTS	Comments	Category of Courses
Common/Shared Courses				
ENG103	Engineering Materials II	6		Compulsory
PHYS162	Physics II for Scientists and Engineers	6		Compulsory
MATH162	Calculus 2	8		Compulsory
ENG200	Differential Equations and Linear Algebra	6		Compulsory
ENG202	Numerical Methods in Engineering	6		Compulsory
ENG201	Applied Probability and Statistics	6		Compulsory
ENG400	Capstone project	12		Compulsory
Discipline-Specific Requirement				
ELCE 203	Signals and Systems	6		Compulsory
ELCE 200	Circuit Theory I	6		Compulsory
ELCE 202	Digital Logic Design	6		Compulsory
ELCE 204	Solid State Devices	6		Compulsory
ELCE 201	Circuit Theory II	6		Compulsory
ELCE 301	Electronic Circuits	6		Compulsory
ELCE 304	Computer Networks	6		Compulsory
ELCE 307	Digital Signal Processing	6		Compulsory
ELCE 302	Electric Machines and Drives	6		Compulsory
ELCE 308	Communication Systems	6		Compulsory
ELCE 303	Power System Analysis	6		Compulsory
ELCE 300	Microprocessor Systems	6		Compulsory
ELCE 305	Data Structures and Algorithms for ECE	6		Compulsory
ELCE 306	Linear Control Theory	6		Compulsory
	Selection among Interdisciplinary Design Project OR Independent Study	6		Compulsory
Discipline-Specific Requirement (Specialization areas and electives)				
Devices and Circuits				
	Electromagnetics	6		Elective
	Analog Circuit Design	6		Elective
	RF and Microwave Circuit Design	6		Elective
	Reconfigurable Computing and FPGAs	6		Elective
	Embedded Systems	6		Elective
	Fundamentals of Photonics	6		Elective
	Power Electronics	6		Elective
	Data Analytics	6		Elective
	Fundamentals of Biomedical Engineering and Biophysics	6		Elective
	Numerical Optimization Techniques for Engineers	6		Elective
Power Engineering and Control Systems				
	Power Electronics	6		Elective
	Power Systems Protection	6		Elective
	Power Systems Operation and Control	6		Elective
	Power System Automation	6		Elective

	High Voltage Engineering	6		Elective

	Electric Power Generation	6		Elective
	Renewable Energy and Storage Systems	6		Elective
	Power Transmission and Distribution Plants	6		Elective
	Electromagnetics	6		Elective
	Modern Control Theory	6		Elective
	Control of Electric Drives	6		Elective
	Numerical Optimization Techniques for Engineers	6		Elective
	Selected BSc in Robotics courses	6		
Signal Processing and Communications Systems				
	Electromagnetics	6		Elective
	Numerical Optimization Techniques for Engineers	6		Elective
	Wireless Sensor Networks	6		Elective
	Fundamentals of Photonics	6		Elective
	Digital Image Processing	6		Elective
	Data Analytics	6		Elective
	Antennas and Microwave	6		Elective
	Advanced Digital Signal Processing	6		Elective
Computer Engineering				
	Reconfigurable Computing and FPGAs	6		Elective
	Embedded Systems	6		Elective
	Operating Systems	6		Elective
	Wireless Sensor Networks	6		Elective
	Data Analytics	6		Elective
	Numerical Optimization Techniques for Engineers	6		Elective
	Machine Learning and Applications	6		Elective
	Database Systems	6		Elective
	Digital Image Processing	6		Elective
	Selected BSc in Computer Science courses	6		Elective

4.2 Kazakh Language Policy Requirements

Beginning students will be given the stage 1, diagnostic KAZTEST during student orientation. This test will be administered to students free of charge. Based on the results of their diagnostic KAZTEST, students will be placed either in the basic, intermediate or advanced Kazakh courses. Every student must pass a minimum of 12 ECTS (two 6 ECTS courses) in the NU UG Core Curriculum at the appropriate level in Kazakh Language, Literature or Culture before graduation.

5. NORMAL PROGRESSION PATTERN

A student must obtain at least a D grade to pass a course offered in SEng. Students will need to determine the passing grade for courses offered by other schools.

	Fall	**ECTS**	**Spring**	**ECTS**
Freshman	ENG 100 Introduction to Engineering	6	ENG 103 Engineering Materials II	6
	MATH 161 Calculus I	8	MATH 162 Calculus II	8
	PHYS 161 Physics I for Scientists and Engineers with Laboratory	8	PHYS 162 Physics II for Scientists and Engineers with Laboratory	8
	ENG 101 Programming for Engineers	6	HST 100 History of Kazakhstan	6
	SHSS 150 Rhetoric & Composition	6	Kazakh Language	6
	Total semester ECTS credits	**34**	**Total semester ECTS credits**	**34**
Sophomore	**Fall**	**ECTS**	**Spring**	**ECTS**
	ENG 200 Differential Equations and Linear Algebra	6	ENG 201 Applied Probability and Statistics	6
	ELCE 200 Circuit Theory I	6	ENG 202 Numerical Methods in Engineering	6
	ELCE 202 Digital Logic Design	6	ELCE 201 Circuit Theory II	6
	ELCE 203 Signals and Systems	6	ELCE 204 Solid State Devices	6
	Ethics (PHIL 210, 211, OR 212)	6	SHSS 210 Technical Writing	6
	Total semester ECTS credits	**30**	**Total semester ECTS credits**	**30**
Junior	**Fall**	**ECTS**	**Spring**	**ECTS**
	ELCE 301 Electronic Circuits	6	ELCE 300 Microprocessor Systems	6
	ELCE 304 Computer Networks	6	ELCE 302 Electrical Machines and Drives	6
	ELCE 306 Linear Control Theory	6	ELCE 303 Power Systems Analysis	6
	ELCE 307 Digital Signal Processing	6	ELCE 305 Data Structures and Algorithms	6
	ELCE 308 Communications Systems	6	Selection among Interdisciplinary Design Project (IDP) OR Independent Study	6
	Total semester ECTS credits	**30**	**Total semester ECTS credits**	**30**
Senior	**Fall**	**ECTS**	**Spring**	**ECTS**
	ENG 400 Capstone Project	6	ENG 400 Capstone Project	6
	ECON302 Managerial Economics	6	Business Fundamentals & Entrepreneurship	6
	Kazakh Language	6	Discipline Elective 3	6
	Discipline Elective 1	6	Discipline Elective 4	6
	Discipline Elective 2	6	Discipline Elective 5	6
	Total semester ECTS credits	**30**	**Total semester ECTS credits**	**30**
			Total ECTS credits	**248**

[1] Capstone Project spans two semesters for a total sum of 12 ECTS

Total Number of Credits: 248 ECTS

Note 1: The study pattern for the courses is indicative only. Students may take these courses according to their own schedule. They are recommended to consult their Academic Advisor for guidance and planning if necessary.

6. CURRICULUM MAP

Alignment of Courses with Program Learning Outcomes:

	Program Learning Outcomes						
	1	2	3	4	5	6	7
NAZARBAYEV UNIVERSITY UNDERGRADUATE CORE CURRICULUM REQUIREMENTS(1)							
Communicate fluently in the English Language							
English (2 Courses)				■		■	■
Demonstrate competence in the Kazakh Language							
Kazakh (2 Courses)				■			
Describe and interpret major events in Kazakh and Kazakhstani history							
HST 100 History of Kazakhstan				■	■	■	
Demonstrate knowledge of the natural and social sciences							
Managerial Economics		■			■		■
PHYS161 Physics I for Scientists	■	■	■				
Apply numerical and digital literacy skills							
MATH161 Calculus I	■					■	
Programming for Engineers	■	■				■	
Apply skills in business, design and entrepreneurial thinking							
Fundamentals of Entrepreneurship and Management				■	■	■	■
Use research skills and methods to complete projects							
ENG100 Introduction to Engineering	■	■	■	■	■	■	■
Identify ethical and leadership issues and take appropriate leadership actions							
Select 1 among 3 SHSS offered courses on Ethics				■			
B. COMMON/SHARED COURSES							
ENG101 Engineering Materials II	■		■			■	
PHYS161 Physics II for Scientists and Engineers	■	■	■				
MATH162 Calculus 2	■					■	
ENG200 Engineering Mathematics (Differential Equations & Linear Algebra)	■	■	■				
ENG202 Numerical Methods in Engineering	■	■	■			■	
ENG201 Applied Statistics	■	■	■		■		
CEE201 Environmental Chemistry	■	■	■				
ENG400 Capstone project	■	■	■	■	■	■	■
ENG300 Interdisciplinary Project	■	■	■	■	■	■	■
Independent Study	■	■	■	■	■	■	■

	Program Learning Outcomes						
	1	2	3	4	5	6	7
C. DISCIPLINE-SPECIFIC REQUIREMENTS (CORE COURSES)							
Signals and Systems	X	X	X				
Circuit Theory I	X	X	X	X			
Digital Logic Design	X	X	X	X	X	X	X
Solid State Devices	X	X	X			X	X
Circuit Theory II	X	X	X		X	X	
Electronic Circuits	X		X	X	X		
Computer Networks	X	X	X			X	
Digital Signal Processing	X	X	X				
Electric Machines and Drives	X	X	X	X		X	X
Communication Systems	X	X	X	X	X	X	X
Power System Analysis	X	X	X	X	X	X	X
Microprocessor Systems	X	X	X			X	
Data Structures and Algorithms for ECE	X	X	X	X	X	X	
Linear Control Theory	X	X		X		X	
Selection among Interdisciplinary Design Project OR Independent Study	X	X	X	X	X	X	X

7. CAPSTONE PROJECT

The Capstone Project is a 2-semester common course for all engineering programs which spans across the fall and spring semesters of the same academic year. The importance of the Capstone project is reflected in the total number of credits it carries, being 12 ECTS which are equivalent to two standard-sized courses.

One of the important features of the Capstone Project is "learning by doing". It is intended to be a platform for the students to develop their intellectual and innovative abilities and to give them the opportunities to integrate and apply the knowledge and analytical skills gained in previous stages of study. It should also provide students with opportunities to develop their problem-solving skills and communication skills. The process from concept to final implementation and testing, through problem identification and the selection of appropriate solutions will be practiced by the students.

7.1 Capstone Project Management

Normally a group of students will be assigned one project under the supervision of an academic staff member so that they will work independently and collaboratively to achieve the project objectives. Students may work on different aspects of a project. The group size may increase for a larger-scale project or a more complex project.

The assignment of projects is expected to be completed at the beginning of the fall semester in the final year of study. Guidelines for Capstone Project are given to students at the beginning of the final year.

7.2 Capstone Project Assessment

Assessment of the Capstone Project focuses in three main areas: project reports, oral presentations and work done over the whole project period. Assessment will be done by a team of staff including the project supervisor.

8. DEPARTMENTAL BEng. PROGRAM COMMITTEE

8.1 The composition of the Departmental BEng. Program Committee is decided by the Head of Department. The Committee is responsible for program performance monitoring, review, and enhancement.

8.2 The Departmental BEng. Program Committee will regularly collect the course portfolios, program statistics and conduct surveys of students and other key stakeholders on the relevance, delivery, quality and the standards of the courses. The Committee will analyze the collected data and recommend areas for improvement taking into consideration the adequacy of resources, learning and teaching approaches, best practices, as well as the local and global trends. The Committee will also oversee the implementation of recommendations to improve the program.

8.3 The Departmental BEng. Program Committee is responsible for the program portfolio for each academic year including the annual program monitoring report.

9. STUDENT STATUS, ACADEMIC CALENDAR, POLICIES AND PROCEDURES

The program currently only accepts full-time students.

The program operates on the basis of an academic year divided into three academic periods: the regular fall and spring semesters and a summer term (if offered). Depending on public holidays, the fall semester and spring semester should have up to fourteen weeks for studies with two weeks for end-of-semester examinations. The School does not normally offered summer terms. Summer terms at NU are generally eight weeks.

The official NU Academic Calendar, Course Schedules, Final Examinations Schedule, and Policies and Procedures are available online at the Office of the Registrar website (https://registrar.nu.edu.kz/). It is the responsibility of the students to familiarize themselves with the following Policies and Procedures:

- Academic Policies and Procedures for Undergraduate Programs
- Regulations on Leave of Absence for Undergraduate and Foundation Year Program
- Policy and Procedures on the Fifth Year of Undergraduate Study
- Undergraduate Attendance policy and Procedures
- Regulation on Dismissal and Voluntary Withdrawal for Undergraduate and Foundation Year Program Students
- Graduation policy and Procedure for Undergraduate and Graduate Programs

Induction and orientation week takes place at the beginning of the fall semester to allow new students to adapt to the program requirements. New students are expected to familiarize themselves with the layout of the buildings, location of the staff offices, lecture theatres, laboratories, and other teaching facilities during the orientation.

10. COURSE REGISTRATION AND WITHDRAWAL

10.1 In addition to program registration, students need to register for courses at specified periods prior to the commencement of a semester. NU has an online course registration system. Students are notified by email from the Office of the Registrar of the dates for the registration period.

10.2 NU uses a priority registration system that ensures students in their last year of undergraduate study will have the first opportunity to register for classes. Students are notified, via email from the Office of the Registrar, of the dates for the registration period.

10.3 A student is waitlisted when the course they have attempted to register for is full. When a place in the course becomes available the top student in the waitlist is registered in the course and notified by email. Once the waitlist period ends, the student will have time to register for alternate courses before the end of the “add” deadline. Students must register for courses by the end of the first week of class in the fall or spring semester, and by the end of the second day of classes during the summer term (if offered).

10.4 An add/drop period will also be scheduled by the Office of the Registrar for each semester and during the summer term (if offered). The add/drop period can be found in the Academic Calendar. For courses not available for online registration, students must complete the add/drop form available from the Office of the Registrar.

10.6 Students who failed to attend the first week of any class for which they have completed registration and appear on the class roster can be dropped from the course by the administrators.

10.7 Students may apply for withdrawal of their registration on a course after the add/drop period, if they have a genuine need to do so. The application should be made on the Course Withdrawal form available from the Office of the Registrar. The course withdrawal deadline can be found in the Academic Calendar.

10.8 The pre-requisite requirements of a course must have been fulfilled before a student registers for that course. However, the pre-requisite requirements of a course can be waived under exceptional circumstances by submitting a completed Requisite override form available from the Office of the Registrar. If the pre- requisite course concerned forms part of the requirements for award, the course has to be passed in order to satisfy the graduation requirements for the program concerned, despite the waiving of the pre-requisite.

11. STUDY LOAD

11.1 For students following the progression pattern specified for their program, they have to take the number of credits and courses, as specified in this Program Handbook, for each semester. Students cannot drop those courses assigned by the department unless prior approval has been given by the department.

11.2 The normal study load is about 30 ECTS credits in a regular fall or spring semester. The maximum study load to be taken by a student in a regular fall or spring semester is 36 ECTS credits, unless exceptional written permission is given by the Dean and from the Vice-Provost for Academic Affairs. The maximum study load to be taken by a student in a summer term (if offered) is 12 ECTS credits, unless exceptional written permission is given by the Dean and from the Vice-Provost for Academic Affairs. For such cases, students are reminded that the study load approved should not be taken as grounds for academic appeal.

11.3 The minimum load for a full-time student in any given regular fall or spring semester is 24 ECTS credits of coursework that count toward graduation. Under exceptional circumstances, a student may be permitted to enroll for fewer than 24 ECTS credits if written permission is received from the Dean and from the Vice-Provost for Academic Affairs.

11.4 To help improve the academic performance of students on academic probation (the meaning of “academic probation” can be found in Section 19.2), these students will not be allowed to take 36 ECTS or more during their probation period in the fall and spring semesters.

11.5 Students who have obtained approval to pace their studies and students on program without any specified progression pattern who wish to take more than the normal course load in a fall or spring semester should seek advice from the Department concerned before the selection of courses.

11.6 Students are required to be present at the beginning of the semester and to remain until the semester is completed.

12. COURSE EXEMPTION AND CLASS ATTENDANCE

There is no course exemption policy for this program. In exceptional cases, students may substitute courses in the curriculum (including the mandatory Nazarbayev University Undergraduate Core Curriculum Requirements' courses) with other courses, if written permission is given by the Head of Department and the Dean.

12.1 All students are expected to attend all classes at the University. Penalties as stated in the course policies will be applied if attendance falls below 80% of scheduled classes. At the start of the semester, each instructor is responsible for clearly communicating the course attendance policies and/or School attendance policies. Faculty has right to lower grades or initiates a drop/withdrawal from a course if there is a violation of the attendance policies. Students should be mindful of the course policies and make sure they completely understand the consequences of missing classes (either excuse or unexcused).

12.2 Excused absence is when a student misses classes for one of the following documented reasons: personal illness; family emergency; school approved absence such as conference, Olympiad, or other academic events. All medical certificates must be endorsed by the NU doctors and recorded by the Department of Student Affairs. Only the instructors may approve a student's request to be absent from class. Students should get the appropriate "excuse" forms available from the School Office and submit the completed forms to each course instructor for approval for each missed class. In the event of a dispute, the matter may be reported to the Vice dean for Academic Affairs or equivalent official of the School. The determination of the Vice Dean or equivalent School official shall be final.

12.3 Unexcused absence occurs when a student deliberately misses a class with no reasons.

12.4 Students are responsible for monitoring their own attendance. Students who exceed the maximum number of absences in the current and previous semester will not be eligible for University sponsored study abroad programs or University sponsored events.

13. CREDIT TRANSFER

13.1 Students may transfer credits for recognized previous studies which will be counted towards meeting the requirements for award. Transferred credits may be counted towards more than one award. The granting of credit transfer is a matter of academic judgment. The student should provide a detailed course syllabus showing the topics covered and assessment tasks which were completed for each course and a certified official transcript with the number of credits and the grade or final assessment in the course. Unless the course is a language course all language of instruction must be in English. To ascertain the academic standing of the institution offering the previous studies, the Department might need to request the institutions concerned to provide more information.

13.2 Transfer credit is not given for courses in which the student earned lower than C grade (or its equivalent). Grades earned at other universities are not included in computing the student's CGPA at NU. All transfer credits will be annotated as such on the student's NU transcript.

13.3 The maximum number of transferable credits is 60 ECTS credits. Discretion may be made with approval of the Dean for a student who was on an approved Academic Mobility program.

13.4 Certain types of credit cannot be transferred to the NU, including but not limited to the credits awarded by higher education institutions for noncredit courses, workshops, and seminars offered by other higher education institutions as part of continuing education programs.

13.5 The transfer decision and final judgement are made by the relevant Department or if there is no relevant Department by the School. The School will decide the number of credits to be transferred, and if appropriate the level of the course and the course equivalent.

13.6 Transfer credits at the time of admission can only be granted for courses taken in the preceding two academic years.

13.7 Credit for courses taken at institutions outside NU subsequent to admission can only be granted by prior written approval from the relevant Department, or if there is no relevant Department from the School Admissions Committee.

13.8 Credits earned in other higher education institutions during the time spent at NU shall be processed in accordance with appropriate internal regulations of NU.

13.9 Credit transfer can be applicable to credits earned by students through studying at an overseas institution under an approved Academic Mobility program. Students should, before they go abroad for the approved Academic Mobility program, seek prior approval from the program offering Department (who will consult the course offering Departments as appropriate) on their study plan and credit transferability. As with all other credit transfer applications, the Departments concerned should scrutinize the syllabuses of the courses which the students are going to take at the overseas institution, and determine their credit transferability based on academic equivalence with the corresponding courses on offer at the NU, and the comparability of the grading systems adopted by NU and the overseas institution. The transferability of credits and the suitability for allowing grades to be carried over must be determined and communicated to students before they go abroad for the approved Academic Mobility program.

13.10 For credit transfer of retaken courses, the grade attained in the last attempt should be taken in the case of credit transfer with grade being carried over. Students applying for credit transfer for a course taken in other institutions are required to declare that the course grade used for claiming credit transfer was attained in the last attempt of the course in their previous studies. If a student fails in the last attempt of a retaken course, no credit transfer should be granted, despite the fact that the student may have attained a pass grade for the course in the earlier attempts.

13.11 Students will not be granted credit transfer for a course which they have attempted and failed in their current study.

14. LEAVE OF ABSENCE

Periods of time during which a student is on an approved leave of absence from the University shall not be included in the calculation of time limitations for stipends. When granting a leave of absence to a student, whose tuition is funded through the state or University, his/her right for an educational grant will be retained. Funding and tuition fees will be paused for the period of the leave of absence, except for funding of stipends, which are established by the procedures of the paying state stipend to the students who have been granted a leave on medical grounds. The funding and tuition fees will be resumed after the end of a leave of absence.

A leave of absence will not be considered for approval in the following cases:

1) If the application is submitted during the examination period;

2) If a student has been scheduled for dismissal in the light of poor academic performance, inadequate progress toward degree, or for disciplinary reasons.

If a student has an outstanding “Incomplete” at the time he or she is granted leave of absence, the period for completion of that “Incomplete” may be extended for the period of the leave of absence with the written approval of the faculty member who granted the “Incomplete” and the Dean.

A student who requests a leave of absence shall submit an application form provided by the Office of the Registrar. A leave of absence may be granted by the Dean, the Vice President for Student Affairs, and the Vice Provost for Academic Affairs. The student’s leave of absence will become effective upon the Provost’s signature of the order, which shall indicate the dates of beginning and termination of the leave of absence and its grounds. Copy of the order is given to the student, along with a document stating their academic status at the time of leaving and the conditions they will be under upon their return from leave of absence. If the student was enrolled in classes prior to the approval of the leave of absence, no grades will be awarded for the interrupted semester and all courses will be marked with a “Withdrawal” (“W”). The grant of the a leave of absence will be recorded on the student’s transcript.

14.1 Leave of Absence - Medical.

Students may request for leave of absence when extraordinary circumstances such as illness or injury prevent the student from continuing classes and incompletes or other arrangements with the instructors are not possible. Medical leave of absence policy covers both physical and mental health conditions, including pregnancy and maternity.

A leave of absence can be granted to a student on the grounds of a medical certificate confirmed by a qualified medical officers consulting commission created in accordance with legislation of the Republic of Kazakhstan for a period from 6 to 12 months, except that in the case of tuberculosis a leave may be granted for a period of 1 to 2 years and in the case of maternity a leave of absence may be granted for a period of up to 2 years. A second leave of absence on medical grounds shall not be granted to a student. A student may request a leave of absence on medical grounds by submitting an application to the Department of Student Affairs for validation, along with an original medical certificate issued by the Medical Authority. When returning from a leave of absence granted on medical grounds a student shall submit an application to the Office of the Registrar no less than 20 working days prior to beginning of the

academic period they wish to return, and in cases other than pregnancy/maternity leave, he/she will submit a medical certificate of an appropriate Medical Authority approving the student's return to the University. Students returning from pregnancy/maternity leave shall submit birth certificate of the child or other relevant document(s).

14.2 Leave of Absence - Immediate Family Member.

Students may be granted for leave of absence based on change in social or economic status affecting an immediate family member (immediate member means a parent, spouse, dependent child, sibling, or grandparent). In order to grant a leave of absence based on circumstances of an immediate family member, the University may request to present evidence of a direct impact on the student's ability to continue with his or her program of study. If requested, such evidence shall be submitted to the Dean, who shall review and forward copies of such documentation to the Vice President for Student Affairs and International Cooperation and the Vice Provost for Academic Affairs. When returning from a leave on non-medical grounds a student shall submit an application to the Office of the Registrar not less than 45 days prior to the beginning of the semester in which they wish to return.

14.3 Leave of Absence - Other.

A student may be granted a leave of absence from the University for a period of up to one year for reasons other than a medical condition or event affecting an immediate family member if the following conditions met:

No leave of absence may be granted under this section for any undergraduate student prior to the completion of the first year of his or her studies;

No leave of absence may be granted under this section for any student who is currently on probation, and has had Category B disciplinary actions;

No leave of absence may be granted under this section for any student who is behind in credit hours;

A leave of absence under this section shall be granted only to a student with high academic performance GPA 3.0 and above;

A leave of absence under this section will be granted only on a determination by the Dean that such leave will not be detrimental to the student's ability to complete the program.

To apply for a leave of absence under this section, a student is required to submit documentation demonstrating the purpose of the leave and the activities in which he or she expects to participate during the leave period. In the event that a proposed leave includes a period of employment with a company, the supporting documentation submitted in advance must include a letter of invitation from the employing company and a copy of the corporate registration or other documentation of the company's operations. When returning from a leave on non-medical grounds a student shall submit an application to the Office of the Registrar not less than 45 days prior to the beginning of the semester in which they wish to return. At the end of the leave period, the student will be required to submit a report detailing his or her activities during the leave period to the Dean and a letter from a supervisor or equivalent individual(s) attesting to the accuracy of the student's report and evaluating the student's performance during the leave period. In the event the student's activities during the period of leave include employment, he or she is required to submit relevant documentation demonstrating uninterrupted employment for the prescribed period. Violation of the terms of this section will be treated as non-academic misconduct under the University's Student Code of Conduct and Disciplinary Procedures.

15. PRINCIPLES OF ASSESSMENT

15.1 Assessment of learning and assessment for learning are both important for assuring the quality of student learning. Assessment of learning is to evaluate whether students have achieved the intended learning outcomes of the courses that they have taken and have attained the overall learning outcomes of the academic program at the end of their study at a standard appropriate to the award. Appropriate methods of assessment that align with the intended learning outcomes will be designed for this purpose. The assessment methods will also enable teachers to differentiate students' different levels of performance within courses. Assessment for learning is to engage students in productive learning activities through purposefully designed assessment tasks.

15.2 Assessment will also serve as feedback to students. The assessment criteria and standards will be made explicit to students before the start of the assessment to facilitate student learning, and feedback provided will link to the criteria and standards. Timely feedback will be provided to students so that they are aware of their progress and attainment for the purpose of improvement.

15.3 The course results based on the assessments are examined by the Exam Board at the end of each semester. The Exam Board will review, discuss and finalize progression and completion.

16. ASSESSMENT METHODS

16.1 Students' performance in a course can be assessed at the discretion of the course coordinator by a variety of assessment activities, including examinations, tests, assignments, projects, laboratory work, field exercises, presentations and other forms of classroom participation. Assessment activities which involve group work should include some individual components therein, i.e. the contribution made by each student in a group effort shall be determined and assessed separately, and this can result in different grades being awarded to students in the same group.

16.2 The course learning outcomes, assessment activities, and the weighting of each activity in the overall course grade will be clearly stated in the course specifications. The course learning outcomes should be assessed by appropriate assessment activities, in line with the outcome-based approach.

16.3 At the beginning of each semester, the course coordinator will inform students of the details of the methods of assessments to be used within the assessment framework as specified in the course specifications.

16.4 Students who did not participate in assessment activities will be awarded zero mark. When there are extenuating circumstances, the students must provide documentary evidence and apply for excuse absence (refer to Section 12). Depending on the circumstances, the course instructor may for cases of approved excused absence:

1) Set a new date (or deadline) for the students to retake or submit the missed assessment activity;

2) Decide on alternative means to compensate for the missed assessment activity.

Applications for excuse absence so that students can participate in missed assessment activity will not be accepted 7 calendar days after the original assessment activity date.

16.5 Course instructors have the right not to accept and/or deduct marks for late submission of assessment elements. These course policies should be stated in the course specifications. At the beginning of each semester, the course coordinator must inform students of the course policies.

17. COURSE RESULTS

17.1 Course instructors, in respect of the course they teach, have sole responsibilities for marking and grading students' coursework and examinations scripts. Assessment elements (including final examinations) will be graded by a clear marking scheme (set by the course instructor) which is non-negotiable. Timely feedback of assessment will be given to students as soon as possible (e.g. not later than a month), and in any case, before the final examination/assessment. In this regard, course instructors will be accountable to the Head of Department, to ensure that all forms of assessment, including the students' coursework and examination scripts, are correctly marked and graded where appropriate. Course instructors will avoid administrative errors at all times, and submit the grades to the Office of the Registrar according to the schedule set in the academic calendar. To ensure consistency and uniformity for a common course taught by different course instructors, meetings can be arranged amongst them before the examination papers are set or before the marking is done.

17.2 Course grades should be reviewed and finalized by the Department before being formally released to students and submitted to the Exam Board.

18. PROGRESSION / ACADEMIC PROBATION / DISMISSAL

18.1 The School Board shall, at the end of each semester (except for Summer Term - students who are eligible to graduate after the completion of Summer Term courses will be processed in the beginning of the fall semester), determine whether each student is

(i) Eligible for progression towards an award; or

(ii) Eligible for an award; or

(iii) Required to be dismissed from the program.

18.2 At the conclusion of every semester, each student's Grade Point Average (GPA) (see Section 23) and rate of progress toward degree are calculated by the Office of the Registrar and academic standing is determined for students seeking Bachelor degrees according to the following criteria:

1) Good Academic Standing – A student having a Cumulative Grade Point Average (CGPA) of 2.0 or above and a GPA in the current semester of 2.0 or above is considered to be in good academic standing;

2) Academic warning – A student will receive notice of academic warning if his/her academic performance is deemed to be unsatisfactory. A student may receive an academic warning after the mid-

semester status reports, which are required from all course instructors in all courses to help identify and assist students who may need additional guidance (Mid-semester grading will be based on Satisfactory (S) – i.e. A student who is at a minimum C or above with excellent attendance; or Non Satisfactory (NS) – i.e. Any student who is at a C- or below with attendance problems, and other problems that may keep the student from successfully completing the courses. Notification of academic warning will be sent by the Office of the Registrar to the student, the School's Vice Dean of Academic Affairs and the student's advisor. A student will be advised to limit their social activities and may not be considered for NU sponsored travel.

3) Academic probation – A student who fails to maintain Good Academic Standing based on GPA will be placed on Academic Probation. At the end of one semester of academic probation, students are subject to dismissal from NU if they have not achieved the necessary conditions to return to Good Academic Standing. In exceptional cases, the Dean may recommend to extend academic probation for a second semester based on evidence of improvement, overall academic progress, the student's potential to return to Good Academic Standing and eventually to graduate on time. The recommendations must be submitted to the Vice Provost for Academic Affairs indicating the grounds for the recommendation. The final decision on extension of the academic probation for another semester is made by the Vice Provost for Academic Affairs. Under no circumstances may a student be on academic probation more than two consecutive semesters or for more than three semesters in total.

18.3 Grades received during Summer Term may also affect a student's academic standing.

18.4 The Dean will receive a probation report at the end of each semester from the Office of the Registrar. Students will receive notification from the Office of the Registrar informing them of any change in their academic standing

18.5 Students are required to remain for four years of study as an undergraduate student to ensure they graduate pursuant to graduation requirements as specified in the internal regulations of NU.

18.6 NU expects students to complete their degree requirements within four years (subject to the Policy on Fifth Year Study and other internal regulations of NU). To complete a degree in four years, students must average 30 ECTS per semester (including transfer credits and summer courses). Any students who falls 30 or more ECTS credits behind this rate of completion will be subject to dismissal from NU. The Office of the Registrar shall submit a list of students who are 30 or more ECTS credits behind satisfactory progress toward satisfactory progress toward a degree to the Dean, who shall make a recommendation to the Provost. The total credits are tallied by counting all credits earned from coursework as well as credits transferred into NU. Attempted credits are calculated by tallying the credits for every course on a student's transcript including transfer credit, graded courses, and courses that were graded AW, W, F, or I.

18.7 Students may be considered for the fifth year of study if they are unable to meet graduation requirements by the end of the last semester of their final year and are expected to be able to complete their degree with one additional year of study. At the end of the spring semester, as soon as is practicable after the receipt of final grades, the Office of the Registrar will send each School a list of the fourth year students who will not satisfy the requirements for graduation. The Vice Dean for Academic Affairs or equivalent in each School, in consultation with academic advisors and Department Chairs, will complete a form indicating the specific courses in which the student is to be enrolled during his or her fifth year. This form must be submitted to the Office of the Registrar by the stipulated deadline. The Office of the Registrar shall send a letter to the student's parent informing them that the student is eligible for a fifth year of study at cost, identifying the list of courses in which the student will be required to enroll during a fifth year of study, and indicating the current cost per credit of fifth year study at the University. The letter

will contain an acceptance form. Upon timely return of the acceptance form the student will be enrolled as a fifth year student in the specific courses indicated in the letter. When the student is enrolled, the Office of the Registrar shall forward a copy of the letter and the acceptance form to the Bursar's Office. The Bursar's Office shall generate a billing statement and payment contract which will be send to the student. The Bursar's Office shall be responsible for the execution and registration of the contract. When the contract is executed, the Bursar's Office will send it to the Office of the Registrar for inclusion in the student's permanent file. A student enrolled into a fifth year will receive an academic schedule for each semester of the fifth year based on the list of required courses identified in the letter from the Office of the Registrar. The fifth year student is not allowed to change this schedule, drop or add courses, or withdraw from this set schedule. All academic requirements for graduation must be completed within the fall and spring semester of the fifth year. A sixth year will not be considered under any circumstances. If a student has not completed their program of study by May of the fifth year, they will not graduate from the University or receive a diploma. They will receive a letter of attendance on approved letterhead. The school will ensure that each fifth year student meets regularly with their academic advisor. During their fifth year of study, fifth year student may be provided with accommodation on campus, depending on availability. Fifth year students will be charged an accommodation fee if they choose to live on campus.

19. APPEAL OF GRADES

All students have the right to appeal any grade that they have received that they believe is in error. The error must be based on one of the following criteria:

Error in calculation

Error in application of the class grade policy as presented in the course specifications

Incorrect entry of the grade into the database

Incomplete marking of an assessment

In the case of an exam, a student must first consult with the course instructor as soon as the grade is available and announced to the students. The student should review his or her corrected, graded final exam in the presence of a faculty within the stipulated period set by the course coordinator. No viewing is allowed after the stipulated period. If any error is found, the student should complete a "Grade appeal" form and submit it to the course coordinator. The School will set the official deadline for the appeal process. Late appeals will not be accepted.

Upon receipt of the "Grade appeal" form, the course coordinator can accept or deny the request. If there is insufficient ground for the grade appeal, the instructor can deny the request. However, if a student's grade has been assigned incorrectly due to technical or procedural error, or miscalculation of grade, the course coordinator should complete a "Grade change" form from the Office of the Registrar. This form must be signed by the course instructor and the Dean. No grades can be changed after a degree has been granted.

If a student is dissatisfied with the outcome from the course coordinator, he or she may appeal to the Dean or Vice Dean, who shall consult with the course coordinator before making a decision. The decision of the Dean or Vice Dean shall be final. All grade changes must be resolved by the end of the first week of the next semester.

20. RETAKING OF COURSES

20.1 Any student who receives a grade that would prevent academic progress in his or her program of study may enroll to retake that course. The total number of times a student may retake a course is limited to three retake attempts. Students are not permitted to retake a course if it has already been passed for the purpose of improving the awarded grade.

20.2 All retake attempts will remain in the student record and on the transcript, and will be counted to semester's GPA, semester CPGA, semester's earned credits, semester's attempted credits and total attempted credits. Only the last retake will be counted in the final CGPA and total earned credits.

20.3 The summer term is short and the instructors of courses if offered can decide on the course policy, mode of delivery, and assessment requirements. If retake courses are offered in the summer term, a student cannot participate in more than two retake courses.

21. EXCEPTIONAL CIRCUMSTANCES

Absence from an assessment component

21.1.1 Students who are absent without permission from any form of assessment or who do not submit coursework for assessment will be awarded a mark of zero for that assessment unless the course instructor determines that there are extenuating circumstances. When there are extenuating circumstances, it is the student responsibility to provide documentary evidence in accordance to established University and School procedures and inform the course instructors as soon as possible prior to the assignment of the final grades. Depending on the circumstances, the instructor may set a new date for the students to resubmit or retake the missed assessments (refer to Section 16).

21.1.2 All medical documents must be verified by the NU doctors and endorsed by the Department of Student Affairs.

21.1.3 Any student who cannot take the examination as scheduled is required to submit his/her application for late assessment in writing to the Head of Department offering the course, within five working days from the date of the examination, together with any supporting documents. Decisions of applications for late assessment and the means for such late assessments shall be made by the Head of Department after consultation with the course coordinator.

Assessment to be completed (Incomplete grade)

21.2 When a student has completed a substantial portion of the requirements for a course but, due to extenuating circumstances, is unable to complete all requirements, the course instructor may assign a temporary grade of "Incomplete". An "Incomplete" grade can be given only on the basis of a written prior agreement between the student and the instructor and approved by the Head of Department and the Dean. The agreement will describe the additional work that is expected and the terms under which it is to be completed. The date for completion of work is to be determined by the course instructor, but all work is to be completed no later than the end of the following semester (including summer semester if appropriate)

21.3 When the work or examination that is required under an "Incomplete" agreement is completed, the course instructor shall request a change of the "I" grade to the appropriate grade for the course, at which time the grade of "I" will be removed from the student's transcript.

21.4 An "I" grade can also be applied to a student who cannot take part in a final examination in a course because of personal health problems, or that of immediate family. A new deadline will be set by the course instructor for the completion of the final examination.

21.5 An "I" has no grade points and is not included in the calculation of GPA.

21.6 A grade of Incomplete that is not completed by the end of the subsequent semester automatically reverts to the grade indicated in the agreement between the course instructor and the student. If no grade is indicated in the agreement and the instructor does not submit a change of grade request, the "Incomplete" grade will revert to an "F". In no case shall a student be granted a degree while there are unresolved Incompletes in the student's record.

Withdrawal

21.7 Withdrawal from courses will be permitted up to the date indicated in the Academic Calendar for the year in which the withdrawal occurs. A student will not be allowed to withdraw from a course in which he/she had taken a grade of "W" in a previous semester.

21.8 A withdrawal from a course is effective upon the student's submission of a completed Withdrawal Form to the Office of the Registrar.

21.9 A student who takes a Leave of Absence during a semester will automatically be withdrawn from all courses.

Other particular circumstances

21.10 A student's particular circumstances may influence the procedures for assessment but not the standard of performance expected in assessment.

22. GRADING

22.1 Assessment grades shall be awarded on a criterion-referenced basis. The following Common Grading Scale is applied to all NU undergraduate programs:

Letter grade	**%**	**Quality Point**	**Explanation**
A	95-100	4	Excellent, exceeds the highest standards in the assignment of course
A-	90-94.9	3.67	Excellent, meets the highest standards for the assignment or course
B+	85-89.9	3.33	Very good, meets the high standards for the assignment or course

B	80-84.9	3.00	Good, meets most of the standards for the assignment or course
B-	75-79.9	2.67	More than adequate; shows some reasonable command of the material
C+	70-74.9	2.33	Acceptable; meets basic standards for the assignment or course
C	65-69.9	2.00	Acceptable; meets some of the basic standards for the assignment or course
C-	60-64.9	1.67	Acceptable; while falling short of meeting basic standards in several areas
D+	55-59.9	1.33	Minimally acceptable; falling short of meeting many basic standards
D	50-54.9	1.00	Minimally acceptable; lowest passing grade
F	0-49.9	0	Failing; very poor performance

'F" is a course failure grade, whilst all others ('D' to 'A') are course passing grades.

No credit will be earned if a course is failed.

Semester GPA

22.2 At the end of each semester, a semester Grade Point Average (GPA) will be computed based on the grade point of all the courses taken in the semester. For each course, the grade point is determined by multiplying the number of credits with the numeric quality point based on the obtained grade for that course. The sum of the grade points is then divided by the total credits for all the courses taken in the semester as follows:

$$GPA = \frac{\sum_n Course\ Credit\ Value\ X\ Course\ Quality\ Point}{\sum_n Course\ Credit\ Value}$$

where n = number of courses (inclusive of failed courses) taken by the student in the semester.

In addition, the following courses will be excluded from the semester GPA calculation:

(i) Transferred courses

(ii) Incomplete courses

(iii) Withdrawn courses

Figure 1: example of the semester GPA calculation

Courses	Credits (ECTS)	Letter Grade	Quality Point	Credit value multiply by Quality Point
Course 1	8	A	4.00	8X4=32
Course 2	6	B+	3.33	6X3.33=19.98
Course 3	6	C-	1.67	6X1.67=10.02
Course 4	6	F	0	6X0=0
Course 5	6	B	3.00	6X3=18.00
	Total = 32			Total = 80
Semester GPA =				80/32 = 2.5

22.3 GPA's will be calculated for each Semester including the Summer Term. This Semester GPA will be used to determine students' eligibility to progress to the next Semester alongside with the 'cumulative GPA'. The Semester GPA calculated for the Summer Term will also be used for this purpose

Annual GPA

22.4 At the end of each academic year, an annual Grade Point Average (GPA) will be computed based on the grade point of all the courses taken in the academic year (excluding the summer term). For each course, the grade point is determined by multiplying the number of credits with the numeric quality point based on the obtained grade for that course. The sum of the grade points is then divided by the total credits for all the courses taken in the academic year.

In addition, the following courses will be excluded from the yearly GPA calculation:

(i) Transferred courses

(ii) Incomplete courses

(iii) Withdrawn courses

22.5 GPA's will be calculated for each academic year excluding the Summer Term. This annual GPA will be used to determine Dean’s list. Students who have taken at least 60 ECTS and obtained an annual GPA of greater or equal to 3.8 based on the fall and spring semesters grades in the academic year and did not have any misconduct will be recommended for the Dean’s lists, which are commendations to undergraduate students of excellence.

Cumulative GPA

22.6 At the end of every semester, a Cumulative Grade Point Average (CGPA) will be computed based on the grade point of all the courses taken from the start of the program in residence at the University (including the summer term). For each course, the grade point is determined by multiplying the number of credits with the numeric quality point based on the obtained grade for that course. The total cumulative grade points are then divided by the total graded credits for all the courses taken from the start of the program in residence at the University.

22.7 For courses which have been retaken, only the grade point obtained in the final attempt will be included in the CGPA calculation. The CGPA is an indicator of overall performance at graduation, and is capped at 4.0.

Administrative Grades

22.8 The following University-wide administrative grade notations apply to all undergraduate programs:

Grades	Comments
P/F	A grade of P (pass) or F (Fail) may be reported for students who are permitted to take a course on a P/F grading basis rather than receiving a letter grade. Classes may only be taken on a P/F basis with the approval of the course instructor and the Dean. A "P" will not be used in calculating the student's GPA or CGPA; an "F" grade will be used in calculating the GPA and CGPA. The pass is equivalent to a C- or above
AU	Audited courses are recorded on the transcript with the notation "AU". Audited courses are not included in the calculation of the GPA, attempted credit, or earned credit. The grade "AU" is automatic. The course instructor cannot assign any other grade. Audited courses do not receive credit, cannot be counted towards graduation requirements, do not satisfy prerequisites and cannot be transferred.
I	Incomplete
IP	This grade is assigned at the end of the first term of a year-long class if the student has made adequate progress up to that point. It will be changed to reflect the class grade for both semesters of study at the end of the year.
W	Withdrawal
AW	Administrative Withdrawal. This grade indicates that a student has been ordered withdrawn from a course based on: Disciplinary grounds, following the procedures and standards specified in the internal regulations of NU Non-payment of tuition where appropriate following the procedures and standards specified in the internal regulations of NU

AD	Administrative Drop – An administrative drop occurs when a student has failed to attend the first week of any class for which they have completed registration and appear on the class roster. This process is initiated by the appropriate School to which the course belongs

23. GRADUATION REQUIREMENTS FOR BEng (HONS) IN ELECTRICAL AND COMPUTER ENGINEERING

All students qualifying for a 4-year Full-time Undergraduate Degree offered from fall 2018 onward must meet the following specific graduation requirements of their chosen program of study:

Complete successfully a minimum of 248 ECTS composed of courses as specified in the program curriculum;

Obtain at least a C- grade for the Capstone Project;

Earn a CGPA of 2.00 or above at graduation.

23.1 It is the student's responsibility to ensure that all requirements for graduation are fulfilled in a timely fashion. The student should consult his/her academic advisor to determine whether the requirements have been met and, if not, what the student must do to meet the requirement.

23.2 The Office of the Registrar will send the list of students who meet graduation requirements, including their CGPA's and completed courses, to the Dean, who will approve each individual student and then return the list to the Office of the Registrar.

23.3 The Registrar will review all information, based on the recommendation of the Dean, and verify the list of students for graduation.

23.4 The list of recommended and verified students will be submitted to the Provost for final approval.

24. AWARD CLASSIFICATION

24.1 An undergraduate student is eligible for honors designation and will receive "red" diplomas, if he/she meets one of the following criteria:

1) his/he completed academic record equal to 4.00 CGPA. Such student qualifies for the category "Distinction";

2) his/he completed academic record equal to 3.90 CGPA and above (CGPA at graduation >= 3.90) calculated after excluding student(s) eligible for the category "Distinction". Such student qualifies for the category "Summa Cum Laude";

3) his/he completed academic record equal to 3.80 CGPA and above (CGPA at graduation >= 3.80) calculated after excluding student(s) eligible for the category "Distinction" and "Summa Cum Laude". Such student qualifies for the category "Magna Cum Laude";

24.2 Any courses passed after the graduation requirement has been met will not be taken into account in the grade point calculation for award classification.

25. END-OF-SEMESTER AND FINAL EXAMINATIONS

End-of-Semester Period

25.1 The End-of-Semester period is a time of reduced social and extracurricular activity, starting with the last week of classes and continuing through the final examination period. In this period, students concentrate on academic work and prepare for the final examinations.

25.2 The following rules govern the conduct of classes during the End-of-Semester period:

1) During this time course instructors should neither make extraordinary assignments nor announce additional course meetings to "catch-up" in course presentations that have fallen behind. Course instructors may choose to conduct optional review sessions and to suggest other activities that might seem appropriate for students preparing for final examinations. Review sessions should be scheduled for optimal attendance, and a serious effort should be made by course instructors to accommodate students who are unable to attend a scheduled review session.

2) No graded homework assignments, mandatory quizzes, or examinations should be given during the last week of classes except:

a) in classes, where graded homework assignments or quizzes are routine parts of the instruction process, or

b) in classes with laboratories, where the final examination will not test the laboratory component. In such a case, the laboratory sessions during the week preceding examination period may be used to examine students on that aspect of the course

c) Take-home examinations, given in place of the officially scheduled in-class examination, may be distributed in the week preceding the final examination period

d) During the End-of-Semester period, no course instructor may schedule any extracurricular musical, dramatic, or athletic events involving compulsory student participation, nor may students be asked to attend any meetings of committees

Final Examinations

25.3 No other coursework, including laboratory or studio work, will be due during the final examination period unless it is assigned in advance and in lieu of the course's final examination.

25.4 All scheduled final examinations, or equivalent final graded exercises, are held at the end of the semester during NU's official final examination period. Final papers or other assignments that are assigned in lieu of a final examination will be due during the NU's final examination period.

25.5 The final exam schedule is generated by the Office of the Registrar. The date, time and venue of the final exam should not be changed. No student shall be required to take more than two scheduled final examinations that take place within a single calendar day. Students who find conflicts in their final examinations should seek to resolve these with the course instructors involved at the time the final examination schedule is posted. Course instructors are encouraged to be accommodating whenever possible. If a course instructor refuses to accommodate a conflict in a situation where a student is scheduled for more than two final examinations on the same calendar day, the student may appeal to the Dean.

25.6 On the day of the final exam, a student who is sick or has extenuating conditions that can affect the performance may apply for deferred assessment and should not sit for the exam. Once he/she sits for the exam, the student cannot appeal the grade based on medical and extenuating condition grounds (refer to Sections 20 and 22).

25.7 Students with a disability, dyslexia or other diseases can apply for special assessment arrangements in their final exams. Notification of special requirements must be made by the student to the course instructor at least three working days prior to the final exam. If the student did not apply for special assessment arrangements and sit for the exam, they cannot appeal the grade based on medical or extenuating condition grounds (refer to Sections 20 and 22).

25.8 Any student shall be permitted to review his or her corrected, graded final examination in the presence of a faculty or staff member within the stipulated period set by the course coordinator. If any error is found, the student should appeal (refer to Section 20).

Student Examination Conduct

25.9 Students are expected to arrive at the examination room on time.

25.10 Student will be required to present a current NU student identity card when entering an examination hall, and to display this card on their desks during the examination.

25.11 All rules concerning the administration of the examination will be explained to the students before the start of the examination. Students are required to observe all instructions given by examiners, supervisors, proctors, or other officials responsible for the conduct of the examinations.

25.12 The following rules apply to all examinations:

1) Talking to anyone other than the proctor in the examination room is not permitted.

2) The presence of any illegal items (unless permitted by the examination) will be grounds for charges of academic misconduct and immediate expulsion from the examination, and a grade of “F” on that examination. These items include but are not limited to cell phones or any text messaging devices.

3) Students must stop working at the end of the time allowed for the examination. Continuing to work on the examination after the allowed time is considered cheating.

25.13 Communicating answers to other students is as serious as receiving answers. Students who assist others are subjects to disciplinary actions and penalties.

26. ACADEMIC MISCONDUCT

26.1 All academic misconduct will be processed in accordance to the NU Student Code of Conduct and Disciplinary Procedures.

26.2 All disciplinary actions against students' misconducts will be recorded in students' records.

26.3 Students who have committed disciplinary offences (covering both academic and non- academic related matters) will be put on 'disciplinary probation'. The student will lose the stipend during the 'disciplinary probation'.

26.4 Students with two academic misconducts will be recommended for dismissal.

26.5 Students with records of academic misconduct will not be considered for University funded activities including student trips and overseas summer mobility programs.

26.6 The University reserves the right to withhold the issuance of any certificate of study to a student who has unsettled matters with the University, or who is subject to disciplinary action.

27. COURSE SPECIFICATIONS

Core Courses

Course Code and Title	Circuit Theory I
Course Descriptor	In this course, you will be introduced to the concepts and definitions of charges, currents, voltages, power, and energy. You will learn the voltage- current relationship of basic circuit elements – resistors, inductors, capacitors, dependent and independent voltage and current sources; apply Kirchhoff's current and voltage laws to circuits to determine voltage, current and power in branches of any circuits excited by DC voltages and current sources. Apply simplifying techniques to solve DC circuit problems using basic circuit theorems and structured methods like node voltage and mesh current analysis. The goal also includes derivation of the transient responses of RC and RL circuits, steady state response of circuits to sinusoidal excitation in time domain, application of phasors to circuit analysis, introduction to nonlinear electronic devices such as diodes, MOSFETs.
Course LOs	After successfully completing this course, the students will be able to: describe resistive and energy storage elements, and fixed/controlled sources. transform different sort of connections in electric circuits like Wye-and Delta connections. apply techniques for the analysis and simulation of linear electric circuits, and measurements of their properties. analyze various types of responses of first- and second-order electric circuits. use modern tools, such as PSpice, MATLAB, etc. present and analyze data with effective report writing skills.

Course Code and Title	Circuit Theory II
Course Descriptor	In this course, you will be introduced to network theory and circuits analysis. You will learn Voltage & Current source transformations, Wye & Delta transformations, Superposition theorem, Thevenin's & Norton's theorems, Maximum Power Transfer theorem, Reciprocity theorem, Compensation theorem, Millman's theorem, Tellegen's theorem- statement & Applications. AC Analysis: Concepts of phasor & complex impedance/Admittance – Analysis of Simple series and parallel circuits – Active power, Reactive power, Apparent power (Volt Amperes), Power Factor and Energy Associated with these circuits – concepts of complex power – phasor diagram, impedance triangle & power triangle associated with these circuits. Resonance: Introduction – series resonance – parallel resonance – Definition: Q factor – half power frequency – resonant frequency – Bandwidth – Mathematical Expression for Different types of Resonant circuit. Coupled circuits: Mutual inductance – Co-efficient of coupling – Dot convention – Energy consideration – Analysis of Coupled circuits 3-phase circuits: Poly phase system – phase sequence – Analysis of 3 phase Balanced/Unbalanced circuits – power and power factor measurement. Source free and forced response of RL, RC and RLC series circuits – Forced response of RL, RC and RLC series circuits with sinusoidal excitation – time constant & Natural frequency of oscillation – Laplace transform application to the solution of RL, RC & RLC transient circuits, MOSFET models
Course LOs	After successfully completing this course, the students will be able to: 1. describe the concept of circuit elements lumped circuits, waveforms, circuit laws and network reduction. 2. solve the electrical network using mesh and nodal analysis by applying network theorems. 3. explain the concept of active, reactive and apparent powers, power factor and resonance in series and parallel circuits. 4. characterize coupled circuits, three phase loads and power measurement. 5. analyze the transient response of series and parallel A.C. circuits 6. solve problems in time domain using Laplace Transform.

Course Code and Title	Engineering Materials II
Course Descriptor	The module covers the fundamentals of materials science and engineering. These include the understanding of the material structure from the atomic to micro to macro levels. The effects of the structure and the processing techniques on the material properties will be discussed. These concepts will be illustrated using methods to allow students to utilize the knowledge for materials selection in common engineering applications.
Course LOs	After successfully completing this course, the students will be able to: explain the influence of microscopic structure or defects on material properties describe the processing and applications of common engineering materials including polymers, biomaterials, metals & their alloys conduct appropriate destructive and non-destructive tests to determine properties of materials. assess and describe the mechanisms leading to malfunction.

Course Code and Title	Digital Logic Design
Course Descriptor	An introductory course to practical aspects of digital system design. The course covers digital logic design, including Boolean Algebra, basic design concepts and implementation technology, number representation, synthesis and design of combinational and sequential logic, and hands on experience in a lab. Pre-requisite: Calculus II
Course LOs	After successfully completing this course, the students will be able to: 1. solve basic binary mathematical operations related to binary logic gates operations 2. create gate-level implementation of combinational and sequential logic functions 3. create a state transition diagram from a description of a sequential logic function

	4. program behavioral operation of logic circuits using VHDL 5. use modern digital design tools such as ModelSim 6. implement a VHDL design on FPGA 7. write test-bench for verification of digital systems 8. describe the role of digital systems in technology, culture and society

Course Code and Title	Microprocessor Systems
Course Descriptor	Architecture, structure and programming language of typical microprocessors and micro-controllers. Sample microprocessor families. Memories, UARTS, timer/counters, serial devices and related devices. Interrupt programming. Hardware/software design tradeoffs. This will be run concurrently with a micro process lab. Pre-requisite: Digital Logic Design and Computer Architecture
Course LOs	After successfully completing this course, the students will be able to: 1. design an embedded system, including both hardware and software. 2. decide what level of sophistication the microprocessor needs to have and what additional devices are needed based on the features of the application. 3. determine how to connect the microprocessor, memories, and extra devices into a working system. 4. read device-timing diagrams for processors, memories, and the like, and determine device timing compatibility. 5. build an embedded system, both hardware and software, using DMA and/or interrupts. 6. use auxiliary circuits, like latches, bus drivers, UARTs and demultiplexers, to build a system 7. program embedded systems

Course Code and Title	Electronic Circuits
Course Descriptor	In this course, the objective is to understand the basic concepts in the design of electronic circuits using linear integrated circuits and their applications in the processing of analog signals. MOSFET characteristics, MOSFET models, Inverting & Non-Inverting amplifiers – voltage follower – summing and differential amplifiers – AC amplifiers Differentiator & Integrator – precision rectifiers – clipper and clamper circuits – log and anti-log circuits – Instrumentation amplifier - comparator and its applications. Analog Multiplier using Emitter Coupled Transistor Pair - Gilbert Multiplier cell Variable transconductance technique- analog multiplier ICs and their applications- Operation of the basic PLL- Closed loop analysis Voltage controlled oscillator- Monolithic PLL IC 566-Application of PLL. Analog switches- High speed sample and hold circuits and sample and hold ICs- Types of converter-Performance specifications-D/A conversion circuits:R-2R & inverted R-2R Ladder- D/A converters-A/D conversion circuits :Successive approximation, dual slope and flash A/D converters
Course LOs	After successfully completing this course, the students will be able to: explain techniques for the analysis of linear electric circuits test the properties of linear electrical circuits using practical experiments solve various types of responses of first-and second-order electric circuits use modern circuit simulation tools such as SPICE and MATLAB illustrate circuit simulation data with effective report writing skills

Course Code and Title	Solid State Devices
Course Descriptor	In the last 50 years, solid state devices like transistors have evolved from an interesting laboratory experiment to a technology with applications in all aspects of modern life. Making transistors is a complex process that requires unprecedented collaboration among material scientists, solid state physicists, chemists, numerical analysts, and software professionals. And yet, as you will see in part 1 of this course, that the basics of current flow through solid state semiconductor devices can be understood by using some elementary concepts of quantum- and statistical-mechanics. In Part 2, we will use this framework to analyze bipolar-transistors (Shockley, 1953). And in Part 3, we will do the same for MOSFETs (Grove, 1967). Although much have changed in the last 30 years - transistors have gotten smaller, MEMS have become an important research area, and cross-disciplinary research in Nano-bio-electronic systems is flourishing - yet the simple but powerful concepts that

	you will learn in this introductory course will still provide you the background and a reference point for all your future research work.
Course LOs	After successfully completing this course, the students will be able to: explain semi-conductor device models of MOSFET, BJT, and PN junction devices choose an appropriate device model for a given application circuit solve physical model equations using various mathematical techniques review various semi-conductor device models used in industrial applications use modern device simulation tools such as SPICE and TCAD illustrate device simulation data with effective report writing skills

Course Code and Title	Electric Machines and Drives
Course Descriptor	The general purpose of the module is to have the students exposed to the fundamentals of magnetics and electromagnetic energy conversion and its applications to basic electrical machines and drives. Topics covered include: Fundamentals of electricity, magnetism and electromagnetic energy conversion, Torque generation principles, DC motors and generators, efficiency and heating of electrical machines, Ideal transformers, practical transformers, three-phase transformers, Armature Windings, polyphase Synchronous motors and generators, permanent magnet motors, polyphase Asynchronous motors, stepper motors, Applications of electrical machines and drives, Controls of DC motors, brushless DC and AC motors, Variable Speed Drives (VSD)
Course LOs	After successfully completing this course, the students will be able to: explain the theory and laws of electromagnetism and electromechanical energy conversion describe the purpose, types, construction, equivalent circuits (both real and ideal models) for both single & three phase transformers compute induced voltage in modern electrical machines such as rotating loops, induced torques, armature reaction, power flow diagrams and losses contrast DC motor and DC generator using equivalent circuits in different configurations

	apply theoretical concepts using modern tools and electro-mechanical devices illustrate measurement data from electrical machines with effective report writing skills

Course Code and Title	Power System Analysis
Course Descriptor	This unit introduces students to the core knowledge of power systems analysis and modelling. The course will begin by introducing concepts related to the operation of plant equipment and the deregulation of the energy industry. This is followed by a detailed study into current, voltage, capacitance and impedance relations on a short, medium and long-distance transmission line. power-flow calculations for various symmetrical and unsymmetrical fault conditions will be investigated using the methods of Gauss-Seidel, Newton-Raphson. This course will cover, introduction to power system analysis, and three phase systems, per unit quantities, change of base, power system modelling, capacitance of transmission lines, bus admittance matrix, types of buses, formation of power flow equations using Ybus matrix, Power flow studies, Gauss-Seidel method, and Newton-Raphson method.
Course LOs	After successfully completing this course, the students will be able to: calculate energy and power system line parameters in per-unit format. analyze Ybus and Zbus for different energy system networks perform network calculations of admittance and impedance circuits through Ybus and Zbus modification of matrices analyze Gauss-Seidel power flow over different electricity energy network. utilize Newton-Raphson Power flow over different electricity energy network. simulate Gauss- Seidel and Newton-Raphson models using the Power World software.

Course Code and Title	Computer Networks
Course Descriptor	This course introduces fundamental concepts in the design and implementation of computer communication networks, their protocols, and applications. Topics to be covered include: overview of network architectures, applications (HTTP, FTP), network programming interfaces (e.g., sockets), transport (TCP, UDP), flow control, congestion

	control, IP, routing, multicast, data link protocols, error-detection/correction, multiple access, LAN, Ethernet, wireless networks, and network security. Examples will be drawn primarily from the Internet (e.g., TCP, UDP, and IP) protocol suite. Pre-requisite: Programming for Engineers
Course LOs	After successfully completing this course, the students will be able to: - Introduce the basic principles that govern the operation of networked computer systems in general, and the Internet in particular. - Identify the cross-layer relationship in the OSI layering. - Design and organize principles of successful computer networks. - Demonstrate how a network is designed based on specific requirements. - Introduce students to networking research and state-of-art tools to create new methods to improve the performance of conventional solutions

Course Code and Title	Data Structures and Algorithms for Electrical and Computer Engineers
Course Descriptor	The course focuses on basic and essential topics in data structures, including array-based lists, linked lists, skip-lists, hash tables, recursion, binary trees, scapegoat trees, red–black trees, heaps, sorting algorithms, graphs, and binary tree. These data structures will be used as tools to algorithmically design efficient computer programs that will cope with the complexity of actual applications.
Course LOs	After successfully completing this course, the students will be able to: explain the need for efficiency in data structures and algorithms. apply methods to analyze running time of essential data structures compare efficiency of the algorithms and implementations through implementation. demonstrate skills in tracing, analyzing, and designing recursive algorithms and recursive methods. interpret the concept of abstract data type to represent and implement heterogeneous data structures. apply computational thinking to a diverse set of problems and disciplines. write computer programs involving these data structure in a high level language

Course Code and Title	Linear Control Theory
Course Descriptor	This course is an introductory course in control theory which introduces analysis of feedback closed loop systems and controller design. The course includes description of linear, time-invariant, continuous time systems, differential equations, transfer function representation, block diagrams and signal flows. Moreover, it discusses system dynamic properties in time and frequency domains, and performance specifications. Then the course covers basic properties of feedback including stability analysis: Routh-Hurwitz criterion, Root Locus method, Bode gain and phase margins, and Nyquist criterion. Then classical controller design in time and frequency domain: lead, lag, lead-lag compensation, rate feedback, and PID controller are introduced. Laboratory work consists of MATLAB and Simulink assignments, reinforcing analytical concepts and design procedures.
Course LOs	After successfully completing this course, the students will be able to: 1. Demonstrate an understanding of the fundamentals of (feedback) control systems 2. Determine the time and frequency-domain responses of first and second-order systems to step and sinusoidal (and to some extent, ramp) inputs. 3. Determine the stability of open loop and closed-loop control system 4. Apply root-locus and Bode plot techniques to analyze and design control systems. 5. Design PID controller systems 6. Implement and test system models and control designs in MATLAB

Course Code and Title	Signals and Systems
Course Descriptor	Introduction to signals: classifications, transformations, and basic building-block signals. Introduction to systems: properties (linearity, time-invariance, causality etc.) and system interconnections. Time-domain analysis: convolution sum and convolution integral, linear constant-coefficient difference and differential equations. Frequency domain analysis: Fourier series (derivation, properties, and convergence), Continuous-time Fourier transform (derivation, properties, convergence), Discrete-time Fourier transform (derivation, properties, convergence). Laplace transform (properties, convergence), inverse Laplace transform. Introduction to Z transform (time-permitting).

Course LOs	After successfully completing this course, the students will be able to: identify basic properties of signals and systems relate input-output of LTI systems using convolution and differential/difference equations compute the spectrum of periodic signals using Fourier series apply Fourier and Laplace transforms to signals and systems use simulations tools such as MATLAB or LabView for manipulations of signals and systems

Course Code and Title	Digital Signal Processing
Course Descriptor	This course provides the foundations on digital signal processing covering a range of topics including DFT, Z transforms, LTI systems, IIR and FIR filters. Fourier and Z transform would be utilized to system stability and its transfer function. Time and frequency domain techniques for designing, building and testing IIR and FIR filters would be explored in detail. Pre-requisites: Signals and Systems
Course LOs	After successfully completing this course, the students will be able to: explain the basics of discrete-time signals and systems, and sampling and sampling-rate alteration perform transform-domain analysis using Discrete Fourier Transform and Z-Transform apply fast Fourier Transform design digital (FIR and IIR) filters, and develop various structures for their realization apply and integrate knowledge in practice during the lab experiments (MATLAB/Simulink/DSP Kits)

Course Code and Title	Communication Systems
Course Descriptor	This course covers a wide range of topics in analog and digital communication systems including; Amplitude modulation types and demodulation, angle modulation and demodulation, sampling and quantization, additive white gaussian noise, and baseband and passband digital modulation techniques. Laboratory assignments train students in design aspects and performance analysis of different systems, techniques and methods in modern communication systems.
Course LOs	After successfully completing this course, the students will be able to: describe the fundamental components of a communication system analyze amplitude and angle modulation schemes identify different trade-offs of communication systems such as compromise between power and bandwidth analyze baseband and passband digital modulation schemes implement analog to digital conversion through sampling and quantization use modern hardware and simulation tools for evaluating the performance of communication systems

Project Courses

Course Code and Title	Interdisciplinary Design Project
Course Descriptor	In this course, students are exposed to a realistic interdisciplinary engineering problem provided by industry or faculty. Interdisciplinary Design Project is a year-long project spanning two semesters, where, working in interdisciplinary groups of size 5 or more, students will select and apply appropriate project management and systems engineering tools and principles under realistic conditions. The students are expected to integrate and apply technical knowledge and understanding from different disciplines to achieve the best solutions by considering a diverse set of issues and constraints. This is a self-directed program that require initiative, creative thinking, independence, and critical thinking. The students will be also expected to explore outside their domain of expertise, knowledge and educational background.

Course LOs	After successfully completing this course, the students will be able to: develop possible solutions for a complex design problem identify the requirements, which have to be fulfilled by possible solutions apply project management and industrial systems engineering practices to the design process apply health and safety and legal/certification regulations within practical engineering design work as part of an interdisciplinary group subject to various constraints present and defend team results

Course Code and Title	Capstone Project
Course Descriptor	The capstone project is the culminating experience of the student's engineering program and provides students with the opportunity to apply and integrate their knowledge and skills gained from earlier years. This is achieved in a context of a year-long and substantial engineering project related to the student's discipline area. Students will take the responsibility to organize, plan and carry-out the various tasks required for successful completion of the project. Wherever possible, projects will be sourced from industry partners. Projects may be undertaken by individual students or in small teams. At the completion of the unit, students will hand over their project deliverables and present project outcomes in a report as well as end-of-semester oral presentation and defense.
Course LOs	After successfully completing this course, the students will be able to: perform literature survey to propose an open-ended design or research problem evaluate feasibility of a diverse set of solutions using research methods design, interpret, and invent to meet design specifications of a real-life engineering problem effectively develop and construct project implementation plans; produce and develop a well written capstone project report and project presentation; prove ability to communicate effectively with all stakeholders in an ethical and professional manner and confidently defend ideas and proposals to the project client and university audiences.

Common Courses

Course Code and Title	Introduction to Engineering
Course Descriptor	This course introduces students to the foundation and fundamental principles required to become analytical, detail-oriented, and productive engineers. The students will also gain an overview of what engineers do and of the various areas of specialization. Important topics for the engineering profession such as research in engineering, communications, and safety are also introduced. Additionally, students will work together in interdisciplinary groups to research, design, fabricate, test, and deploy a complete engineering project. Through lectures, laboratory practicum and project work, the students will become familiar with the following topics: - Overview of the Engineering Discipline - Engineering Communications - Research Skills - Occupational Health & Safety - Drafting and 3D Modelling - Fundamental Dimensions and Units - Manufacturing (3D Printing and/or others) - Material & Chemical Properties - Hydraulics and Fluids management - Programming - AC/DC circuits
Course LOs	After successfully completing this course, the students will be able to: explain many of the different specializations of the engineering profession. Be in a position to apply basic research skills in engineering. program electronic components (e.g., microcontrollers such as Arduino Uno, Raspberry Pi) for sensor components, controllers, and actuators for an engineering system design & visualize engineering components & systems using 3D CAD modelling software describe & apply manufacturing processes for engineering components (e.g. via 3D printing). explain & use hydraulics and fluid mechanics properties for fluid processes. Design Assemble and Test engineering systems explain various safety issues typical for an engineering environment & apply safety precautions as required. apply hands-on approaches to troubleshooting electrical/mechanical/civil/chemical engineering systems. Devise effective teamwork practices for problem solving

Course Code and Title	Programming for Engineers
Course Descriptor	This is an introductory course for programming essential for Engineering undergraduate study. The module would focus on the development of programming

	skills that can be directly applied to solve engineering problems where the computer is part of the system or is used to model a physical or logical system. This module introduces programming as a tool for solving engineering problems through C and Java programming languages. This is an introductory course providing foundational programming to Chemical, Mechanical, Civil and Electrical Engineers. Topics covered include: -Introduction to computers and programming -Variables in C, assignment statements, and arithmetic expressions -Input-output operations and functions -Operators: rules of operator precedence -Flow of Control, if-else, switch, while, for, do -Structured programming -Arrays & Pointers -Dynamic Memory Allocation -Elementary programming in Java -Methods in Java -Methods and Arrays in Java -Objects and Classes
Course LOs	After successfully completing this course, the students will be able to: 1. develop programming solutions to open ended engineering problems. 2. infer alternate solutions to programming problems. 3. develop software specifically using C and Java programming languages. 4. apply knowledge of programming to solve practically relevant engineering problems. 5. use the object-oriented concepts to write optimal and efficient codes.

Course Code and Title	Physics II for Scientists and Engineers Prerequisites: Physics I for Scientists and Engineers
Course Descriptor	This is an introductory calculus-based course covering Electricity, Magnetism and elements of Optics. The students will learn to identify fundamental laws in everyday electromagnetic phenomena and to apply these laws to solving basic physics problems and to describing laboratory experiments.
Course LOs	After successfully completing this course, the students will be able to: 1. think critically and scientifically by applying physics concepts, including from other classes. 2. gain knowledge and develop the skills to understand, set-up and solve qualitatively physics problems for the basic topics. 3. learn the appropriate mathematical techniques and concepts to obtain quantitative solutions to problems in topics listed above. 4. improve his/her communicating skills related to this course via the reading the textbook and additional materials, doing homework problems, writing laboratory reports and doing optional in-class presentation. 5. collect and analyze data and/or information from external sources. 6. prepare coherent reports based on the accepted standards presented in class. 7. meet the deadlines developing effective learning habits and discipline necessary to promote life-long learning.

Course Code and Title	Managerial Economics
Course Descriptor	The goal of this course is to learn how to apply microeconomic principles and quantitative tools to managerial decisions. It covers issues like demand analysis, production and cost analysis, and pricing strategy. By doing so, this course helps students develop strategies and tools for solving a wide variety of issues and problems that managers face. Students who successfully complete this course are expected to make an accurate evaluation of external business environment and create value within various organizational settings.
Course LOs	After successfully completing this course, the students will be able to: 1. make an accurate evaluation of external business environment 2. create value within various organizational settings.

Course Code and Title	Fundamentals of Entrepreneurship and Management
Course Descriptor	This course introduces students to the fundamentals of entrepreneurship. It covers topics including opportunity identification, idea generation, building business models and plans, to presenting ideas. We will discuss the role of entrepreneurial activity in Kazakhstan's economy. The course is a guide to high-growth entrepreneurship, combining theoretical frameworks with cases and practice-oriented exercises.
Course LOs	After successfully completing this course, the students will be able to: 1. comprehend basic concepts of the entrepreneurial process. 2. comprehend basic tools for the analysis of the entrepreneurial process. 3. apply those concepts as part of a working team in the development, reporting and presentation of a business plan.

Course Code and Title	Applied Probability and Statistics
Course Descriptor	This course provides an introduction to basic probability theory and statistics. Topics include sample spaces, events, classical and axiomatic definition of probability, conditional probability, independence, expectation and conditional expectation, variance, distributions of discrete and continuous random variables, joint distributions, central limit theorem, descriptive statistics, confidence interval estimation, and hypothesis testing.
Course LOs	After successfully completing this course, the students will be able to: 1. describe various interpretations of probability and the difference between discrete random variables

	2. list important continuous and discrete distributions. 3. compute descriptive statistics and summarize a dataset 4. compute confidence intervals and conduct hypothesis tests 5. use software for basic statistical analysis. Prerequisites: Calculus II

Course Code and Title	Calculus I
Course Descriptor	This course covers limits and continuity as well as differentiation and integration of polynomial, rational, trigonometric, logarithmic, exponential and algebraic function. The application areas include slope, velocity, extrema, area, and volume.
Course LOs	After successfully completing this course, the students will be able to: 1. use both the limit definition and rules of differentiation to differentiate functions. 2. sketch the graph of a function using asymptotes, critical points, the derivative test for increasing/decreasing functions, and concavity. 3. apply differentiation to solve applied max/min problems. 4. apply differentiation to solve related rates problems. 5. evaluate integrals both by using Riemann sums and by using the fundamental Theorem of Calculus. 6. apply integration to compute arc lengths, and areas between two curves. 7. use L'Hospital's rule to evaluate certain indefinite forms.

Course Code and Title	Calculus II Prerequisites: Calculus I
Course Descriptor	This course covers transcendental functions, advanced integration techniques, improper integrals, area and arc length in polar coordinates, infinite series, power series and Taylor's theorem
Course LOs	After successfully completing this course, the students will be able to: 1. integrate functions whose antiderivative is given by elementary functions. 2. use integrals in a variety of area and volume computations. 3. solve first order differential equations by separation of variables or the method of integrating factors 4. analyze the convergence of series which are either absolutely convergent or alternating 5. write the most usual Maclaurin series expansions and their intervals of convergence, together with how to derive them. 6. work with curves in parametric form, especially polar coordinates. 7. identify types of conic from their equation in cartesian or polar coordinates.

Course Code and Title	Differential Equations & Linear Algebra Prerequisites: Calculus II
Course Descriptor	1. Differential equations of first- and second-order 2. Series solution of differential equations 3. Laplace transforms and its application to the solution of initial value problems 4. Some of the important special functions. 5. Linear algebra applications
Course LOs	After successfully completing this course, the students will be able to: 1. solve a large class of first- and second-order differential equations analytically using standard techniques. 2. model simple physical situations encountered in engineering using first- and second-order differential equations. 3. use Laplace transform techniques to solve first- and second-order initial value problems. 4. recognize and work with a number of the higher transcendental functions of mathematics. 5. solve more difficult second-order linear differential equations using series solutions. 6. find general solutions to linear algebraic equation systems. 7. use Mathematica for both calculus and linear algebraic applications.

Course Code and Title	Physics I for Scientists and Engineers
Course Descriptor	This is an introductory calculus-based course covering Mechanics, Mechanical Waves and Thermodynamics. The students will learn to identify fundamental laws of mechanics and thermodynamics in everyday phenomena and to apply these laws to solving basic physics problems and to describing laboratory experiments.
Course LOs	After successfully completing this course, the students will be able to: 1. think critically and scientifically by applying physics concepts, including from other classes. 2. gain knowledge and develop the skills to understand, set-up and solve qualitatively physics problems for the basic topics. 3. learn the appropriate mathematical techniques and concepts to obtain quantitative solutions to problems in topics listed above. 4. improve his/her communicating skills related to this course via the reading the textbook and additional materials, doing homework problems, writing laboratory reports and doing optional in-class presentation. 5. collect and analyze data and/or information from external sources. 6. prepare coherent reports based on the accepted standards presented in class. 7. meet the deadlines developing effective learning habits and discipline necessary to promote life-long learning.

Course Code and Title	Rhetoric & Composition
Course Descriptor	This course familiarizes students with the skills and process involved in writing an academic research paper. With a focus on the steps of the writing process, students will complete two major research papers, while practicing skills in summarizing, paraphrasing, and citation. In addition to the mechanics of writing, the course emphasizes the development of critical thinking skills through reading, response, and discussion. Another goal of the course is to increase students' oral communication skills through both class discussion and presentations. Finally, SHSS 150 focuses on helping students develop an original and distinctive writing voice, one that allows synthesis of personal experience, opinion, and reading.
Course LOs	After successfully completing this course, the students will be able to: 1. accurately paraphrase short passages while writing a concise summary of an article or book chapter. 2. critically and thoughtfully engage with academic texts through class discussions, writing summaries and responses, and through oral presentations. 3. write a logical, well-organized, and coherent research essay of 5-7 pages with correct citations (minimum of five sources) and sophisticated vocabulary.

Course Code and Title	Kazakh I
Course Descriptor	Students are offered a selection of courses in Kazakh language based on their language-knowledge level. The following description covers: Upper Intermediate Kazakh. In this course, students will develop or continue to develop advanced linguistic competencies in four areas: listening, reading, writing and speaking. They will work with materials for level B2 and learn to give opinions on different topics, analyze the text, compare statistical data and write an essay. Hence, they will learn vocabulary and grammar appropriately each theme. Furthermore, they will additionally learn new terms demonstrating Kazakh culture in this course.
Course LOs	After successfully completing this course, the students will be able to: 1. discuss issues on topics included in the syllabus, give detailed answers and provide an opinion on the topics; 2. formulate main idea and report on the texts for upper- intermediate level; 3. synthesize info and arguments from a number of sources; 4. critically analyze and evaluate papers for general public with consideration of principles of unity, coherence, tone, persona, purpose, methods; 5. follow the discussion on matters related to their field and understand in detail the points given prominence by the speaker; 6. make a descriptive and comparative report/diagram/chart;

	7. argue with good grammatical control without much sign of having to restrict what they want to say; 8. make well-structured project presentation with introduction, main body, conclusion and reference; 9. make own judgement in planning, problem solving and make a decision in different social and cultural situations

Course Code and Title	History of Kazakhstan
Course Descriptor	This course is a history of the territories which today make up Kazakhstan, from the Mongol conquests to the collapse of the USSR. The course combines a thematic approach with a chronological structure. We will examine two interrelated aspects of the history of the lands that today make up Kazakhstan. Firstly, we will analyses how authority was asserted, recognized, and challenged over the past few centuries. How did modern states emerge? What were the limits of state control over society and culture? What role did religious and national identities play in bringing political communities together and in tearing them apart? Who paid the costs of political and economic modernization? Secondly, we will study the usage of land and other natural resources. How did people assert the right to use land? What tensions did land usage and the exploitation of natural resources cause? What were the economic and environmental effects of land usage?
Course LOs	Knowledge Knowledge of the basic moments in Kazakhstani history from the post-Mongol period onwards, with a particular focus on the themes of authority and land usage Basic understanding of key historiographical debates relating to the study of Kazakhstan Understanding and ability to deploy key concepts relating to the study of Kazakhstani history, including ‘nation’ and ‘class’ Academic skills Ability to analyze a range of primary sources chosen by the instructor, paying particular attention to their context, genre, and authorship Ability to identify the question, thesis, and methods of a scholarly work in the field of history with the instructor’s guidance Appreciation of the diversity of scholarly approaches to the study of the past Ability to extract and systematize information from selected primary and secondary sources Ability to formulate a thesis and to structure an analytical in-class essay in response

	to an essay question provided by the instructor Ability to lead a group discussion on a historical topic Ability to take selective notes on expert presentations, seminars, and readings Other skills Ability to collaborate with peers in source leadership and in other classwork Ability to moderate discussion in a medium-sized group Ability to intervene in class in front of a medium audience of peers Self-discipline and self-motivation

Course Code and Title	Technical Writing
Course Descriptor	This course presents students with practical information about communicating in different kinds of workplace environments and professional and technical discourse communities. This course highlights the key characteristics of technical writing and emphasizes the importance of planning, drafting, and revising texts. Students will analyze and produce common technical writing genres, and react to rhetorical situations each genre presents, including issues of audience, organization, visual design, style, and the production of texts.
Course LOs	After successfully completing this course, the students will be able to: 1. identify and understand the structures and functions of the primary genres of technical writing 2. analyze and adapt to the constraints of specific rhetorical situations, including audiences, purposes, modality, and use 3. integrate tables, figures, and other images into documents 4. produce and present technical documents, including research reports, that are accessible to non-specialist audiences and demonstrate the ethical use of sources and appropriate citation conventions

Course Code and Title	Kazakh II (Language and ethnicity)
Course Descriptor	Developed for the "C1" level, this course is intended for studying an ethnos through language units preserved in its vocabulary. During this course, the students will study and analyze ethnocultural lexis (words, word combinations, fixed phrases, proverbs, historical texts). By means of these analysis, they will learn about perceptions, psychology, character, and preferences of the Kazakh people. The students are going to identify and analyze extralinguistic factors that have influenced the formation of national cultural lexis. As a result, they will have learned that the national lexis can

	provide information about the nation and also the ways to analyze it. Besides, the knowledge of identifying national cultural peculiarities that the students are going to gain in this course can be used in their study of other languages. As course materials, the students are going to read oral literature and ethnographic texts and work with ethnolinguistic, etymology and dialect dictionaries.
Course LOs	After successfully completing this course, the students will be able to: 1. develop and use the norms of intellectual language competences through understanding the connection between the language and national mentality and culture. 2. use the national perceptions and knowledge for personal development, preparation of qualitative proposals and effective decision-making. 3. use interlanguage communication principles as a tool of development business responsibility. 4. learn using the national values as a source of information and creative source of development the business responsibility. 5. develop skills in analyzing deeper national cultural layers of the Kazakh language, using it in different social and cultural situations. Prerequisites: Kazakh I

Elective Courses

Course Code and Title	Power Electronics
Course Descriptor	The course examines the application of electronics to energy conversion and control. Topics covered include: types and performance of power semiconductor devices; modelling and analysis of AC-DC (rectifier), DC-DC, and DC-AC (inverter) power converters; selection of power electronics circuit components based on electromagnetic stress; analysis of converter voltage / current steady-state operation waveforms and their frequency spectra using theory and simulations. Prospective applications such as motion control systems, power supplies, and grid-connected for renewable energy shall be discussed.
Course LOs	After successfully completing this course, the students will be able to: perform power calculations for nonsinusoidal / nonlinear circuits; make conductivity and switching power loss analysis for semiconductor devices; analyze steady-state electromagnetic performance of AC-DC rectifiers, DC-DC converters, and AC-DC inverters; use modern converter simulation tools such as PSIM for power converters analysis illustrate power electronics simulation data with effective report writing skills

Course Code and Title	Electromagnetics
Course Descriptor	Electromagnetics is the science underlying wave transmission, propagation, interaction, and detection. The aim of the module is to provide the insights and the engineering perspective to electromagnetics and wave propagation. Maxwell's equations, and the lumped element model of transmission lines, are the starting point for the analysis that encompasses transmission lines, static and dynamic problems, plane wave propagation, transmission, and reflection. Through the cycle of lecture, the students will become familiar with the electromagnetic concepts and their application, and will gain insight on solving problems that involve waves. The course revolves around 6 pillars: the mathematical description of electromagnetics: phasors and vectors algebra; transmission lines and their analysis, including Smith chart methodology; statics, solution of Maxwell equations in time-invariant fields; time-varying fields and their solutions; plane wave propagation, reflection, transmission, and polarization; waveguides and devices. Through the course, emphasis will be given on practical aspects and applications of the electromagnetic principles to telecommunications, sensors, data transmission, biomedical applications.
Course LOs	After successfully completing this course, the students will be able to: solve problems using the vector field notation in the phasor domain, in Cartesian, spherical, and cylindrical coordinates solve Maxwell's equations in electrostatic and magnetostatic conditions solve Maxwell's equations for time-varying fields using the phasor properties describe polarization and its applications in propagating waves develop a methodology for the solution of electromagnetic problems using appropriate software

Course Code and Title	Antennas and Microwave Prerequisite: Electromagnetics
Course Descriptor	Antennas and Microwaves is an advanced module intended for those interested in working in the Telecommunication field. Topics covered include transmission lines including coaxial, twin-wire, circular, rectangular waveguides, TE, TM, TEM propagation modes, optical fibres, free-space electromagnetic wave propagation, atmospheric attenuation, diffraction, Fresnel zones, electrically small antennas including monopole, dipole, slot, PIFA, loop, microstrip patch, aperture and reflector antennas, broadband antenna including travelling wave, spiral, antenna feed structures including baluns and power dividers and antenna properties including gain, polarization, radiation patterns. You will be able to explain the principles of antennas and propagation required for wireless communications applications and to develop a thorough understanding of models for various radio frequency (RF) transmission line systems and to explain basic antenna properties such as gain, directivity, efficiency, polarization, antenna patterns, to explain electromagnetic wave propagation issues in urban environments, and to solve basic antenna and propagation design problems such as link budget, line loss, and attenuation.
Course LOs	After successfully completing this course, the students will be able to: describe the Faraday's law of electromagnetics, Maxwell's equations, potential functions, wave equations and their solutions describe the time harmonic fields, plane waves in lossless and lossy media, group velocity, flow of electromagnetic power and Poynting vector, and general transmission line equations design waveguide and cavity resonators, analysis of radiation pattern and Smith chart design different types of antennas such as wire antennas, two element antenna array, linear array antennas, etc. use modern antennas and microwave software tools illustrate antennas and microwave engineering data with effective report writing skills

Course Code and Title	Numerical Optimization Techniques for Engineers Prerequisite: None
Course Descriptor	This course studies fundamental concepts of optimization from two viewpoints: theory and algorithms. It will cover ways to formulate optimization problems (e.g. in the primal and dual domains), study feasibility, assess optimality conditions for unconstrained and constrained optimization, and describe convergence. Moreover, it will cover numerical methods for analyzing and solving linear programs (e.g. simplex), general smooth unconstrained problems (e.g. first-order and second-order methods), quadratic programs (e.g. linear least squares), general smooth constrained problems (e.g. interior-point methods), as well as, a family of non-smooth problems (e.g. ADMM).
Course LOs	After successfully completing this course, the students will be able to: formulate finite-dimensional optimization problems for their research purpose. identify the feasibility and optimality of a particular solution to a general constrained optimization problem. compare various computational algorithms for unconstrained optimization, including steepest descent, Newton's method, conjugate- direction methods, and direct search methods use software for numerical computation of minima and maxima. compare various computational algorithms for constrained optimization including penalty function methods, primal and dual methods, penalty and barrier methods, and convex programming implement the numerical methods discussed in class and verify their theoretical properties in practice.

Course Code and Title	RF Circuit Design
Course Descriptor	RF and microwave circuit design is used in many electronic systems and components such as radar, wireless communications, GPS, and aerospace systems. The aim of this module is to introduce modern concepts such as computer aided design techniques used in design and implementation of RF circuits and systems and circuit layout considerations including distributed effects, coupling, parasitic effects, and other design issues. The students will become familiar with concepts such as nonlinearity including intermodulation, harmonic distortion, and AM/PM conversion.

	representation of noise in circuits including noise figure, and dynamic range, transmission lines, Smith charts, and network parameters, RF and microwave active and passive components, microwave amplifier types including low-noise, power, broadband, two-stage, feedback, filters, microwave couplers and power dividers and Wilkinson combiners.
Course LOs	After successfully completing this course, the students will be able to: test RF theory by explaining an engineering application. relate RF circuit design application by explaining case studies. use technical skills by explaining case studies. interpret data analysis by completing hands-on activities. review application of engineering principles by completing hands-on activities. practice systems thinking by completing hands-on activities. practice temporal reasoning by completing hands-on activities. practice quantitative skills by explaining case studies.

Course Code and Title	RF Integrated Circuits
Course Descriptor	Radio frequency integrated circuit (RFIC) design has become an essential part Wi-Fi, mobile phone, wireless infrastructure, Bluetooth device, and the emerging Internet of Things (IoT) technologies. This course covers the fundamentals of RFIC design techniques. In this course you will learn RFIC design techniques, tools such as design rule check (DRC) and layout vs. Schematic (LVS), knowledge of the device technologies, circuit topologies and concepts and design and layout. In addition, you will also cover the following topics: RFIC technologies including Bipolar, CMOS, and GaAs, Noise, Noise Figure, and Linearity, amplifier class of operation, Low Noise Amplifier and Power amplifier design, Differential Circuits, Mixer Design, Passive On-Chip Components, Circuit Layout, Thermal Management, Packaging, Current Mirrors and Biasing.
Course LOs	After successfully completing this course, the students will be able to: 1. use modern microwave design software tools to analyze microwave circuits 2. design radio frequency integrated circuits (RFIC) including amplifiers and matching

	networks 3. generate radio frequency integrated circuit layouts 4. explain the performance of planar RF components including spiral inductors, MIM capacitors, FETs, and BJTs 5. select appropriate rfic technology for particular application 6. illustrate rfic engineering data and circuit layouts with effective report writing skills

Course Code and Title	Power Amplifier and Wireless Transmitter Circuits
Course Descriptor	This course covers the fundamental theory of radio frequency (RF) power amplifiers and their applications in wireless communications circuits and transmitter systems. In this course you will learn about the role that power amplifiers play in microwave systems including transmitters in terms of power, efficiency, and linearity. Transmitter design including upconverters and mixers are covered. You will also learn power amplifier topics including load-line impedance, power combining, non-linear device models, bias circuits, classes of operation, and impedance matching. RF power passive and active devices are also discussed including load-pull measurements for high power and efficiency. High efficiency power amplifiers including class E and F mode amplifiers, linearization and efficiency enhancement techniques including pre-distortion are covered. Power amplifier architectures including multiband, broadband, and high efficiency Doherty, and envelope tracking amplifiers are also covered.
Course LOs	After successfully completing this course, the students will be able to: 1. use modern microwave design software tools to analyze microwave circuits 2. design wireless circuits including amplifiers and matching networks 3. analyze the effects of amplifiers, mixers, oscillators, and filters in transmitter operation select appropriate amplifier load topologies for gain, efficiency, power, and linearity 5. select appropriate device technology for amplifier output power, 1 dB compression, and third order intercept 6. illustrate transmitter engineering data with effective report writing skills

Course Code and Title	Fundamentals of Photonics
Course Descriptor	The course provides the fundamentals of optics and photonics, for the use in engineering and systems. The course describes the fundamentals of optics and photonics components and applications and describes both the main devices and the main formulation of light propagation and reflection. The course will be divided into 4 parts: (1) Introduction on electromagnetic and wave optics, plane waves, polarization, scattering matrix formality. (2) Optoelectronics and devices: LED and SLED, laser, photodetector, devices (coupler, splitter, resonator, circulator, polarization filter). (3) Ray optics: ray optic, Gaussian beams, lens and focusing, Fourier optics, fiber optics, guided propagation, modes, graded index optics. (4) Applications: gratings and grating solver, statistical optics and Monte Carlo, imaging and endoscopy, fiber optic communications.
Course LOs	After successfully completing this course, the students will be able to: design optical system and networks. apply optical theory to a set of photonics applications evaluate the performance of optical systems implement photonics concepts into computational methods

Course Code and Title	Optical Sensors and Biosensors
Course Descriptor	The course provides fundamentals and insights on optical sensors and biosensors. Optical sensors find recent applications in the increasingly attractive field of biophotonics, where it is necessary to perform biomedical, biophysical, and biological detection. The course is structured into 4 thematic areas, with the intent of giving a wide range of coverage to the field of sensors. (1) Optical sensors: principles of operation of spectroscopy, absorption, fiber optic, integrated optics, and devices for sensing. (2) Biophysical sensors: gratings, Fabry-Perot, Fourier Transform Reflectometry, distributed sensors. (3) Biosensors: surface plasmon resonance, spectroscopy techniques, evanescent field sensors. (4) Integration and application of sensors into medical devices.
Course LOs	After successfully completing this course, the students will be able to: evaluate different optical sensing approaches and their implementation into devices

	examine the principles of biodetection and biological binding design biophysical sensing devices through methodological performance analysis design medical devices equipped with optical biosensors. explain the theory of plasmonic sensors and their modern implementation in thin-film coating

Course Code and Title	Mixed Signal Circuits
Course Descriptor	Design of data converters using sigma–delta techniques. Operation and design of custom digital filters for decimating and interpolating in analog–to–digital interfaces.
Course LOs	After successfully completing this course, the students will be able to: 1. evaluate different switched capacitor circuits and their applications 2. formulate frequency and transient response of A/D and D/A convertor circuits 3. design signal processing circuits for a given technical specification 4. model systems level simulations of mixed-signal circuits in SPICE 5. build filters to meet the technical specifications such as bandwidth, power and technology limits

Course Code and Title	Analog Integrated Circuits
Course Descriptor	An introductory course in analog circuit synthesis for microelectronic designers. Topics include: Review of analog design basics; linear and non-linear analog building blocks: harmonic oscillators, (static and dynamic) translinear circuits, wideband amplifiers, filters; physical layout for robust analog circuits; design of voltage sources ranging from simple voltage dividers to high-performance bandgaps, and current source implementations from a single resistor to high-quality references based on negative-feedback structures.

Course LOs	After successfully completing this course, the students will be able to: 1. evaluate different amplifiers and their applications 2. formulate frequency and transient response of differential amplifiers 3. design current mirror circuits for a given technical specification 4. model systems level simulations of analog circuits in SPICE 5. build physical design and schematics for analog circuits to meet the technical specifications such as bandwidth, power and technology limits

Course Code and Title	Digital Integrated Circuits
Course Descriptor	This course covers the analysis and design of digital integrated circuits using CMOS technology. The course emphasizes design, and requires extensive use of MAGIC for circuit layout, and HSPICE and IRSIM for simulations. The main list of topics: CMOS Inverter, Combinational Logic, Arithmetic Structures / Bit Slice Design, Sequential Circuits, Interconnect Clock Distribution, Memory Advanced Voltage Scaling Techniques, and Power Reduction Through Switching Activity Reduction.
Course LOs	After successfully completing this course, the students will be able to: 1. evaluate different digital logic gates and their applications 2. formulate transient response and transfer characteristics of CMOS logic gates 3. design complex digital circuits such as using large variable problem for a given technical specification 4. model systems level simulations of digital circuits in SPICE and Virtuso 5. build physical design and schematics for high speed digital circuits to meet the technical specifications such as bandwidth, power and technology limits

Course Code and Title	VLSI design
Course Descriptor	This is an introductory course which covers basic theories and techniques of digital VLSI design in CMOS technology. In this course, we will study the fundamental concepts and structures of designing digital VLSI systems include CMOS devices and circuits, standard CMOS fabrication processes, CMOS design rules, static and dynamic logic structures, interconnect analysis, CMOS chip layout, simulation and testing, low power techniques, design tools and methodologies, VLSI architecture.
Course LOs	After successfully completing this course, the students will be able to: apply mathematical methods and circuit analysis models in analysis of CMOS digital electronics circuits apply CMOS technology-specific layout rules in the placement and routing of transistors and interconnect compare between different state-of-the-art CMOS technologies and processes design models of moderately sized CMOS circuits that realize specified digital functions

Course Code and Title	System identification and control
Course Descriptor	This course is offered to graduates and includes topics such as mathematical models of systems from observations of their behavior; time series, state-space, and input-output models; model structures, parametrization, and identifiability; non-parametric methods; prediction error methods for parameter estimation, convergence, consistency, and asymptotic distribution; relations to maximum likelihood estimation; recursive estimation; relation to Kalman filters; structure determination; order estimation; Akaike criterion; bounded but unknown noise model; and robustness and practical issues.
Course LOs	After successfully completing this course, the students will be able to: relate system identification applications by explaining case studies. use technical skills by explaining case studies. interpret data analysis by completing hands-on activities. review application of engineering principles by completing hands-on activities.

	practice systems thinking by completing hands-on activities. practice temporal reasoning by completing hands-on activities. practice quantitative skills by explaining case studies

Course Code and Title	High Frequency Electronic Devices
Course Descriptor	The course deals with crystals, bipolar transistors (BJT, HBT) and eld effect transistors (MOSFET, MESFET, pHEMT), PIN diodes, varactor, Schottky diode, tunnel diode, IMPATT and Gunn diode. Component structure, function and applications. Packaging and assembly.
Course LOs	After successfully completing this course, the students will be able to: test theory of HF electronic devices by explaining an engineering application. relate applications of HF electronic devices by explaining case studies. use technical skills by explaining case studies. interpret data analysis by completing hands-on activities. review application of engineering principles by completing hands-on activities. practice systems thinking by completing hands-on activities. practice temporal reasoning by completing hands-on activities. practice quantitative skills by explaining case studies.

Course Code and Title	Reconfigurable Computing and FPGAs
Course Descriptor	The course aims to introduce the concepts, development cycle and applications of reconfigurable computing, especially using Field Programmable Gate Arrays (FPGAs). The course will cover the fundamental architecture of commercial FPGAs (such as Xilinx Virtex series and Intel Stratix series), how different digital circuits can be mapped into this architecture and developing FPGA targeted digital circuits through hardware description languages (VHDL, Verilog). The course will cover the different development stages of FPGA based system design such as design specification through HDL, synthesis, mapping, placement and routing and the configuration file generation. There will be sufficient emphasis on digital circuit simulation for functional verification as well as timing verification using industry standard simulators (such as Xilinx iSIM

	and Mentor Graphic's modelSim). For design implementation, students will be introduced to industry standard design tools such as Xilinx Vivado and Intel Quartus Prime software design suites. Students are also expected to complete a project work which encompasses the concepts covered in the course in the implementation of a hardware accelerator and demonstrate it on an FPGA platform. The course will also discuss current challenges faced by the reconfigurable computing community and some of the research directions.
Course LOs	After successfully completing this course, the students will be able to: illustrate the internal architecture modern FPGA devices apply hardware description languages (HDL) in developing reconfigurable systems analyze different design techniques to improve the system performance in terms of frequency and area evaluate an FPGA based system implementation in terms of resource consumption, clock frequency and power consumption design moderately complex FPGA based digital systems

Course Code and Title	Parallel Computer Architecture
Course Descriptor	This course builds upon the computer architecture course and discusses advanced topics in a computer system design. Topics covered include modules and hierarchy, processes, ports and signals, data types and simulation. CPU performance, its factors and evaluating performance. Instruction set principles and Examples, classifying instruction set architectures, memory addressing, type and size of operands, operations in the instruction set, instructions for control flow, encoding an instruction set, role of compilers, MIPS Instruction Set Architecture. Advanced processor concepts such as datapath and Control, building a datapath, single cycle implementation, multi-cycle implementation, exceptions, micro-programming, hard-wired control, enhancing performance with pipelining, pipelined datapath, pipelined control, data hazards and forwarding, data hazards and stalls, control hazards, exception handling. Instruction level parallelism, caches and memory hierarchy design, multiprocessors and clusters, programming multiprocessors, multiprocessors connected by a single bus, multiprocessors connected by a network, clusters, network topologies, chip multiprocessors and multithreading. Vector processors, basic vector architecture, vector length and stride, enhancing vector performance, effectiveness of compiler vectorization. Advanced topics in disk storage, real faults and failures, I/O performance, reliability, measures and benchmarks.

Course LOs	After successfully completing this course, the students will be able to: 1. analyze, compare and contrast the concepts, design principles implementation, and performance issues of contemporary parallel and distributed architectures 2. illustrate how we measure the performance of different architectures. 3. identify various interconnection networks of parallel systems 4. define various enhancement of the parallel systems using pipelining technique 5. discuss the impact of different cache memory implementations. 6. illustrate how we measure and enhance the performance of cache memory 7. appraise the performance of various interconnection networks and topologies.

Course Code and Title	Digital Image Processing
Course Descriptor	Digital Image Processing (DIP) is referred to use of digital computers to process digital images. This includes any processes where the input and output are both images, or the input is image and the output are attributes, which are extracted image information suitable for processing. The interest in DIP stems from two basic areas: (1) improvement of pictorial information for human interpretation; and (2) processing of image data for storage, transmission, and machine perception. The aim of this course is to introduce fundamental methods in digital image processing.
Course LOs	After successfully completing this course, the students will be able to: describe the fundamentals of digital image processing implement various image enhancement, restoration, and segmentation techniques develop image processing techniques in spatial and frequency domains use modern image processing tools such as Matlab and/or OpenCV illustrate image processing data with effective report writing skills

Course Code and Title	Introduction to Stochastic Modeling
Course Descriptor	Stochastic processes and modeling is the foundation of many signal processing algorithms used in radar, sonar, speech and image analysis, and communications. The aim of this module is to introduce fundamental concepts in stochastic processes and modeling. In order to simplify these concepts, we take an approach using which we attempt to develop in students an intuitive feel for these concepts that enables them to "think probabilistically". Based on this background, we will then cover more advanced concepts such as different families of random processes and their applications in modeling, linear filtering, and prediction. MATLAB will be used during the labs to provide students with motivating exercises and provide a "hands-on" approach to the subject, which essentially promotes a better understating.
Course LOs	After successfully completing this course, the students will be able to: describe important PMFs and PDFs used in modeling stochastic systems formulate problems which involve basic stochastic processes argue the advantage/disadvantage of using different signal models design basic Markov chain models and Winer filters implement various stochastic models in Matlab

Course Code and Title	Data Analytics
Course Descriptor	Big data has found imminent applications in various fields such as medicine, signal processing, education, etc. Extraction of implicit and potentially useful information from data is the ultimate goal in big data mining. Big data can be "big" either in terms of sample size, number of variables (dimension), or both. Machine learning techniques that can be used for "large-sample" data is substantially different from "large-dimension" data. The aim of this course is to first give an introduction to machine learning as the technical basis of data mining and then introduce various machine techniques that can be used for big data mining. We will cover suitable methods for analyzing large-dimension and large-sample data.
Course LOs	After successfully completing this course, the students will be able to: formulate various problems in different disciplines from the stand point of machine learning characterize popular classical as well as modern data mining techniques

	construct predictive models in large-dimension and/or large-sample settings use modern software to apply the state-of-the-art data mining techniques

Course Code and Title	Advanced Digital Signal Processing
Course Descriptor	This is an advanced level course in digital signal processing covering a range of topics including stochastic signal processing, parametric statistical signal models, and adaptive filtering, application to spectral estimation, optimum FIR filter design and implementation, multirate Signal Processing, Time-Frequency representations, filter banks, adaptive filtering (if time permits). Pre-requisites: Digital Signal Processing
Course LOs	After successfully completing this course, the students will be able to: design optimum digital FIR filters by applying DSP knowledge in solving realistic problems perform efficient computation of DFT analyze multirate signal processing systems apply concepts of random signal processing to real world applications

Course Code and Title	Power Transmission and Distribution Systems
Course Descriptor	This course aims to provide knowledge on power transmission and distribution systems design and implementation, it is also discuss on IEC standards, regulations, demand calculation, equipment selection, loss and performance control in power systems, different levels of power transmission and distribution operation rules as well as HV substation design and performance, power factor improvement, principles, low-voltage fundamental regulations along with neutral wiring system design in distribution network and their calculations, low-voltage distribution network design and component capacity calculation, distributed generation and renewable energy (solar and wind generation), active and reactive power compensations, substation transformer selection, BAY design and bus-bar calculations, power quality introduction, distribution system de-rating, EHV and HVDC transmission lines, radial and ring dispatch in distribution network and end user voltage drop calculation and heat generation in components.

Course LOs	After successfully completing this course, the students will be able to: describe the basic concepts of power transmission system read data from tables for transmission line parameters calculation perform operations for transmission line and transmission system parameters calculation describe the major components of HVDC system and its operation explain the mechanical design of transmission line analyze various distribution system components, their performance, limitations use modern transmission line modelling tools such as Matlab

Course Code and Title	High Voltage Engineering
Course Descriptor	This course aims to provide fundamental knowledge and practice required for operating high voltage systems, training of students on electrical energy and power system field properties and materials, electrodynamic force calculations, thermal behavior and ratings calculations, electrical contact behavior, a detailed coverage of liquid, gas and solid insulators, bushings, cable insulators, over headline insulators design, selection, and assessment, specific items in High Voltage (HV) field including transformers, switchgear, CTs, PTs, insulation systems, cables, overhead lines, surge arresters, and earthing systems, switching and lightning standard signals, and calculation of their influence on high voltage apparatus.
Course LOs	After successfully completing this course, the students will be able to: evaluate the various types of insulating materials (gaseous, liquids, solids, vacuum, composites) and their applications in high-voltage equipment. calculate electric stress, magnetic field, mechanical and thermal aspects associated with high voltage high power equipment and their application in the design of high-voltage components classify and explain different techniques to generate and measure high-voltages (DC, AC, impulse). employ various types of electrical/physical/chemical diagnostic measurements for insulation assessment and characterization explain different High Voltage test techniques

	calculate transformer deterioration in distorted conditions explain and classify high voltage conductor and cables

Course Code and Title	Power System Protection
Course Descriptor	This course introduces students to the fundamentals of power systems protection and relaying. It discusses the types of faults and their calculation using symmetrical components methods; electromechanical relay principles; relaying transducers - voltage and current transformers; transmission line protection - overcurrent, directional, distance, out-of-step protection; primary and backup protection zones, discrimination of relay time and current settings. The detailed list of topics to be covered in this course are: Introduction to protective relaying, fundamental units – per unit and per cent values, phasors and polarity, non-symmetrical faults and method of symmetrical components, relaying transducers – voltage and current transformers, protection fundamentals, ground fault protection and reclosers, overcurrent protection, directional protection, distance protection, out-of-step protection.
Course LOs	After successfully completing this course, the students will be able to: will test principles of power engineering by explaining an engineering application. relate power engineering applications by explaining case studies. use technical skills by explaining case studies. review application of engineering principles by completing hands-on activities. deconstruct characterization and measurements by organizing data. practice temporal reasoning by completing hands-on activities. practice quantitative skills by explaining case studies

Course Code and Title	Advanced Power System Analysis
Course Descriptor	This course aims at making the students aware of the system level aspects of the power system and electrical energy, standard practices in stable, economic and reliable operation of the power system. To put it in simple words, it encompasses all the electrical power concepts taught in the curriculum so far will be discussed from

	the application prospective. In this unit, the following topics are included: Detailed modeling of polyphase synchronous machines (PSM), different modes of operation, active and reactive power management in PSM. Following the PSM modelling, the stability problem in power system will be introduced. Under this topic, different types of stability determination criteria, power-angle equation, equal-area criterion for stability, multi-machine stability, solution of swing equation will be discussed. The economic operation of the electrical energy with special emphasis on load frequency control, economic dispatch, automatic generation and unit commitment problems. The course introduces the (N-k) contingency analysis (CA) of power system and various method used in the analysis, power system network reduction techniques will also be taught. Following the CA, the principles of state estimation are introduced at the end.
Course LOs	After successfully completing this course, the students will be able to: test principles of power engineering by explaining an engineering application. relate power engineering applications by explaining case studies. use technical skills by explaining case studies. review application of engineering principles by completing hands-on activities. deconstruct characterization and measurements by organizing data. practice systems thinking by completing hands-on activities. practice temporal reasoning by completing hands-on activities. practice quantitative skills by explaining case studies

Course Code and Title	Electric Power Generation
Course Descriptor	This course primarily aims at introducing the fundamentals of power generation technologies, systems along with the economic aspects and feasibility study. After going through this course, the students will get a thorough knowledge on thermal, hydro, gas and nuclear power plant operation and management, different substation configurations, economics of power generation systems, and cogeneration trigeneration technologies. The detailed list of topics include: Energy Scenario in Kazakhstan, Principle of operation of thermal power plants; Line diagram of Thermal Power Station (TPS) showing paths of coal, steam, water, air, ash, and flue gasses; Description of TPS

	components - Economizer, Boilers, Super heaters, turbines, condensers, chimney and cooling towers; efficiency calculation of TPS; Cogeneration and trigeneration in TPS, Efficiency and economics of combined heat and power (CHP) generation systems; Hydropower Plants: Principle of operation of Hydropower plants, Elements of hydroelectric power station-types-concept of pumped storage plants-storage requirements, estimation of power developed from a given catchment area, and efficiency of the plant; Nuclear Power Plants: Nuclear fission and chain reaction, principle of operation of nuclear reactor, reactor components, shielding and safety precautions; Gas Power Stations: Principle of operation and Components, and efficiency; Economic aspects of power generation and different tariff systems; Renewable energy systems.
Course LOs	After successfully completing this course, the students will be able to: test principles of power engineering by explaining an engineering application. relate power engineering applications by explaining case studies. use technical skills by explaining case studies. review application of engineering principles by completing hands-on activities. construct Design skills by completing a project. practice systems thinking by completing hands-on activities. practice quantitative skills by explaining case studies

Course Code and Title	Industrial Electric Machinery
Course Descriptor	This course talks about the principle of operation of AC machines in detail along with their modelling and simulation. The course main emphasizes AC machines such as 3-phase transformers, synchronous and asynchronous machines. The course start with the principle of operation of three phase transformers followed by voltage regulation and efficiency in transformers, parallel operation of transformers, open-delta connection, 3-phase auto transformer. This is followed by principle of operation of synchronous generators, equivalent circuit of synchronous machine, power and torque derivations, synchronous machine model parameters, parallel operation of synchronous generators, transient modelling of synchronous machine. This is followed by synchronous motor principle of operation, equivalent circuit, starting methods, and torque equation. This is followed by asynchronous machines (single phase and polyphase) principle of operation, induction generator versus induction motor, torque-speed characteristics, starting methods, speed control, and model parameter estimation. The unit ends with detailed discussion on industrial applications of various machines.

Course LOs	After successfully completing this course, the students will be able to: test principles of power engineering by explaining an engineering application. relate power engineering applications by explaining case studies. use technical skills by explaining case studies. review application of engineering principles by completing hands-on activities. deconstruct characterization and measurements by organizing data. practice systems thinking by completing hands-on activities. practice temporal reasoning by completing hands-on activities. practice quantitative skills by explaining case studies

Course Code and Title	Introduction to Cybersecurity
Course Descriptor	Cybersecurity has become crucial for individuals, organizations and nations. This course will introduce students to the basics of cybersecurity and applied cryptography. Students will learn the fundamentals of computer and network systems security including the importance of cybersecurity, authentication, attacks and intrusions, encryption and decryption, networking and wireless security, vulnerability analysis and defense. Students will also learn the underlying scheme for designing and analyzing a secure system
Course LOs	After successfully completing this course, the students will be able to: 1. explain the core cybersecurity principles 2. identify the key components of cybersecurity network architecture 3. apply cybersecurity architecture principles 4. familiarize with security threats, vulnerabilities and attacks 5. analyze threats and risks within context of the cybersecurity architecture 6. describe basics of security of computer and networks systems 7. evaluate decision making outcomes of cybersecurity scenarios

Course Code and Title	Operating Systems
Course Descriptor	The course focuses to understand the underlying technologies that make contemporary operating systems work efficiently. The course will study and discuss file system, processes, threads, synchronization, I/O, file systems, memory management, transactions, security threats and attacks, and system coordination techniques. In addition, through this course we will discover how these technologies are integrated into the systems we use today and then apply these technologies to practical applications. The course will have projects and programming tasks that need to be presented in class. Prerequisites: Data Structures and Algorithms
Course LOs	After successfully completing this course, the students will be able to: 1. describe the role of Operating System (OS) as a resource manager that facilitates and supports multiprogramming 2. identify the role of OS as a high-level interface to the hardware 3. analyze the low-level realization of CPU dispatch 4. identify Performance tradeoff inherent in OS realization

Course Code and Title	Database Systems
Course Descriptor	Provides fundamental knowledge of, and practical experience with, database concepts. Includes study of information concepts and the realization of those concepts using the relational data model. Practical experience gained designing and constructing data models and using SQL to interface to both multi-user DBMS packages and to desktop DBMS packages. Prerequisites: Operating Systems
Course LOs	After successfully completing this course, the students should be able to: define the terminology, features, classifications, and characteristics embodied in database systems. demonstrate an understanding of the relational data model.

	apply the major components of the relational database model to database design. formulate, using SQL, solutions to a broad range of query and data update problems. able to model an application's data requirements using conceptual modeling tools like ER diagrams and design database schemas based on the conceptual model. demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database. use a desktop database package to create, populate, maintain, and query a database.

Course Code and Title	Wireless Sensor Networks
Course Descriptor	This course covers fundamentals of wireless sensor networks, architecture, protocols, and performance. After completing this course, you should understand the principles of WSN and be able to design and maintain WSNs. Topics include: Wireless technology for distributed sensor networks, clustering techniques in WSN, routing in WSN, WSNs security, industrial WSN protocols, WSNs design, implementation and management. Performance of WSNs including simulation analysis. Prerequisites: Wireless Networks
Course LOs	After successfully completing this course, the students should be able to: describe the architectures of WSNs, protocols, applications and performance 2. design WSNs, especially with limited resources 3. implement right topology for the right applications of WSNs 4. simulate WSNs in order to predict or tune their performance.

Course Code and Title	Fundamentals of Biomedical Engineering and Biophysics
Course Descriptor	This interdisciplinary course aims to develop an understanding the basic principles in Biomedical Engineering and Biophysics. During the semester will be covered topics for both fields such as history, major state-of-the-art research and development technologies, promising applications for human treatment diagnostics and others; Students will also learn fundamentals of research, and clinical/hospital techniques/methods/technologies applied in Biomedical Engineering and Experimental

	Biophysics, developing bio-materials for use in medicine and elements of the tissue engineering. It will be focusing on the relevant biological and engineering-related issues including complex cell culture and structure, extracellular matrix biochemistry and tissue organization, muscle and bone regeneration, scaffold fabrication and nanoscopic optical and topographical characterization. Course is open to upper level undergraduate students enrolled in Bachelor programs in Engineering, Physics and Biology.
Course LOs	After successfully completing this course, the students should be able to: characterize the fundamentals of Biomedical Engineering and Biophysics topics; outline the main terminology, features, classifications and characteristics of the tools and devices in the field, as well as their application and development; differentiate the modern design diagnostics challenges applied to human biomedical treatment; evaluate basics of elements of various systems in modern Biomaterials Technology, Tissue Engineering and Experimental Biophysics; hypothesize new results based on research paper assignments during the semester and evaluate its significance, importance and relevance to the research field.

Course Code and Title	Modern Characterizations for Semiconductor Industry
Course Descriptor	Course materials are designed for students, who have basic knowledge of semiconductor materials science. The course will introduce students the modern characterization techniques widely applied in the semiconductor industry including electrical, optical, chemical and physical methods. Fundamental principles, mechanisms, instrumentation and applications of instruments will be covered. Experimental sessions will be prepared for students, who can perform characterizations on materials and devices with modern instruments in an actual laboratory.
Course LOs	After successfully completing this course, the students should be able to: 1. grasp the theories and principles of characterization techniques for semiconductor materials and devices. 2. make critical selections to characterize semiconductor materials and devices. 3. implement measurements for semiconductor materials and devices 4. design appropriate experimental setup for characterization of semiconductor

	materials and devices 5. plan for future research studies using the acquired knowledge 6. interpret data by scientific software

Date 11.08.2018