



وزارت تحصیلات عالی
علمی معینیت
ریاست انکشاف برنامه های علمی

برنامه ملی بازنگری و انکشاف نصاب تحصیلی پوهنتون های کشور

د انرژي انجنيري خانگي تحصيلي نصاب

نصاب تحصيلی رشته انرژي انجنيري

Curriculum of Energy Engineering (B.Eng.)

لیسانس دوره / دوره لیسانس

د انجنيري پوهنځی / پوهنځي انجنيري / Engineering Faculty

کال ۱۳۹۸

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

پیام مقام وزارت تحصیلات عالی

نیروی بشری آموزش دیده و متخصص یکی از عناصر اصلی توسعه سیاسی، اجتماعی و اقتصادی کشورها شمرده می شود. بدون تردید انکشاف همه جانبه افغانستان عزیز بدون حضور منابع بشری متخصص و متعهد امکان پذیر نخواهد بود. وزارت تحصیلات عالی افغانستان و نهاد های مربوط آن مسئولیت آموزش و تربیه متخصصین را در رشته ها و عرصه های مختلف با فراهم آوری امکانات مساعد و مناسب تحصیلات عالی عهده دار می باشد. تحصیلات عالی ستندرد و معیاری وابسته است به نصاب تحصیلی عالی، بروز و جامع که مبتنی بر نیازمندی محصلان در جامعه، منطقه و جهان و با معیار های قبول شده ملی و بین المللی تنظیم گردیده باشد. وزارت تحصیلات عالی افغانستان به منظور تحقق این امر مهم با وجود چالش های فراوان، گام های مؤثر و مفیدی را در جهت معیاری ساختن نظام تحصیلی کشور برداشته است. ما کاملاً باورمند هستیم که مردم افغانستان شایسته تحصیلات عالی با کیفیت اند که از اعتبار جهانی برخوردار بوده و پاسخگوی نیاز های اساسی بازار کار افغانستان باشد. برای نیل به این اهداف والا داشتن نصاب درسی هماهنگ با معیارهای جهانی، افغانستان شمول و کاربردی امر حتمی و الزامی است.

در پلان استراتژیک ملی وزارت تحصیلات عالی، تدوین نصاب تحصیلی معیاری برای تمام رشته های تحصیلی به عنوان یکی از اهداف اصلی مطمح نظر بوده و به همین جهت به کمیسیون ملی نصاب تحصیلی وظیفه سپرده شد تا در این مورد رهنمودی را تدوین نموده و در روشنائی آن روند انکشاف و بازنگری نصاب تمامی رشته های تحصیلی کشور را آغاز نماید.

خوشبختانه پروسه انکشاف و بازنگری نصاب های تحصیلی حدود دو سال قبل در تمام رشته ها از مرحله نیاز سنجی از سطح دیپارتمت ها، پوهنحی ها و پوهنتون ها، مستفیدان از نهاد های دولتی و خصوصی آغاز و همچنان مدل های متعددی سایر کشورها نیز مورد مطالعه و بررسی قرار گرفت و نصاب های یک تعداد رشته ها تکمیل و به منصفه تطبیق قرار گرفت.

اینک مسرت داریم که در تداوم این پروسه، انکشاف و بازنگری نصاب های تحصیلی رشته های مختلف انجیری پوهنتون های کشور؛ مبتنی بر رهنمود جدید، با همت و همکاری همه جانبه مسئولین و اعضای کادر علمی پوهنحی های انجیری پوهنتون های دولتی و خصوصی کشور تحت نظر کمیسیون ملی نصاب تحصیلی تکمیل و آماده تطبیق گردیده است. ما شاهد تلاش های مستمر، صادقانه و تخصصی همکاران خویش در نهادهای تحصیلی کشور، در تمامی مراحل از جمله مرحله نیاز سنجی، بررسی های مسلکی کمیته های تخصصی و برگزاری کلستر های متعدد تدوین نصاب درسی، مرحله تدقیق و مرحله نهایی سازی در هر یک از رشته های فوق الذکر بودیم و اقدامات صورت گرفته را که با کیفیت و معیارهای عالی به انجام رسیده است، تحسین و تقدیر می کنیم.

اکنون با افتخار نصاب های بازنگری شده بیست رشته مختلف انجیری نهایی شده در وزارت تحصیلات عالی افغانستان را جهت تطبیق در تمام پوهنتون ها و مؤسسات تحصیلات عالی دولتی و خصوصی که این رشته ها را دارند تقدیم جامعه علمی خویش می نماییم. امید داریم با تطبیق

نصاب های جدید بسا از خلاها و کاستی های قبلی رفع گردیده، ارائه خدمات تحصیلات با کیفیت بهتر و بازدهی مؤثر تر صورت گیرد.

در پایان از تمامی تهیه کنندگان نصاب های تحصیلی رشته های انجینیری، به خصوص از همکاران گرامی در وزارت تحصیلات عالی، اعضای کمیسیون ملی نصاب، استادان پر تلاش شامل در این پروسه، رؤسای پوهنخی ها و آمرین دیپارتمنت های مربوطه، کمال قدردانی و سپاس گزاری را می نمایم و برای شان موفقیت های مزید در عرصه خدمت به جامعه اکادمیک کشور را تمنا دارم.

پوهنمل دیپلوم انجینیر عبدالتواب بالاکرزی
معین علمی و سرپرست وزارت تحصیلات عالی

برنامه ملی بازنگری و انکشاف نصاب های تحصیلی

وزارت تحصیلات عالی بازنگری و معیاری سازی نصاب های تحصیلی را یکی از اولویت های کاری خویش دانسته و در راستای آن برنامه بازنگری و انکشاف نصاب های تحصیلی را طرح و تنظیم نمود است. بر اساس طرح فوق کمیسیون ملی نصاب تحصیلی؛ با در نظر داشت تعدد رشته ها، برنامه بازنگری را در مجموع 34 کلستر اصلی و 164 کلستر فرعی راه اندازی نمود. مبتنی بر پلان عملیاتی بازنگری نصاب هر رشته با حضور روسای فاکولته ها و اعضای کادر علمی همان رشته، ذینفع ها، متخصصین و مسئولین امور ذیربط صورت میگیرد. در همین راستا ما شاهد تدویر کلستر رشته های مختلف جهت بازنگری، انکشاف و بروز سازی نصاب تحصیلی کشور یکی بعد دیگری تحت شعار ملت واحد-نصاب تحصیلی واحد هستیم. همچنان در نظر است تا نصاب های تحصیلی جدید به اساس لایحه سیستم کریدت وزارت تحصیلات عالی تدوین گردد زیرا در این سیستم، واحدهای درسی برای تکمیل هر یک از دوره های تحصیلی معین می باشد. مضامین به کتگوری های اساسی، حتمی-تخصصی، پوهنتون شمول و اختیاری و کار عملی و منوگراف دسته بندی گردیده، حد اقل و حد اکثر کریدت و یا واحد درسی در مطابقت به لایحه سیستم کریدت، برای هر سمستر مشخص شده است. برای تعیین و تسلسل مضامین در دوره تحصیلی، پیش نیاز بودن یک مضمون برای مضمون دیگر مورد توجه قرار گرفته است. در کل وزارت تحصیلات عالی برنامه بازنگری و انکشاف نصاب های تحصیلی را به منظور برآورده ساختن اهداف ذیل انجام می دهد:

- عیار سازی نصاب های تحصیلی در مطابقت با معیار های ملی و بین المللی
- به روز رسانی نصاب های تحصیلی با توجه به تحولات شگرف ساینس و تکنالوژی در مطابقت به نیاز بازار کار

در تمام کلستر های بازنگری و انکشاف نصاب های تحصیلی رشته های مختلف، تحقق اهداف ذیل مطمح نظر است:

- بازنگری مضامین به اساس تعداد کریدت و محتوای مضمون؛
- نیاز سنجی جهت حذف و اضافه نمودن مضامین به اساس اولویت بندی نیاز های همان رشته؛
- ارزیابی مضامین پیش نیاز (مضامین اساسی، حتمی-تخصصی و اختیاری)؛
- تطبیق اهداف آموزشی رشته با شیوه ها و مدل های جدید (OBE, SCL) آموزش مبتنی بر نتایج و شاگرد محوری؛
- همسان سازی نام مضامین، تعداد کریدت ها و کود گذاری مضامین؛
- مشخص نمودن نتایج متوقعه از کریکولم درسی و مطابقت آن با نتایج متوقعه رشته؛

-
- تغییرات، تعدیلات و تعویض نام مضامین به اساس پیشنهاد اعضای کلستر ها با استفاده از مآخذ معتبر کشور های منطقه و جهان؛
 - ازدیاد، حذف و ادغام مضامین مطابق نیاز محصلان کشور، معیاری و همسان سازی کریکولم درسی با کشورهای منطقه و جهان و نیاز بازار کار

پوهنمل خواجه زبیر صدیقی
رئیس انکشاف برنامه های علمی

Preface

Due to years of war and conflict in Afghanistan, as any other sector of the country, energy sector was also demolished and could not provide satisfactory services. This was in case that the country had a lot of resources that could be used for generating electricity, biogas and etc. based on these problems and opportunities, the Engineering Faculty of Kandahar University conducted an academic need assessment for establishing bachelor of energy engineering program in 2010. As a result, it was determined that there is lack of enough knowledge in this field. For eliminating this problem, the Energy Engineering Department was officially established in the framework of Engineering Faculty in 2013. In the framework of an active partnership supported by USWDP/USAID, Kandahar University (KDRU) and Texas A&M University (TAMU) have prepared a market oriented curriculum which contains 52 (147 credits) courses. The courses and number of credits have been decided upon the requirement recognized by Ministry of Higher Education, Afghanistan and Accreditation Board for Engineering and Technology (ABET).

In 2015, Texas A&M University undertook the project funded by University Support and Work Force Development Program (USWDP)/United States Agency for International Development (USAID) to strengthen the capacity of Energy Engineering Department in developing a market oriented curriculum, identifying effective teaching methods, procuring curriculum related lab equipment, resources center and related books. The curriculum was reevaluated in the energy engineering clusters held two times by the Directorate of Academic Programs Development (DAPD) in the Ministry of Higher Education (MoHE) in the end of 2019. After some changes, it was approved by all members of the energy engineering cluster.

Energy Engineering Department gratefully acknowledge USWDP/USAID for providing the financial support for this vital project. We are thankful from the steering committee members of this program at Kandahar University and the technical advisors of Texas A&M University for their hard work and valuable efforts. We would also like to extend appreciation to the Directorate of Academic Programs Development (DAPD) of the Ministry of Higher Education (MoHE) for giving us chance to reevaluate the curriculum and finalize it.

Table of Contents

Preface	VII
1. Introduction to Kandahar University	1
1.2. Vision.....	2
1.3. Mission.....	2
2. Introduction to Engineering Faculty	2
2.1. Vision.....	3
2.2. Mission.....	3
2.3. Objectives	3
3. Introduction to Energy Engineering Department.....	4
3.1. Vision.....	4
3.2. Mission.....	4
3.3. Objectives	5
3.4. Values	5
4. Energy Engineering Curriculum	5
4.1. Educational Need Assessment	5
4.2. Outcomes of Educational Need Assessment.....	6
4.3. Program Educational Outcomes.....	6
4.4. Curriculum Development.....	6
4.5. Semester-wise Curriculum Structure	9
4.6. Category-wise Course Syllabuses.....	9
4.6.1. Collegiate { 18 credits (12%) }.....	18
Li. Engl 0102 English I (English for Academic Purposes)	18
Li.Engl 0202 English II (Critical Thinking and Writing)	21
Li. Engl 0302 English III (English Communication Skills in Engineering)	26
En. Hist 0103 History of Afghanistan.....	30
Sh. Isi 0101 Theology I: Islamic Outlook (IO).....	37
Sh. Isi 0201 Theology II: Philosophy of Worship (PW).....	40
Sh. Isi 0301 Theology III: Islamic Moral System (IMS).....	43
Sh. Isi 0401 Theology IV: Islamic Social System (ISS).....	47
Sh. Isi 0501 Theology V: Islamic Political System (IPS).....	50
Sh. Isi 0601 Theology VI: Islamic Economic System (IES)	53
Sh. Isi 0701 Theology VII: Quran And Contemporary Technology (QCT).....	55
Sh. Isi 0801 Theology VIII: Islamic Civilization (IC).....	58
4.6.2. Basic Courses { 56credits (38%) }	61
En. Ene 0104 Calculus I (Differential & Integral Calculus).....	61
En. Ene 0204 Calculus II (Multivariable Calculus for Engineers)	65
Ed. Ene 0304 Calculus III (Differential Equations).....	70
En. Ene 0404 Calculus IV (Probability and Statistics)	74
En. Ene 0105 Physics I (Mechanics)	79
En. Ene 0205 Physics II (Oscillations and Lights)	83
En. Ene 0305 Physic-III (Electricity and Magnetism)	86
Ed. Chem 0208 Engineering Chemistry	90
En. Ene 0107 Drawing-I	95
En. Ene 0207 Drawing-II: Computer-Aided Design(CAD)	100
En. Ene 0106 Introduction to Engineering & Computer.....	105
En. Ce 0310 Engineering Mechanics I: Statics.....	109
En. Ce 0412 Engineering Mechanics II: Dynamics	112
En. Ene 0413 Engineering Circuit Analysis I.....	115
En. Ce 0311 Surveying	118
En. Ene 0519 Engineering Economics.....	125
En. Ene 0625 Seminar I (Research Methodology).....	128

4.6.3.	Professional Courses {73 credits (50%)}	133
	En. Ene 0309 Thermodynamics-I	133
	En.Ene 0409 Thermodynamics-II	137
	En. Wee 0414 Fluid Mechanics	141
	En. Ene 0515 Energy Conversion I	144
	En. Ene 0516 Combustion Technology and Materials	152
	En. Ene 0517 Heat Transfer	155
	En. Ene 0518 Power system I	161
	En. Ene 0626 Power system II	167
	En. Ene 0620 Biomass Energy Engineering	174
	En. Ene 0621 Heating Ventilating and Air-conditioning (HVAC)	179
	En. Ene 0622 Solar Energy Engineering	185
	En. Ene 0623 Hydropower Engineering	191
	En. Ene 0624 Thermal Power Plant	196
	En. Ene 0727 Electrical Systems of Buildings	202
	En. Ene 0728 Energy Efficiency	206
	En. Ene 0729 Wind Energy Engineering	212
	En. Ene 0730 Solar Photovoltaic	217
	En. Ene 0833 Energy Policies and Politics	222
	En. Ene 0835 Engineering Management	226
	En. Ene 0836 Energy and Environment	231
	En. Ene 732 Professional Elective I and En. Ene 0837 Professional Elective II	235
	En. Ene 0731 Seminar II (Research/Project Proposal)	235
	En. Ene 0834 Research/Project Design	236
4.7.	Course Policy	236
4.8.	Advising Protocol	236
	References	237
	Appendix	238

1. Introduction to Kandahar University

Kandahar University was established in 1990 with the faculties of Agriculture, Medicine, Engineering, Education, Sharia, Economics, Journalism and Public relations, Law and Political Science, Public Administration and Policy, Languages and Literature, Computer Science and Stomatology, being established one after another.

The university has been engaged in training and graduating young generation in different study fields such as medical science, engineering, agriculture, education, Islamic studies, and journalism despite the harsh and challenging security, political and economic conditions of the country.

Kandahar University is the central university in southwestern zone of the country functioning as the main unit for observing all governmental and private higher education institutions in the region. Kandahar University has established its first filial institute of higher education in Helmand in 2006, second in Urozgan in 2012 and third in Zabul province in 2017.

In 2004, Kandahar University lacked specific buildings and establishments for teaching, administrative and hostel and with the governor's office support the university had to use different governmental buildings of Kandahar as teaching classes. The university was shifted to the current campus, which is located in northern part (9th district) of Kandahar city in 2004. The university currently holds possession of a total 350 hectares land that includes Agricultural Farm, Medical Faculty Campus and Aino Mina Campus.

Kandahar University has Agricultural Research Farm, Teaching Hospital, Central Laboratory, Library, Meteorological Center, Career Center, Information Technology Center, Media Center, Peace and Anti-Violation Center (Pacha Khan Research Center), India – Afghan Foundation Academic Research Center and English Learning and Computer Learning Center of (ELCLC) its own Pacha Khan Academic and Research Center, which was established in 2008, is the one and only unique center in all over the country that functions in working for peace and against violation.

Moreover, the Career Center was established for the first time in all over the country in 2011 with the innovation of Kandahar University and financial support of USA. This unique center helps graduated and non-graduated students of university in finding job opportunities and in improving work capacity and professional skills. This center has many achievements regarding their work scope in a short period.

Kandahar University is one of the national universities of Afghanistan that has around 10,000 students from 34 provinces, and lecturers, administrative staff and service workers from 20 provinces.

Kandahar University is one of the largest universities of the country that has academic and technical relations with well-known universities of the world. These universities include Asian Institute of Technology, Mahidol University – Thailand, Malaya University — Malaysia, Purdue University, Ball State University, Texas University, John Hopkins University — USA, Handong University—South Korea, Bochum University, Berlin University — Germany, Jawaharlal Nehru University — India, Sistan and Baluchistan University, Zabul University — Iran. Kandahar University is the first university to have the membership of Global Water Partnership.

Kandahar University has 12 faculties. The Education Faculty, Agriculture Faculty, Economics Faculty and Faculty of Sharia (Theology) are the faculties that also provide night shift services to the students. The Education Faculty also gives teaching services to (in-service) students. Besides, in the faculty of medicine we have master degree program in public health that was established in 2016. The university has a total of 43 graduating departments and 8 supporting (non-graduating) departments.

1.2.Vision

Kandahar University aspires to be a leading university in standard teaching, reliable researches, and fulfilling services in various academic fields of study throughout the country and will be regionally well- acknowledged.

1.3.Mission

Kandahar University educates the young generation by providing them with teaching, research, and high standard services at the utmost national levels of excellence.

2. Introduction to Engineering Faculty

Kandahar Engineering Faculty (KDREF) was established in September, 2000. It is the third faculty of Kandahar University in terms of establishment after agriculture and medicine faculties in 1990 and 1994 respectively. Currently it has four departments Civil Engineering, Water and Environmental Engineering, Energy Engineering and Architectural and Town Planning Departments. In addition to these, it is planned to establish Mechanical Department until 2021. All departments have market oriented and updated curriculums developed in the framework of partnerships with the world well-known universities. For the best curriculum delivery, all classes are equipped with standard academic requirements. To be updated from the world development, English is used medium of instruction in the faculty. About 85% of text books, lectures, exams and assignments are in English. By the financial supports of USWDP/USAID and HEDP, all departments have established standard laboratories and resources centers for the practical works and practices of students. After successful completion of the four year program, the graduates receive the B.Eng. degree.

Since its establishment, KDREF has graduated 899 Engineers to Afghan society and currently has 931 students in four departments. It has 32 fulltime faculty members from which, 28 have completed their M. Eng. degrees with different specializations and 4 of them are preparing for getting master degree.

2.1.Vision

Kandahar Engineering Faculty strives to become a leading engineering institution in the country and well known at the regional level.

2.2.Mission

Kandahar Engineering Faculty strives to have such educational environment to acquire, share and use knowledge in various fields of engineering to contribute to the quality of life in Afghan society through innovation and generating research opportunities and engineering services.

2.3.Objectives

- Graduating engineers with high level of commitments to the country with respect to national and international legal frameworks, culture and Islamic values.
- Graduating engineers that have the necessary knowledge and skills for assessment and recognizing alternatives in designing of projects related to socio-economical, environmental and public safety.
- Graduating engineers having necessary verbal and written communication skills for success in their professions or entering graduate studies.
- Graduating engineers functioning effectively on teams with high level of ethical and professional standards.
- Graduating engineers with leadership skills and to be able to challenge the problems and difficulties.
- Conducting high quality researches nationally and internationally in field of engineering.
- Contributing to the overall development of the country.
- Acting as a consultant in the national and international level.

3. Introduction to Energy Engineering Department

Energy Engineering Department was established in 2013 in the framework of Engineering Faculty of Kandahar University. The establishment of this department was based on the problems and opportunities associated with field of energy in the country. The department follows a market oriented curriculum which was developed in the framework of an active partnership with the Texas A&M University of USA. Texas A&M University supported Energy Engineering Department in developing curriculum, preparing teaching materials and upgrading the faculties and lab technicians.

During the partnership with Texas A&M university of USA, a curriculum oriented laboratory, library and resources center were planned for the department. These facilities were procured by USWDP/USAID in 2018.

For the betterment of this four year degree program, four classrooms, one resources center, laboratory and one office were renewed and equipped in the building of engineering faculty by the financial support of USWDP/USAID.

Currently, Energy Engineering Department has six faculty members; four of them have obtained their master degree in energy engineering from the very well-known university, Asian Institute of Technology (AIT), and two faculties are currently preparing for getting master degree. The department graduated its first batch students in June, 2018.

Based on the demand, the faculties of Energy Engineering Department provide advisory and research services to the government and private sectors of the country. These services help to improve the educational and experience level of the faculties and the students.

3.1. Vision

Energy engineering department struggles to train skilled professionals in the field of energy and providing academic research services to the society.

3.2. Mission

To approach the vision of energy engineering department new technologies and effective academic, educational and research methods are worked out.

3.3. Objectives

- Offering skilled engineers to the society equipped with Islamic and national values in the field of energy.
- Searching solutions to energy related difficulties of the society through conducting researches and offering services.
- Investigating best utilization of the available national energy resources for economic development of the country.
- Improving renewable energy for mitigating greenhouse gases emissions from the earth to the atmosphere.

3.4. Values

- Respect of Islamic sanctities and Afghan values.
- Islamic and human moral and improving morality of patriotism.
- Establishing accepted national and international quality.
- Transparency and prevention of corruption.

4. Energy Engineering Curriculum

The bachelor of engineering program in energy engineering was designed to graduate engineers with the ability to identify and address energy related problems, identify

appropriate solutions, design and implement energy projects, create and revise energy policies and provide guidance in promoting energy efficiency in different sectors.

4.1.Educational Need Assessment

Due to years of war and conflict in Afghanistan, the energy sector of the country was unable to provide adequate services for the current energy requirements of the country. This was in case that the country had a lot of resources that could be used for generating electricity. In such a situation, the Engineering Faculty of Kandahar University met different involved stakeholders and individuals from the market and conducted a need assessment for establishing a bachelor of energy engineering program in the framework of engineering faculty in 2010. As a result, the problems and opportunities associated with the field of energy in the country was analyzed and it was determined that there is lack of enough knowledge in this field. For overcoming this problem, the Energy Engineering Department was officially established in the framework of Engineering Faculty in 2013.

4.2.Outcomes of Educational Need Assessment

After conducting the educational need assessment, it was observed that skilled engineers are required to eliminate the current shortage and inadequate use of energy by using national renewable and nonrenewable resources and modern techniques. To graduate engineers with the required knowledge and skills, the curriculum was created by considering the following major energy related areas:

- i. Renewable energy sources and technologies (solar thermal, solar photovoltaic, biomass, wind and hydropower).
- ii. Nonrenewable energy sources and technologies (coal, gas, fossil fuel thermal power plants).
- iii. Energy efficiency (efficient design and audit of energy systems in buildings and energy audit of industries and transport).
- iv. Energy policies, economics and politics (creating energy policies, evaluation of energy projects and understanding energy politics).

4.3.Program Educational Outcomes

By the successful completion of 4 years bachelor of energy engineering, the students will be able to

- i. Apply mathematics, science and engineering
- ii. Design/conduct experiments/analyze data
- iii. Use modern tools and techniques
- iv. Critical thinking and apply knowledge concurrence with other disciplines
- v. Understand professional and ethical responsibility
- vi. Communicate effectively

-
- vii. Ability to function in a group and in multi-disciplinary team

4.4. Curriculum Development

By considering the program educational outcomes, a market oriented curriculum was created in the framework of an active partnership with the Texas A&M University of USA. The curriculum of energy engineering consists of 52 (147 credits) courses in which 18 credits (12%) are collegiate, 54 credits (37%) are basics and 75 credits (51%) are professional including a final research/project.

This curriculum was prepared with due consideration to the criteria for engineering program recognized by Ministry of Higher Education, Afghanistan and the following bachelor of engineering curriculum definition and program educational outcomes set by ABET (Accreditation Board for Engineering and Technology) (<http://www.abet.org/wp-content/uploads/2018/02/E001-18-19-EAC-Criteria-11-29-17.pdf>) which states the following:

“Curriculum: the curriculum requirements specify subject areas appropriate to engineering but do not prescribe specific courses. The faculty must ensure that the program curriculum devotes adequate attention and time to each component, consistent with the outcomes and objectives of the program and institution. The professional component must include:

- a) One year of a combination of college level mathematics and basic sciences (some with experimental experience) appropriate to the discipline. Basic sciences are defined as biological, chemical, and physical sciences.
- b) One and one-half years of engineering topics, consisting of engineering sciences and engineering design appropriate to the student's field of study. The engineering sciences have their roots in mathematics and basic sciences but carry knowledge further toward creative application. These studies provide a bridge between mathematics and basic sciences on the one hand and engineering practice on the other. Engineering design is the process of devising a system, component, or process to meet desired needs. It is a decision-making process (often iterative), in which the basic sciences, mathematics, and the engineering sciences are applied to convert resources optimally to meet these stated needs.
- c) A general education component that complements the technical content of the curriculum and is consistent with the program and institution objectives.

Students must be prepared for engineering practice through a curriculum culminating in a major design experience based on the knowledge and skills acquired in earlier course work and incorporating appropriate engineering standards and multiple realistic constraints.

One year is the lesser of 32 semester hours (or equivalent) or one-fourth of the total credits required for graduation.

Student Outcomes: the program must have documented student outcomes that prepare graduates to attain the program educational objectives. Student outcomes are outcomes (a) through (k) plus any additional outcomes that may be articulated by the program.

- a) an ability to apply knowledge of mathematics, science, and engineering
- b) an ability to design and conduct experiments, as well as to analyze and interpret data
- c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- d) an ability to function on multidisciplinary teams
- e) an ability to identify, formulate, and solve engineering problems
- f) an understanding of professional and ethical responsibility
- g) an ability to communicate effectively
- h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- i) a recognition of the need for, and an ability to engage in life-long learning
- j) a knowledge of contemporary issues
- k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.”

In this curriculum, the course structure has been divided into three groups:

- i. Collegiate courses {18 credits (12%)}:
The collegiate courses includes theology, English and history
- ii. Basic courses {56 credits (38%)}:
The basic courses include the following: science, mathematics and other important courses related to their study.
- iii. Professional courses including a final research/project {73 credits (50%)}:
Professional courses includes all those courses which emphasize on the major fields of energy engineering. Students have to conduct a final year research in these courses.

Code Number of the Course: In this curriculum each course has a code number, such as En.Ene 0205, in which the first letters represent the faculty, the second letters represents the department, the first numbers represent semester and the last two numbers represent the number of course in that semester. For example, En.Ene 0205 is the 5th course in the 2nd semester of engineering faculty (En), energy engineering department (Ene).

Credit Hour: one credit hour is equivalent to one hour of lecture per week or two hours of lab per week or three hours of field work per weak in 16 continuous weeks.

4.5.Semester-wise Curriculum Structure

(Semester - 1) (First year / First Semester)										
No	Subjects	Codes	Subject Category	Classes			Number of Credits	In charge Department and Faculty	Prerequisite Subjects	Remarks
				Theory	Practice	Total				
1	Theology I	Sh. Isi 0101	Collegiate	1		1	1	IS Department, Faculty of Sharia Law	None	
2	English I	Li. Engl 0102	Collegiate	3		3	3	English, Faculty of Literature	None	
3	History of Afghanistan	En. Hist 0103	Collegiate	1		1	1	History, Faculty of Education	None	
4	Calculus I	En. Ene 0104	Basics	4		4	4	Energy Engineering, Faculty of Engineering	None	
5	Engineering Physics I	En. Ene 0105	Basics	3	2	5	4	Energy Engineering, Faculty of Engineering	None	
6	Introduction to Engineering & Computer	En. Ene 0106	Basics	2	2	4	3	Energy Engineering, Faculty of Engineering	None	
7	Drawing I	En. Ene 0107	Basics	1	4	5	3	Energy Engineering, Faculty of Engineering	None	
Total				15	8	23	19			

No	Subject Category	Credits	Percentage due All Credits
1	Collegiate	5	3.40%
2	Professional	0	0.00%
3	Basics	14	9.52%
4	Optional	0	0.00%
	Total	19	12.93%

No	Optional/Basic/Professional Subjects	Credits
1		
2		
3		
Signature		

(Semester - 2) (First year / Second Semester)										
No	Subjects	Codes	Subject Category	Classes			Number of Credits	In charge Department and Faculty	Prerequisite Subjects	Remarks
				Theory	Practice	Total				
1	Theology II	Sh. Isi 0201	Collegiate	1		1	1	IS Department, Faculty of Sharia Law	None	
2	English II	Li.Engl 0202	Collegiate	3		3	3	English, Faculty of Literature	English I	
3	Calculus II	En. Ene 0204	Basics	4		4	4	Energy Engineering, Faculty of Engineering	Calculus I	
4	Engineering Physics II	En.Ene 0205	Basics	3	2	5	4	Energy Engineering, Faculty of Engineering	Calculus I & Engineering Physics I	
5	Drawing II (CAD)	En.Ene 0207	Basics	2	2	4	3	Energy Engineering, Faculty of Engineering	Drawing I	
6	Engineering Chemistry I	Ed. Chem 0208	Basics	2	2	4	3	Chemistry, Faculty of Education	None	
Total				15	6	21	18			

No	Subject Category	Credits	Percentage due All Credits
1	Collegiate	4	2.72%
2	Professional	0	0.00%
3	Basics	14	9.52%
4	Optional	0	0.00%
	Total	18	12.24%

No	Optional/Basic/Professional Subjects	Codes	Credits
1			
2			
3			
Signature			

(Semester - 3) (Second year / First Semester)										
No	Subjects	Codes	Subject Category	Classes			Number of Credits	In charge Department and Faculty	Prerequisite Subjects	Remarks
				Theory	Practice	Total				
1	Theology III	Sh. Isi 0301	Collegiate	1		1	1	IS Department, Faculty of Sharia Law	None	
2	English III	Li. Engrl 0302	Collegiate	3		3	3	English, Faculty of Literature	English II	
3	Calculus III	Ed. Ene 0304	Basics	4		4	4	Energy Engineering, Faculty of Engineering	Calculus II	
4	Engineering Physics III	En. Ene 0305	Basics	3	2	5	4	Energy Engineering, Faculty of Engineering	Engineering Physics I & Calculus I	
5	Thermodynamics I	En. Ene 0309	Professional	2	2	4	3	Energy Engineering, Faculty of Engineering	Engineering Physics II	
6	Engineering Mechanics I: Statics	En. Ce 0310	Basics	3		3	3	Civil Engineering, Faculty of Engineering	Engineering Physics I	
7	Surveying I	En. Ce 0311	Basics	2	2	4	3	Civil Engineering, Faculty of Engineering	None	
				18	6	24	21			

No	Subject Category	Credits	Percentage due All Credits
1	Collegiate	4	2.72%
2	Professional	3	2.04%
3	Basics	14	9.52%
4	Optional	0	0.00%
	Total	21	14.29%

No	Optional/Basic/Professional Subjects	Codes	Credits
1			
2			
3			
Signature			

(Semester - 4) (Second year / Second Semester)										
No	Subjects	Codes	Subject Category	Classes			Number of Credits	In charge Department and Faculty	Prerequisite Subjects	Remarks
				Theory	Practice	Total				
1	Theology IV	Sh.Isi 0401	Collegiate	1		1	1	IS Department, Faculty of Sharia Law	None	
2	Calculus IV	En. Ene 0404	Basics	4		4	4	Energy Engineering, Faculty of Engineering	Calculus II	
3	Thermodynamics II	En.Ene 0409	Professional	2	2	4	3	Energy Engineering, Faculty of Engineering	Thermodynamics I	
4	Engineering Mechanics II: Dynamics	En. Ce 0412	Basics	3		3	3	Civil Engineering, Faculty of Engineering	Statics	
5	Engineering Circuit Analysis I	En.Ene 0413	Basics	2	2	4	3	Energy Engineering, Faculty of Engineering	Engineering Physics III	
6	Fluid Mechanics	En. Wee 0414	Professional	2	2	4	3	Water & Environmental Engineering, Faculty of Engineering	None	
				14	6	20	17			

No	Subject Category	Credits	Percentage due All Credits
1	Collegiate	1	0.68%
2	Professional	6	4.08%
3	Basics	10	6.80%
4	Optional	0	0.00%
	Total	17	11.56%

No	Optional/Basic/Professional Subjects	Codes	Credits
1			
2			
3			
Signature			

(Semester - 5) (Third year / First Semester)										
No	Subjects	Codes	Subject Category	Classes			Number of Credits	In charge Department and Faculty	Prerequisite Subjects	Remarks
				Theory	Practice	Total				
1	Theology V	Sh. Isi 0501	Collegiate	1		1	1	IS Department, Faculty of Sharia Law	None	
2	Energy Conversion I	En. Ene 0515	Professional	2	2	4	3	Energy Engineering, Faculty of Engineering	Engineering Circuit Analysis I	
3	Combustion Technology & Materials	En. Ene 0516	Professional	2	2	4	3	Energy Engineering, Faculty of Engineering	None	
4	Heat Transfer	En. Ene 0517	Professional	3	2	5	4	Energy Engineering, Faculty of Engineering	Thermodynamics I	
5	Power Systems I	En. Ene 0518	Professional	2	2	4	3	Energy Engineering, Faculty of Engineering	Engineering Circuit Analysis	
6	Engineering Economics	En. Ene 0519	Basic	3		3	3	Energy Engineering, Faculty of Engineering	None	
				13	8	21	17			

No	Subject Category	Credits	Percentage due All Credits
1	Collegiate	1	0.68%
2	Professional	13	8.84%
3	Basics	3	2.04%
4	Optional	0	0.00%
	Total	17	11.56%

No	Optional/Basic/Professional Subjects	Codes	Credits
1			
2			
3			
Signature			

(Semester - 6) (Third year / Second Semester)										
No	Subjects	Codes	Subject Category	Classes			Number of Credits	In charge Department and Faculty	Prerequisite Subjects	Remarks
				Theory	Practice	Total				
1	Theology VI	Sh. Isi 0601	Collegiate	1		1	1	IS Department, Faculty of Sharia Law	None	
2	Biomass Energy Engineering	En. Ene 0620	Professional	2	2	4	3	Energy Engineering, Faculty of Engineering	None	
3	HVAC	En. Ene 0621	Professional	2	2	4	3	Energy Engineering, Faculty of Engineering	None	
4	Solar Energy Engineering	En. Ene 0622	Professional	2	2	4	3	Energy Engineering, Faculty of Engineering	None	
5	Hydropower Engineering	En. Ene 0623	Professional	2	2	4	3	Energy Engineering, Faculty of Engineering	None	
6	Thermal Power Plant	En. Ene 0624	Professional	2	2	4	3	Energy Engineering, Faculty of Engineering	Thermodynamics I&II	
7	Seminar I (Research Methodology)	En. Ene 0625	Basics	1		1	1	Energy Engineering, Faculty of Engineering	None	
8	Power System II	En. Ene 0626	Professional	2	2	4	3	Energy Engineering, Faculty of Engineering	Power System I	
				14	12	26	20			

No	Subject Category	Credits	Percentage due All Credits
1	Collegiate	1	0.68%
2	Professional	18	12.24%
3	Basics	1	0.68%
4	Optional	0	0.00%
	Total	20	13.61%

No	Optional/Basic/Professional Subjects	Codes	Credits
1			
2			
3			
Signature			

(Semester - 7) (Fourth year / First Semester)										
No	Subjects	Codes	Subject Category	Classes			Number of Credits	In charge Department and Faculty	Prerequisite Subjects	Remarks
				Theory	Practice	Total				
1	Theology VII	Sh.Isi 0701	Collegiate	1		1	1	IS Department, Faculty of Sharia Law	None	
2	Electrical Systems of Buildings	En. Ene 0727	Professional	2	2	4	3	Energy Engineering, Faculty of Engineering	Engineering Circuit Analysis I	
3	Energy Efficiency	En. Ene 0728	Professional	2	2	4	3	Energy Engineering, Faculty of Engineering	None	
4	Wind Energy Engineering	En. Ene 0729	Professional	2	2	4	3	Energy Engineering, Faculty of Engineering	None	
5	Solar Photovoltaic	En. Ene 0730	Professional	2	2	4	3	Energy Engineering, Faculty of Engineering	Engineering Circuit Analysis I	
6	Seminar II	En. Ene 0731	Professional		4	4	2	Energy Engineering, Faculty of Engineering	Seminar I	
7	Professional Elective I	En. Ene 0732	Professional	3		3	3	Energy Engineering, Faculty of Engineering	None	
				12	12	24	18			

No	Subject Category	credits	Percentage due All Credits
1	Collegiate	1	0.68%
2	Professional	17	11.56%
3	Basics	0	0.00%
4	Optional	0	0.00%
	Total	18	12.24%

No	Optional/Basic/Professional Subjects	Codes	Credits
1			
2			
3			
Signature			

(Semester - 8) (Fourth year / Second Semester)										
No	Subjects	Codes	Subject Category	Classes			Number of Credits	In charge Department and Faculty	Prerequisite Subjects	Remarks
				Theory	Practice	Total				
1	Theology VIII	Sh. Isi 0801	Collegiate	1		1	1	IS Department, Faculty of Sharia Law	None	
2	Energy Policy & Politics	En. Ene 0833	Professional	3		3	3	Energy Engineering, Faculty of Engineering	None	
3	Research/Project Design	En. Ene 0834	Professional		8	8	4	Energy Engineering, Faculty of Engineering	Seminar II	
4	Engineering Management	En. Ene 0835	Professional	3		3	3	Energy Engineering, Faculty of Engineering	None	
5	Energy and Environment	En. Ene 0836	Professional	3		3	3	Energy Engineering, Faculty of Engineering	Engineering Chemistry I	
6	Professional Elective II	En. Ene 0837	Professional	3		3	3	Energy Engineering, Faculty of Engineering	None	
				13	8	21	17			

No	Subject Category	credits	Percentage due All Credits
1	Collegiate	1	0.68%
2	Professional	16	10.88%
3	Basics	0	0.00%
4	Optional	0	0.00%
	Total	17	11.56%

No	Optional/Basic/Professional Subjects	Codes
1		
2		
3		
Signature		

Credits and Percentages of all Categories

No.	Subject Category	Credits	Percentage due All Credits
1	Collegiate	18	12%
2	Professional	73	50%
3	Basics	56	38%
4	Optional	0	0%
	Total	147	100%

No	Subjects	Credits	Percentage
1	Subjects in all Semesters	114	77.70%
2	Thesis	0	0.00%
3	Practices	33	22.30%
4	Total	147	100.00%
Signature			

4.6. Category-wise Course Syllabuses

4.6.1. Collegiate {18 credits (12%)}

Li. Engl 0102 English I (English for Academic Purposes)

Item موضوع	Description توضیحات		
Title عنوان یا مضمون	Li. Engl 0102 English I (English for Academic Purposes)		
Credits and no. of hour د کربډتونو او درسي ساعتونو شمير	Total توليزه	Theoretic نظري	Practical عملي
	3	3	0
Offering year and semester د تدريس کال او سمسټر	First year - First semester		
Aim موخي	The objective of the course is to help students learn some of the linguistic and cultural practices – mainly institutional and disciplinary – involved in studying or working through the medium of English.		
Key Learning Outcomes کلیدي ښوونيز نتيایج	<p>Key learning outcomes of this course follow:</p> <ul style="list-style-type: none"> • Understand the basic approach for learning the English language • Able to understand phonetics and its application to the English language • Develop vocabulary skills • Able to understand common diction in the English language • Understand common grammatical errors in English language • Develop understanding of English literature 		
Academic Staff Responsible د تدريس مسنول استاد			
Syllabus مفردات	<p>I. <u>INTRODUCTION</u></p> <ol style="list-style-type: none"> 1. Current Approaches to Learning English 2. Communication Today <p>II. <u>PHONETICS</u></p> <ol style="list-style-type: none"> 1. Phonetics and Correct English Pronunciation <p>III. <u>SYNTAX</u></p> <ol style="list-style-type: none"> 1. Vocabulary 2. Diction and English Sentence 3. Sentence Variety and Style 4. Grammatical Problems <p>IV. <u>READING SKILL</u></p> <ol style="list-style-type: none"> 1. Readability 2. Reading Strategies 3. Generating Ideas Through Purposive Reading 4. Reading of Selected Stories 5. Comprehension <p>V. <u>WRITING SKILL</u></p> <ol style="list-style-type: none"> 1. Principles of Effective Writing 2. Generating Ideas 		

	<p>3. Planning 4. Organization and Development of Writing 5. Composition 6. Precis</p> <p>VI. <u>WRITTEN COMMUNICATION</u></p> <p>1. Business Communication 2. Tenders and Quotations 3. Journal Articles 4. Report</p> <p>VII. <u>ORAL COMMUNICATION</u></p> <p>1. Dialogue 2. Technical and Scientific Presentation</p>
Pre-requisite مخکینی ایرین مضامین	None
Related Courses اړونده مضامین	Critical Thinking and Writing, English Communication Skills in Engineering
Teaching and Learning methods د تدریس میتود	Lectures, tutorials and assignments
Computer Knowledge د کمپیوتر زده کړې ته اړتیا	Moderate computer knowledge such as MS Word, MS Excel, MS PowerPoint, and CAD.
Course Materials and References د مضمون درسي مواد او اخلیکونه	<p><u>Text Books:</u> <u>درسي کتاب</u></p> <ul style="list-style-type: none"> Ingre, David (2007). Engineering Communication (1st Edition). Cengage Learning
	<p><u>Reference:</u> <u>اخلیکونه</u></p> <ul style="list-style-type: none"> Alexander, O., Argent, S. & Spencer, J. (2008), EAP essentials: A teacher's guide to principles and practice. Reading: Garnet Badger, R. & White, G. (2000). A process genre approach to teaching writing. ELT Journal, 54, 153-160. Biber, D. (2006). University language: A corpus-based study of spoken and written registers. Amsterdam: John Benjamins. Sorenson, Webster's New World Student Writing Handbook, 4th Edition Nation, P. (2007). The four strands. Innovation in Language Learning and Teaching1, 2-13. Quality Assurance Agency for Higher Education (2002). Subject benchmark statements: Languages and related studies." Available from: http://www.qaa.ac.uk/

Evaluation activities and Grades د ارزوني فعاليتونه او نمرې								
Activity فعاليت	Scope هدف	Marks نمرې						
Attendance and class contribution حاضري او په درس کي برخه اخستل	Attending class, contributions to knowledge and relationships with the group.	5						
Assignments کورني دنده	Solving the indicated problems from the problem list and submitting on time.	5						
Laboratory and field trip reports د لابراتوار/ ساحي راپورونه	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion and implication.	15						
Quizzes صنفي ارزوني	Quizzes include teaching materials and assignments from two previous classes.	5						
Midterm exam منځني ازموينه	The midterm exam includes the covered topics.	20						
Final exam وروستي ازموينه	The final exam includes the covered topics after the midterm exam.	50						
	Total Course Marks د کورس مجموعي نمرې	100						
Relationship of this Course to Program Learning Outcome د مضمون اړیکه د څانگي له کلیدي بنوونیزو موخو سره								
No.	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7
		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team
1	Understanding the basic approach for learning English language	1	1	1	2	2	1	1
2	Able to understand the phonetics and its	1	1	1	2	2	1	1

	application to English language							
3	Develop the vocabulary skills	1	1	1	2	2	1	1
4	Able to understand the common diction in English language	1	2	1	1	1	1	1
5	Understanding the common grammatical errors in English language	2	1	1	1	1	1	1
6	Develop the understanding of English literature	2	1	1	1	1	1	1
Total		1.3	1.16	1	1.5	1.5	1	1
Average		1.2						
		1= Some relation 2= Moderate relation 3=Extensive relation						

Li.Engl 0202 English II (Critical Thinking and Writing)

Item موضوع	توضیحات Description		
Title عنوان یا مضمون	Li.Engl 0202 English II (Critical Thinking and Writing)		
Credits and no. of hour د کړېدتونو او درسي ساعتونو شمير	Total ټوليزه	نظري Theoretic	عملي Practical
	3	3	0
Offering year and semester د تدريس کال او سمستر	First year - Second semester		
Aim موخي	Student will learn to write in a clear, concise style and to present information logically. Student will also learn to design documents in which format contribute to clarity and efficiency including use of graphics and deliver oral presentations.		
Key Learning Outcomes کلیدي ښوونیز نتایج	Key learning outcomes of this course follow: <ul style="list-style-type: none"> Understand principles and procedures of technical research and report writing Able to develop writing skills of a business letter Develop the basic idea of graphic aid 		

	<ul style="list-style-type: none"> • Understanding contemporary communication as an engineer • Develop practical writing skills by applying theoretical understanding
<p>Academic Staff Responsible د تدریس مسنول استاد</p>	
<p>Syllabus مفردات</p>	<p>I. <u>OVERVIEW OF TECHNICAL RESEARCH AND REPORT WRITING</u></p> <ol style="list-style-type: none"> 1. Definition and Nature of Technical Writing 2. Properties of Technical Writing 3. Basic Principles of Technical Writing 4. Styles in Technical Writing 5. The Role of Technical Writing 6. The Wholistic Guide of Technical Writing 7. End-products of Technical Writing <p>II. <u>INFORMATION STRUCTURE/TECHNIQUES IN TECHNICAL WRITING</u></p> <ol style="list-style-type: none"> 1. Distinction between Technical and Literary Writing 2. Formal Definition 3. Description Mechanism 4. Process Description 5. Classification 6. Cause and Effect 7. Comparison and Contrast 8. Analogy <p>III. <u>TYPES OF TECHNICAL REPORT</u></p> <ol style="list-style-type: none"> 1. Report Layout 2. Formal Report Format 3. Memorandum Report 4. Letter Report 5. Bulletins 6. Abstract 7. Proposal 8. Research Report 9. Feasibility Study <p>IV. <u>BUSINESS LETTER</u></p> <ol style="list-style-type: none"> 1. Definition and Purpose 2. Elements and Characteristics 3. Format and Styles 4. Types of Business Letters 5. Resume and Cover Letters <p>V. <u>PROCESS AND GUIDELINES IN TECHNICAL WRITING</u></p> <ol style="list-style-type: none"> 1. Writing Process: From Audience to Rough Draft

	<ol style="list-style-type: none"> 2. Audience Analysis 3. Task Analysis 4. Power-Revision Techniques 5. Libraries, Documentation, Cross-Referencing 6. Basic Patterns And Elements of the Sentence 7. Common Grammar, Usage, Punctuation Problems 8. Common Spelling Problems <p>VI. <u>GRAPHIC AIDS</u></p> <ol style="list-style-type: none"> 1. Bar Chart 2. Line Chart 3. Tables 4. Circle or Pie Chart 5. Surface or Strata Chart 6. Map Charts, Flow Charts, Flow Sheets, Diagrams 7. Figures 8. Photographs 9. Drawings 10. Important Points in Handling Graphics <p>VII. <u>CONTEMPORARY COMMUNICATION</u></p> <ol style="list-style-type: none"> 1. E-mail 2. Internet 3. Desktop Publishing 4. Hypertext <p>VIII. <u>LABORATORY SESSION</u></p> <ol style="list-style-type: none"> 1. Technical Report Writing Based on the Real Case 2. Writing of Business Letter Based on Different Case and Scenario of the Company 3. Graphical Explanation of Different Charts, Figure and Facts of the Real Scenario 4. Contemporary Communication Efficiency by Email, Internet, Desktop Publishing Etc.
Pre-requisite مخکینی ارین مضامین	English I (English for Academic Purposes)
Related Courses ارونده مضامین	Critical Thinking and Writing, English Communication Skills in Engineering
Teaching and Learning methods د تدریس میتود	Lectures, tutorials and assignments
Computer Knowledge د کمپیوتر زده کری ته ارتیا	Moderate computer knowledge such as MS Word, MS Excel, MS PowerPoint, and CAD.

Course Materials and References د مضمون درسي مواد او اخليكونه	<u>Text Books:</u> <u>درسي كتاب</u> <ul style="list-style-type: none"> Riordan, Daniel (2013). <i>Technical Report Writing Today</i> (10th Edition). Cengage Learning 	
	<u>Reference:</u> <u>اخليكونه</u> <ul style="list-style-type: none"> Alred, Gerald J., Brusaw, Charles T., Oliu, Walter E. (2011). <i>Handbook of Technical Writing</i>, [Hardcover] Tenth Edition. St. Martin's Press Vicente. et. Al. (2004), <i>Technical Writing</i>. Popular Bookstore, Quezon City, Philippines. 	
Evaluation activities and Grades د ارزوني فعاليتونه او نمري		
Activity فعاليت	Scope هدف	Marks نمري
Attendance and class contribution حاضري او په درس كي برخه اخستل	Attending class, contributions to knowledge and relationships with the group.	5
Assignments كورني دنده	Solving the indicated problems from the problem list and submitting on time.	5
Laboratory and field trip reports د لابراتوار/ ساحي راپورونه	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion and implication.	15
Quizzes صنفي ارزوني	The quiz includes teaching materials and assignments from two previous classes.	5
Midterm exam منخني ازموينه	The midterm exam includes the covered topics.	20
Final exam وروستي ازموينه	The final exam includes the covered topics after the midterm exam	50
	Total Course Marks د كورس مجموعي نمري	100

Relationship of this Course to Program Learning Outcome								
د مضمون اړیکه د څانګې له کلیدي بنوونیزو موخو سره								
No.	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7
		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team
1	Understanding the principles and procedure of technical research and report writing	1	1	1	1	1	1	1
2	Able to develop the writing skills of business letter	1	1	2	1	2	1	1
3	Develop the basic idea of graphic Aid	1	1	1	1	1	1	1
4	Understanding the Contemporary Communication as an Engineer	1	1	1	2	1	2	1
5	Develop the practical writing skills by applying the theoretical understanding	1	1	1	1	1	1	1
Total		1	1	1.2	1.2	1.2	1.2	1
Average		1.11						
1= Some relation 2= Moderate relation 3=Extensive relation								

Li. Engl 0302 English III (English Communication Skills in Engineering)

Item موضوع	Description توضیحات		
Title عنوان یا مضمون	Li. Engl 0302 English III (English Communication Skills in Engineering)		
Credits and no. of hour د کړېدونو او درسي ساعتونو شمير	Total ټوليزه	Theoretic نظري	Practical عملي
	3	3	0
Offering year and semester د تدريس کال او سمستر	Second year - First semester		
Aim موخي	This English communication skills course covers introductions to communication models and analysis; the characteristics of engineering communication and ethics. The course engages students in the writing process and techniques for searching for information, team/group work, peer assessment, and making oral presentations.		
Key Learning Outcomes کلیدي بنوونيز نتايج	<p>Key learning outcomes of this course follow:</p> <ul style="list-style-type: none"> • Develop communication models and ethics in professional life and communication • Understand visual elements in oral and written communication with group work and collaborative writing • Able to understand common documents in engineering communication including ethics in professional life and communication • Able to understand and write the extended essay/research paper • Seminar participation • Understand the key elements of visual elements in oral and written communication; web content and multimedia presentations • Group work and collaborative writing 		
Academic Staff Responsible د تدريس مسنول استاد			

<p style="text-align: center;">Syllabus مفردات</p>	<p>I. <u>THE CHARACTERISTICS OF ENGINEERING COMMUNICATION</u></p> <ol style="list-style-type: none"> 1. Analysis of Communication Based on the CMAPP Model 2. Introduction to the Writing Process 3. Usage Focus on the Assessment of English Usage <p>II. <u>RESEARCH AND REFERENCE WORKS</u></p> <ol style="list-style-type: none"> 1. Working with Others 2. Communication Skills 3. Summarizing and Critique 4. Style Guides, Field-Specific Discourse, and Literature 5. Seminar Participation, Presentation 6. Peer Reviewing and Group Dynamics 7. Peer Assessment and Self-Assessment 8. Ethical Behavior 9. Results of Unethical Behavior <p>III. <u>WORK GROUP TUTORIALS</u></p> <ol style="list-style-type: none"> 1. Oral Presentations <p>IV. <u>WRITING PROCESS</u></p> <ol style="list-style-type: none"> 1. Basics and Methods of Ideas Development 2. Assessment of Writing 3. Writing Tutorials 4. Drafting and Revising 5. The Extended Essay from Planning, Proposal and Drafting/Revising through Final Draft Proofreading. 6. Writing Tutorials and Self-Editing <p>V. <u>ORGANIZING</u></p> <ol style="list-style-type: none"> 1. Outlining. 2. Writing Process 3. Narrowing Topics <p>VI. <u>VISUAL ELEMENTS IN WRITTEN AND ORAL COMMUNICATION AND WRITING PROCESS</u></p> <p>VII. <u>GROUP PROJECTS</u></p> <ol style="list-style-type: none"> 1. Investigation of an Engineering Issue in Relation to Society 2. Brainstorming and Topic Narrowing. 3. Library/On-Line Research <p>VIII. <u>COMMUNICATION STRATEGIES</u></p> <ol style="list-style-type: none"> 1. Mechanism and Process Description 2. Classification and Definition 3. Process Analysis 4. Comparison and Causation 5. Exemplification and Illustration 6. Production of Short Essays and Extemporaneous Speeches on Relevant Topics 7. Review of English Usage 8. Persuasion and Argument (Use of Analogy)
--	--

	<p>IX. <u>OVERVIEW OF CORRESPONDENCE, REPORTS, AND SUMMARIES FOR THE ENGINEERING WORKPLACE</u></p> <ol style="list-style-type: none"> Forms of Address Titles and Heading Captions Salutations and Closings <p>X. <u>GROUP PROJECTS</u></p> <ol style="list-style-type: none"> Brainstorming, Project Planning; Proposal Writing (Collaborative/WIKI Writing) Elements of Web Pages and Web Content, Video Presentations, Animations, Scripting Progress Reports, Consultation with Experts. Tutorials <p>XI. <u>PANEL DISCUSSION/SEMINAR</u></p> <ol style="list-style-type: none"> Evaluation and Assessment of Group Work Final Review
Pre-requisite مخکینی ارین مضامین	English I (English for Academic Purposes)
Related Courses ارونده مضامین	Critical Thinking and Writing, English Communication Skills in Engineering
Teaching and Learning methods د تدریس میتود	Lectures, tutorials and assignments
Computer Knowledge د کمپیوتر زده کری ته ارتیا	Moderate Computer Knowledge such as, using MS Word, MS Excel, MS PowerPoint and CAD.
Course Materials and References د مضمون درسی مواد او اخلیکونه	<p><u>Text Books:</u></p> <p><u>درسی کتاب</u></p> <ul style="list-style-type: none"> Ingre, David (2007). <i>Engineering Communication</i> (1st Edition). Cengage Learning
	<p><u>Reference:</u></p> <p><u>اخلیکونه</u></p> <ul style="list-style-type: none"> Cottrell, Stella. <i>The Study Skills Handbook</i> (3rd Edition). Palgrave Macmillan McMurrey & Buckley (2007). <i>A Writer's Handbooks for Engineers</i> (1st Edition). Cengage Learning Sorenson, Sharon (2009). <i>Webster's New World Student Writing Handbook</i> (5th Edition). Webster's New World

Evaluation activities and Grades								
د ارزوني فعالیتونه او نمرې								
Activity	Scope	Marks						
فعالیت	هدف	نمرې						
Attendance and class contribution حاضري او په درس كې برخه اخستل	Attending class, contributions to knowledge and relationships with the group.	5						
Assignments كورني دنده	Solving the indicated problems from the problem list and submitting on time.	5						
Laboratory and field trip reports د لابراتوار/ ساحي راپورونه	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion, and implication.	15						
Quizzes صنفي ارزوني	Quizzes include teaching materials and assignments from two previous classes.	5						
Midterm exam منځنۍ ازموینه	The midterm exam includes the covered topics.	20						
Final exam وروستۍ ازموینه	The final exam includes the covered topics after the midterm exam.	50						
	Total Course Marks د كورس مجموعي نمرې	100						
Relationship of this Course to Program Learning Outcome								
د مضمون اړیکه د ځانګړي له کلیدي بنوونیزو موخو سره								
No.	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7
		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team

1	Develop the communication models and ethics in professional life and communication	1	2	2	3	2	2	3
2	Understanding the visual elements in oral and written communication with group work and collaborative writing	2	2	2	3	2	3	3
3	Able to understand the common documents in engineering communication including the ethics in professional life and communication	1	2	2	3	3	2	2
4	Able to understand and write the extended essay/ research paper	1	1	2	2	2	3	2
5	Seminar participation	2	1	2	3	3	3	3
6	Understand the key elements of visual elements in oral and written communication; web content and multimedia presentations	1	2	2	3	3	2	3
7	Group work and collaborative writing	2	2	2	3	3	2	3
Total		1.4	1.7	2	2.8	2.6	2.4	2.7
Average		2.2						
1= Some relation 2= Moderate relation 3= Extensive relation								

En. Hist 0103 History of Afghanistan

Item موضوع	Description توضیحات		
Title عنوان یا مضمون	En. Hist 0103 History of Afghanistan		
Credits and no. of hour د کړېدونو او درسي ساعتونو شمير	Total ټوليزه	Theoretic نظري	Practical عملي
	1	1	0
Offering year and semester د تدريس کال او سمسټر	First year - First semester		

<p>Aim موخي</p>	<p>To provide understanding of the contemporary history of Afghanistan along last three centuries, that starts from Ahmad Shah BaBa Abdali till Karzai government.</p>
<p>Key Learning Outcomes كليدي بنوونيز نتايچ</p>	<p>Key learning outcomes of this course follow:</p> <ul style="list-style-type: none"> • To understand the political road map of Afghanistan governments • To understand the patriotic generation of Afghanistan • To acknowledge their sacrifices and services for the freedom • To know the ascending peak of the country • To know the involved personalities behind the events
<p>Academic Staff Responsible د تدريس مسنول استاد</p>	
<p>Syllabus مفردات</p>	<p>I. <u>AFGHANISTAN WITH RESPECT TO ITS GEOGRAPHY AT THE BEGINNING OF CONTEMPORARY STAGE</u></p> <ol style="list-style-type: none"> 1. The Founder of Afghan Imperial (Ahmad Shah Abdali). 2. The (Jerga) System in our Society 3. The Feudalism Government Exemplification 4. Three Downfall Neighboring Countries <p>II. <u>THE ERA STUDY (WESTERN COLONIZATION AND INDIA) AND ITS EFFECTS ON AFGHANISTAN</u></p> <ol style="list-style-type: none"> 1. In General What Was the Result of (Western Colonization on India) on Afghanistan? <p>III. <u>AHMAD SHAHI GOVERNMENT</u></p> <ol style="list-style-type: none"> 1. Compiegne for the Imperial Enlargement 2. Relations to the (Usmani Khilafah) Government Hall (Headquarter) 3. Administration System and Political Culture of the Government Hall (Headquarter) 4. Cultural Image of the Society in Ahmad Shahi Era 5. Afghanistan Political Map in the Time of Passing Away of Ahmad Shah Baba 6. Starting of Disarray in the Afghan Imperial 7. Timor Shah at the Trap of Tribal Enmities 8. The Capital Transition from Kandahar to Kabul 9. Peshawar the Center of Discrepancies and Conspiracies 10. Protests the (SIECKS) in Panjab 11. Passing Away of Timor Shah and Starting of Civil War <p>IV. <u>HOW THE EXTERNAL FACTOR SUCCEEDED ON INTERNAL FACTOR IN THE AWAKENING OF EVENTS</u></p> <ol style="list-style-type: none"> 1. Shah Zaman Failed in the Reestablishment of Previous Imperial 2. The Civil War Among the (Sadoozai) Princes, Faced Country with Great Illness 3. The First Coup and Its Terrible Results 4. The (Lord Marenkteen and Malekam) Scheme for the Isolation of Afghanistan 5. The (Napoleon) Project: Afghanistan as the Way of Attack on

	<p>India</p> <ol style="list-style-type: none"> 6. The (Alphensteen) Job to the Shah Shuja Government Hall and Peshawar Protocol 7. The Descanting of (Sadoozi Tribe) and Ascending of (Mohammad Zai Tribe) 8. The Downfall of (Sadozai Tribe) and Reaching to Power of (Mohammad Zai Tribe) 9. Dost Mohammad Khan Announced Himself as A (Ameru-L-Momineen) 10. Dost Mohammad Khan U-Turned to Russian (Tazar) for Controlling Peshawar 11. The British Exchanged Shah Shuja by Dost Mohammad Khan and by The Triangular Protocol; He Has Been Installed in Kabul 12. The People Reaction (The First Afghan-British War) <p>V. <u>THE 2ND TURN OF DOST MOHAMMAD KHAN</u></p> <ol style="list-style-type: none"> 1. The British Slaved Dost Mohammad Khan in (Kalkata, India) and Sent Him Back to Kabul 2. The Last Round of Civil War Among the Payainda Mohammad Khan Sons 3. The Herat Issue 4. The (Jumrod) Two Protocols 5. Passing Away of Dost Mohammad Khan and Starting Up New Riots <p>VI. <u>REFORMING AND AWAKENING OF THE NEW POLITICAL THINKING</u></p> <ol style="list-style-type: none"> 1. The Role of Sayid Jamal-U-Din in the Reforms of Shair Ali Khan 2. Modernized Governmental System 3. Modernized Publication and Awakening of the New Political Observers 4. The Modernized Military Formation 5. (Emrani) Activities <p>VII. <u>THE CRISES AND MISS IN POLITICAL BALANCE</u></p> <ol style="list-style-type: none"> 1. The Capturing of (Khewa) by Russians and British Forward Policy 2. Afghanistan is Not Required (Lord Leten) 3. The Peshawar Negotiations (Sayid Nor Mohammad Shah and Sir Veliom Pele) 4. Sultan Abdul Hamid Invited Amir Shair Ali Khan to British Relationship 5. Russian Delegation Trip to Kabul and Crises Peak 6. Awful Letter (Between Amir Shair Ali Khan and Lord Leteen) 7. British Decided War <p>VIII. <u>THE RESULT OF STUPID POLICY</u></p> <ol style="list-style-type: none"> 1. The Differences of First and Second Afghan-British War 2. British Troops Entered Afghanistan 3. Amir Mohammad Yaqub Khan (Physiologically Ill Man) 4. Yaqub Khan Stressful Government and (Gandomac) Protocol 5. Protests in Kabul and (Kunaree) Killing 6. Yaqub Khan Surrendered Himself to British
--	--

IX. THE DESPOTISM AND CONSPIRACY ERA

1. Fearing Man (Abdul Rahman Khan)
2. The Two Imperials People
3. The Letter Between Abdul Rahman Khan and Sir (Lable Honry Greefen)
4. Intelligent, Pitiless and Opinionated Leader Amir Abdul Rahman Khan
5. The British and Russian Aggressive Diplomacy
6. The Abdul Rahman Khan External Strategy and the (Panjdeh) Tragedy
7. Dewrand Line
8. The Last Result-Less Efforts of Abdul Rahman Khan
9. The Geographical Map of Afghanistan at the Time of Passing Away of Abdul Rahman Khan

X. THE RIOTS AND CONSPIRACY HALL

1. Afghanistan at the Beginning of 20th Century
2. Amir Habibullah Khan
3. The Political Game Between Amir Habibullah Khan and England
4. Amir Habibullah's Trip to India
5. The Russian-British Protocol (1907) and Afghanistan's Consequence
6. The Modern Culture Propagation
7. The End of Democracy Beginners (Prison And Kill)
8. (Siraju-U-Alkhbar)
9. First World War and Afghanistan
10. First Indian Transitional Government in Kabul
11. Corruption (Degeneracy) and Conspiracy in The King's Hall
12. The King's Killing Tragedy

XI. INDEPENDENT AFGHANISTAN

1. Amanullah Khan is be the King
2. The Independency War and Announcement
3. The Peace Talk
4. Reforms
5. The Historical Trip of Amanullah Khan and Its Results
6. The Awakening of Asleep Ghosts
7. Lowering Conspiracies to Amanullah's Kingdom
8. Amanullah in History Court

XII. THE SON OF (SAQAAW) AND THE TIME OF IDIOTISM

1. Kabul Under the (Badawee) Culture Attack
2. Habibullah Kalakani Introduction
3. Excommunication of Amanullah Khan
4. The Reality of (Saqawee) Government
5. The Assassination of Well-Known Personalities of the Era
6. Do British Had Relations with (Saqawee) Government
7. Descending of (Saqwee) Government
8. Was (Saqawee) Government A Peasant Movement?

XIII. THE ACCOUNTABILITY TIME

	<ol style="list-style-type: none"> 1. Nader Shah's Government on Devastated Kabul 2. Nader Shah's Introduction and Background 3. Nader Shah's Government 4. Security Problems in Nader Shah's Government 5. Establishing the Foundation of A Legal Government 6. King's Relations to Religious Scholars 7. Trying to Solve Economic Problems 8. Administrative Formation 9. Cultural Activities 10. External Policies of the Government 11. Nader Shah's Sudden Assassination <p>XIV. <u>ALMIGHTY GOD BELIEVER KING</u></p> <ol style="list-style-type: none"> 1. Royal Family Accepted Mohammad Zahir Shah As King 2. Mohammad Zahir Shah's Introduction and Background 3. Mohammad Hashim Khan Cabinet Establishment by Mohammad Zahir Shah Commandment 4. New Establishment of Public Formation 5. The Afghanistan Membership in (Saad Abad) Protocol 6. Strengthening the Relations Between Afghanistan and Germany 7. Afghanistan in the Time of Second World-War 8. Mohammad Hashim Khan Resignation and the Start of (Sepah Salar's) Government 9. The (Sepah Salar's) Cabinet 10. Democracy Exemplification <p>XV. <u>REPUBLIC GOVERNMENT</u></p> <ol style="list-style-type: none"> 1. The (Sirtaan 26th) Coup 2. How the Coup Got Over 3. Mohammad Zahir Shah's Resignation and Political Detainees' Forgiveness 4. Giving Speech to Afghans 5. Maiwand Wal's Coup and Killing Issue 6. Republic Flag, Symbol and National Anthem 7. Renovation of Political Relations with Pakistan 8. Removal of (Purcham Group) in the Government and National Revolution Movement 9. Assassinations and Target Killings 10. (Loyea Jerga), Fundamental Law and President Selection 11. Daud Khan's Last Trip to Moscow and Disagreement with Brezhnev 12. Daud Khan Moved on A New and Unknown Rout 13. Khaibar Killing 14. (Khalq And Purcham) Groups Leaders Arresting and Republic Government Collapsing <p>XVI. <u>COUP</u></p> <ol style="list-style-type: none"> 1. Coup and Its Reasons 2. Incident Start and End 3. Government Leadership 4. Eight Orders 5. Disunion in the Government and (Sabotaz)
--	---

	<ol style="list-style-type: none"> 6. The Herat Protests 7. Internal Riots in the (Khalq) Group 8. Dolf Dobz, USA Ambassador Killing in Kabul 9. The Relations of Afghanistan and Pakistan in the Era of Noor Mohammad (Taraake) 10. Noor Mohammad (Taraake) Assassination Result 11. Who Was Noor Mohammad (Taraake)? 12. Hafizullah Amin's Three Months Government 13. Hafizullah Amin's Introduction and Background 14. Legality and Justice 15. Amin, the Establisher of an Anarchistic Administration 16. Agha Shahi Trip Canceling Riot to Kabul 17. How Amin Was Killed? 18. Russian Military Attack on Afghanistan 19. National and International Reactions over Russian Attack on Afghanistan 20. The (Jihaad) Announcement Against Russians 21. (Jihadee) Groups and Donation Amount 22. (Babrak Karmal) Start Work at the Peak of Public Hate 23. (Babrak Karmal) Introduction 24. Russian Plans and (Babrak Karmal) 25. The Start of Cultural Descending 26. Dr. Najibullah Government 27. Coup Against Najib and Government Collapsing 28. The (Jihadee) Groups Government 29. The (Taliban) Movement
Pre-requisite مخکینی اړین مضامین	None
Related Courses اړونده مضامین	None
Teaching and Learning methods د تدریس میتود	Lectures, tutorials and assignments
Computer Knowledge د کمپیوتر زده کړې ته اړتیا	Moderate Computer Knowledge such as, using MS Word
Course Materials and References د مضمون درسي مواد او اخلیکونه	<u>Text Books:</u> <u>درسي کتاب</u> (Atayee), Mohammad Ibrahim (2011). <i>An Overview to the contemporary history of Afghanistan</i> . Maiwand publishing society
	<u>Reference:</u> <u>اخلیکونه</u>

	<ul style="list-style-type: none"> American Encyclopedia Atayea, Mohammad Ibrahim, <i>Kheel aw weesh</i> Attaullah, Qazi, <i>Da Pashtoo Tarekh</i> Britanica Encyclopedia Dr. Bello, <i>Da Afghanistan Tokamona</i> Jamaluddin, Sayeed, <i>Tatamah-ul-bayan Fe Tareekh Afghan</i> Khatak, Khusal Khan, <i>Swat Namah</i> Nomyali, Mohammad Anwar, <i>Da Pahtoo da Tolaniz Mabadi</i> 							
Evaluation activities and Grades د ارزوني فعاليتونه او نمري								
Activity فعاليت	Scope هدف	Marks نمري						
Attendance and class contribution حاضري او په درس كې برخه اخستل	Attending class, contributions to knowledge and relationships with the group.	5						
Assignments كورني دنده	Solving the indicated problems from the problem list and submitting on time.	5						
Laboratory and field trip reports د لابراتوار/ ساحي راپورونه	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion and implication.	/						
Quizzes صنفي ارزوني	Quizzes include teaching materials and assignments from two previous classes.	10						
Midterm exam منځني ازموينه	The midterm exam includes the covered topics.	20						
Final exam وروستي ازموينه	The final exam includes the covered topics after the midterm exam.	60						
	Total Course Marks د كورس مجموعي نمري	100						
Relationship of this Course to Program Learning Outcome د مضمون اړيکه د څانگې له كليدي بشونيزو موخو سره								
No.	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7

		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team
1	Understanding the contemporary history of Afghanistan	1	1	1	2	2	1	1
2	The extend and borders of Afghanistan through from 18 to 20 centuries	1	1	1	2	2	1	1
3	The first Afghan –Anglo War	1	1	1	2	2	1	1
Total		1	1	2	2	1	1	1
Average		1.2						
1= Some relation 2= Moderate relation 3=Extensive relation								

Sh. Isi 0101 Theology I: Islamic Outlook (IO)

Item موضوع	Description توضیحات		
Title عنوان یا مضمون	Sh. Isi 0101 Theology I: Islamic Outlook (IO)		
Credits and no. of hour د کړېدونو او درسي ساعتونو شمير	Total ټوليزه	Theoretic نظري	Practical عملي
	1	1	0
Offering year and semester د تدريس کال او سمسټر	First year - First semester		
Aim موخي	The course is designed to introduce students on the subject of purpose of human existence in the universe.		

Key Learning Outcomes كليدي بنوونيز نتايج	Key learning outcomes of this course should be as follows: <ul style="list-style-type: none"> • Importance of faith in human life • Positive understanding of universe • Aim of creation • Human as a responsible part of universe • Purpose of life
Academic Staff Responsible د تدريس مسنول استاد	
Syllabus مفردات	<p>I. <u>GENERAL INTRODUCTION</u></p> <ol style="list-style-type: none"> 1. Objectives 2. Importance 3. Resources <p>II. <u>ISLAMIC OUTLOOK</u></p> <ol style="list-style-type: none"> 1. Properties of IO <p>III. <u>MATTERS IN IO</u></p> <ol style="list-style-type: none"> 1. Faith 2. Islamic Anthropology 3. Islam and Nature 4. Allah, The Creator
Pre-requisite مخکيني اړين مضامين	None
Related Courses اړونده مضامين	PW, IMS, ISS, IPS, IES, QCT and IC.
Teaching and Learning methods د تدريس ميتود	Lectures, tutorials and assignments
Computer Knowledge د کمپيوتر زده کړې ته اړتيا	Moderate Computer Knowledge such as, using MS Word, MS Excel, MS and PowerPoint.
Course Materials and References د مضمون درسي مواد او اخليکونه	<p><u>Text Books:</u></p> <p><u>درسي کتاب</u></p> <ul style="list-style-type: none"> • Dayee , Abdul Zahir ,Translation by (Mahmood Marhoon) (1389 Hij-Sham) Islamic outlook, Al-azhar publishing society <p><u>Reference:</u></p>

	<u>اخليکونه</u> <ul style="list-style-type: none"> Jahed , Abdul Wahid (1391 Hij- Sham) Islamic worldview, Resalat publisher Lecture notes of Islamic studies instructors, Kabul university (1384 Hij-Sham), Islamic worldview 							
Evaluation activities and Grades د ارزوني فعاليتونه او نمري								
Activity فعاليت	Scope هدف	Marks نمري						
Attendance and class contribution حاضري او په درس کي برخه اخستل	Attending class, contributions to knowledge and relationships with the group.	5						
Assignments کورني دنده	Solving the indicated problems from the problem list and submitting on time.	5						
Laboratory and field trip reports د لابراتوار/ ساحي راپورونه	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion and implication.	/						
Quizzes صنفي ارزوني	Quizzes include teaching materials and assignments from two previous classes.	10						
Midterm exam منځني ازموينه	The midterm exam includes the covered topics.	20						
Final exam وروستي ازموينه	The final exam includes the covered topics after the midterm exam.	60						
	Total Course Marks د کورس مجموعي نمري	100						
Relationship of this Course to Program Learning Outcome د مضمون اړیکه د ځانگي له کلیدي بنوونیزو موخو سره								
No.	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7

		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team
1	Importance of faith in human life	1	1	1	2	2	1	1
2	Positive understanding of universe	1	1	1	2	2	1	1
3	Aim of creation	1	1	1	2	2	1	1
4	Human as a responsible part of universe	1	1	1	2	2	1	1
5	Purpose of life	1	1	1	2	2	1	1
Total		1	1	1	2	2	1	1
Average		1.2						
1= Some relation 2= Moderate relation 3= Extensive relation								

Sh. Isi 0201 Theology II: Philosophy of Worship (PW)

Item موضوع	Description توضیحات		
Title عنوان یا مضمون	Sh. Isi 0201 Theology II: Philosophy of Worship (PW)		
Credits and no. of hour د کړېدونو او درسي ساعتونو شمیر	Total ټوليزه	Theoretic نظري	Practical عملي
	1	1	0
Offering year and semester د تدريس کال او سمسټر	First year - Second semester		
Aim موخي	This course aims to provide information on criteria, importance, and benefits of worshipping Allah.		
Key Learning Outcomes	Key learning outcomes of this course follow: <ul style="list-style-type: none"> Generality of Worship 		

کلیدی بنوونیز نتایج	<ul style="list-style-type: none"> • Criteria for Worship • Objectives of Worship • Importance of Worship • Needs for Worship • Benefits of Worship 	
Academic Staff Responsible د تدریس مسنول استاد		
Syllabus مفردات	<p>I. <u>GENERAL INTRODUCTION</u></p> <p>II. <u>WORSHIP IN ISLAM</u></p> <ol style="list-style-type: none"> 1. Criteria 2. Objectives 3. Generality <p>III. <u>BRANCHES IN ISLAM AND THEIR PHILOSOPHY</u></p> <ol style="list-style-type: none"> 1. Faith (Shahadat) 2. Prayer (Salaat) 3. Fasting (Saum) 4. Islamic Tax (Zakaat) 5. Pilgrimage (Hajj) <p>IV. <u>INVENTION IN WORSHIP (BEDA'AT)</u></p>	
Pre-requisite مخکینی اړین مضامین	Islamic Outlook (IO)	
Related Courses اړونده مضامین	IMS, ISS, IPS, IES, QCT and IC.	
Teaching and Learning methods د تدریس میتود	Lectures, tutorials, and assignments	
Computer Knowledge د کمپیوتر زده کړې ته اړتیا	Moderate computer knowledge such as MS Word, MS Excel, MS, and PowerPoint.	
Course Materials and References د مضمون درسي مواد او اخلیکونه	<p><u>Text Books:</u></p> <p><u>درسي کتاب</u></p> <ul style="list-style-type: none"> • Azizi, Shere zad (1389 Hij-Sham), <i>Worshipping jurisprudence (Feqha) in Islam</i> 	
	<p><u>Reference:</u></p> <p><u>اخلیکونه</u></p> <ul style="list-style-type: none"> • Qarzawi, Yusuf. Translation by Saif-u-rahman Habibi (2007), <i>Worship in Islam</i>, New Kabul book store • Rahim , Shah waliullah Ben Abdul (1413 Hij-Qam), <i>Hujjatullah-hel-baligha</i> 	
Evaluation activities and Grades د ارزونې فعالیتونه او نمرې		
Activity	Scope	Marks

فعالئ	هءف	نمري
Attendance and class contribution حاضري او په درس كي برخه اخستل	Attending class, contributions to knowledge and relationships with the group.	5
Assignments كورني دنه	Solving the indicated problems from the problem list and submitting on time.	5
Laboratory and field trip reports د لابراتوار/ ساحي راپورونه	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion and implication.	
Quizzes صنفي ارزوني	Quizzes include teaching materials and assignments from two previous classes.	10
Midterm exam منځني ازموينه	The midterm exam includes the covered topics.	20
Final exam وروستي ازموينه	The final exam includes the covered topics after the midterm exam.	60
	Total Course Marks د كورس مجموعي نمري	100

Relationship of this Course to Program Learning Outcome

د مضمون اړيکه د ځانگي له کليدي بنوونيزو موخو سره

No.	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7
		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team
1	Generality of Worship	1	1	1	1	1	1	1
2	Criteria for Worship	1	1	1	2	2	1	1
3	Objectives of Worship	1	1	1	1	1	1	1
4	Importance of Worship	1	1	1	2	2	1	1

5	Needs for Worship	1	1	1	1	1	1	1
6	Benefits of Worship	1	1	1	1	1	1	1
Total		1	1	1	1.33	1.33	1	1
Average		1.1						
1= Some relation 2= Moderate relation 3=Extensive relation								

Sh. Isi 0301 Theology III: Islamic Moral System (IMS)

Item موضوع	Description توضیحات		
Title عنوان یا مضمون	Sh. Isi 0301 Theology III: Islamic Moral System (IMS)		
Credits and no. of hour د کړېدونو او درسي ساعتونو شمير	Total ټوليزه	Theoretic نظري	Practical عملي
	1	1	0
Offering year and semester د تدريس کال او سمسټر	Second year - First semester		
Aim موخي	This course aims to provide information on moral values of Islam.		
Key Learning Outcomes کلیدي بنوونيز نتيچ	<p>Key learning outcomes of this course follow:</p> <ul style="list-style-type: none"> • Importance of morality • Relation between soul and body • Close relation between faith and morality • Importance of morality • Resources of morality in Islam • Islamic moral values • Immoralities • Reasons for immorality • Bad effects of immorality on society 		
Academic Staff Responsible د تدريس مسنول استاد			
Syllabus مفردات	<p>I. <u>GENERAL INTRODUCTION</u></p> <p>II. <u>RESOURCES OF IMS</u></p> <p>III. <u>OBJECTIVES OF IMS</u></p> <p>IV. <u>ISLAMIC MORAL VALUES</u></p>		

	<p>1. Integrity 2. Prosperity 3. Cooperation 4. Dedication 5. Modesty</p> <p>V. <u>SOCIAL MORAL VALUES</u></p> <p>1. Justice 2. Respect 3. Positivism 4. Cooperation 5. Remission</p> <p>VI. <u>INDIVIDUAL IMMORALITIES</u></p> <p>1. Arrogance 2. Lying 3. Disloyalty 4. Stinginess 5. Pessimism 6. Fanatics 7. Jealousy 8. Fanaticism</p> <p>VII. <u>SOCIAL IMMORALITIES</u></p> <p>1. Mockery 2. Abusing 3. Injustice 4. Backbiting 5. Prodigality 6. Hatred</p> <p>VIII. <u>REASONS FOR IMMORTALITY</u></p> <p>IX. <u>BAD OUTCOMES OF SOCIAL IMMORALITIES</u></p> <p>X. <u>TREATMENT OF IMMORALITIES IN ISLAM</u></p>
Pre-requisite مخکینی ارین مضامین	Islamic Outlook (IO)
Related Courses ارونده مضامین	PW, ISS IPS, IES, QCT and IC.
Teaching and Learning methods د تدریس میتود	Lectures, tutorials, and assignments
Computer Knowledge د کمپیوتر زده کری ته اړتیا	Moderate computer knowledge such as MS Word, MS Excel, and MS, PowerPoint.
Course Materials and References	<u>Text Books:</u> <u>درسی کتاب</u>

د مضمون درسي مواد او اخليكونه	<ul style="list-style-type: none"> Alghzalee , Mohammad Ben Mohammad, <i>Ehya-e-Ulomidden</i> 						
	<p>Reference:</p> <p><u>اخليكونه</u></p> <ul style="list-style-type: none"> Fatimi , Said Ahmad, <i>Ethical system in Islam</i> Nadawi, Said suliman, Translated by Mowlana Aziz Rahman Saiffee (1390 Hij-Sham), <i>Nabawi Akhlaq</i> 						
Evaluation activities and Grades د ارزوني فعاليتونه او نمري							
Activity فعاليت	Scope هدف					Marks نمري	
Attendance and class contribution حاضري او په درس كې برخه اخستل	Attending class, contributions to knowledge and relationship with the group.					5	
Assignments كورني دنده	Solving the indicated problems from the problem list and submitting on time.					5	
Laboratory and field trip reports د لابراتوار/ ساحي راپورونه	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion and implication.					/	
Quizzes صنفي ارزوني	Quizzes include teaching materials and assignments from two previous classes.					10	
Midterm exam منخني ازموينه	The midterm exam includes the covered topics.					20	
Final exam وروستي ازموينه	The final exam includes the covered topics after the midterm exam.					60	
	Total Course Marks د كورس مجموعي نمري					100	
Relationship of this Course to Program Learning Outcome د مضمون اړيکه د ځانګې له کلیدي بڼوونيزو موخو سره							
No.	Course Outcomes	Program Outcomes					
		1	2	3	4	5	6

		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team
1	Importance of morality	1	1	1	2	2	1	2
2	Relation between soul and body	1	1	1	2	2	1	2
3	Close relation between faith and morality	1	2	1	2	2	1	1
4	Importance of Morality	1	1	1	2	2	1	1
5	Resources of morality in Islam	1	1	1	2	2	1	1
6	Islamic moral values	1	1	1	2	2	2	2
7	Immoralities	1	1	1	2	2	3	3
8	Reasons for immorality	1	1	1	1	2	2	2
	Bad effects of immorality on society							
Total		1	1.12	1	1.87	2	1.5	1.75
Average		2.0						
		1= Some relation		2= Moderate relation		3= Extensive relation		

Sh.Isi 0401 Theology IV: Islamic Social System (ISS)

Item موضوع	Description	توضیحات
---------------	-------------	---------

Title عنوان يا مضمون	Sh.Isi 0401 Theology IV: Islamic Social System (ISS)		
Credits and no. of hour د کړېدونو او درسي ساعتونو شمير	Total ټوليزه	Theoretic نظري	Practical عملي
	1	1	0
Offering year and semester د تدريس کال او سمسټر	Second year - Second semester		
Aim موخي	This course provides insight on interrelation between individual and society.		
Key Learning Outcomes کلیدي ښوونيز نتايج	<p>Key learning outcomes of this course follow:</p> <ul style="list-style-type: none"> • Interrelations between individual and society • Principles of social life • Structure of social life • Structure of Islamic family • Rights and responsibilities of individual in society • Neighbor rights 		
Academic Staff Responsible د تدريس مسؤل استاد			
Syllabus مفردات	<p>I. <u>GENERAL INTRODUCTION</u></p> <p>II. <u>PRINCIPLES OF ISS</u></p> <p>III. <u>PROPERTIES OF ISS</u></p> <p>IV. <u>OBJECTIVES OF ISS</u></p> <p>V. <u>STRUCTURE OF ISS</u></p> <p>1. Individual</p> <p>2. Family</p> <p>3. Society</p> <p>VI. <u>SOCIAL RELATIONS</u></p> <p>VII. <u>SOCIAL RESPONSIBILITIES</u></p> <p>VIII. <u>SOCIAL REFORM</u></p>		
Pre-requisite مخکيني اړين مضامين	Islamic Outlook (IO)		
Related Courses اړونده مضامين	PW, IMS, IPS, IES, QCT and IC.		
Teaching and	Lectures, tutorials, and assignments		

Learning methods د تدریس میتود		
Computer Knowledge د کمپیوتر زده کړې ته اړتیا	Moderate computer knowledge such as MS Word, MS Excel, and MS PowerPoint.	
Course Materials and References د مضمون درسي مواد او اخلیکونه	<u>Text Books:</u> <u>درسي کتاب</u> <ul style="list-style-type: none"> Zai , Zahidi Ahmad, <i>Social system in Islam</i> 	
	<u>Reference:</u> <u>اخلیکونه</u> <ul style="list-style-type: none"> Alkabisee, Dr. Ahmad (1428 Hij-Qam), <i>Alahwa-lul-shkhseeya</i> Zaidan, Abdul Karim, Translation by Abdul Hakim Amal (1407 Hij-Qam), <i>Usoulloddawa</i> 	
Evaluation activities and Grades د ارزونې فعالیتونه او نمرې		
Activity فعالیت	Scope هدف	Marks نمرې
Attendance and class contribution حاضري او په درس کې برخه اخستل	Attending class, contributions to knowledge and relationships with the group.	5
Assignments کورني دنده	Solving the indicated problems from the problem list and submitting on time.	5
Laboratory and field trip reports د لابراتوار/ ساحي راپورونه	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion and implication.	/
Quizzes صنفي ارزونې	Quizzes include teaching materials and assignments from two previous classes.	10
Midterm exam منځنۍ ازموینه	The midterm exam includes the covered topics.	20
Final exam وروستۍ ازموینه	The final exam includes the covered topics after the midterm exam.	60
	Total Course Marks د کورس مجموعي نمرې	100
Relationship of this Course to Program Learning Outcome د مضمون اړیکه د څانګې له کلیدي بنوونیزو موخو سره		
No.	Course Outcomes	Program Outcomes

		1	2	3	4	5	6	7
		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team
1	Interrelations between individual and society	1	2	2	3	3	3	3
2	Principles of social life	1	1	2	3	2	3	3
3	Structure of social life	1	2	1	2	3	2	3
4	Structure of Islamic family	1	1	2	2	2	2	2
5	Rights and responsibilities of individual in society	1	2	2	3	3	3	3
6	Neighbor rights	1	2	2	2	2	3	3
Total		1	1.6	1.8	2.5	2.5	2.6	2.8
Average		2.1						
1= Some relation 2= Moderate relation 3= Extensive relation								

Sh. Isi 0501 Theology V: Islamic Political System (IPS)

Item موضوع	Description توضیحات		
Title عنوان یا مضمون	Sh. Isi 0501 Theology V: Islamic Political System (IPS)		
Credits and no. of hour د کربدتونو او درسي ساعتونو شمیر	Total ټولیزه	Theoretic نظري	Practical عملي
	1	1	0
Offering year and semester د تدریس کال او سمستر	Third year - First semester		
Aim موخي	This course provides insight on political system and its structure in Islam.		
Key Learning Outcomes کلیدي ښوونیز نتایج	<p>Key learning outcomes of this course follow:</p> <ul style="list-style-type: none"> • Nature of politics in Islam • Relation between Islam and politics • Sentence of Secularism • Islamic government and its structure • International relations of Islamic state • Importance of peace in Islam 		
Academic Staff Responsible د تدریس مسؤل استاد			
Syllabus مفردات	<p>I. <u>GENERAL INTRODUCTION</u></p> <p>II. <u>PRINCIPLES OF IPS</u></p> <p>III. <u>PROPERTIES OF IPS</u></p> <p>IV. <u>OBJECTIVES OF IPS</u></p> <p>V. <u>ISLAM AND POLITICS</u></p> <p>VI. <u>SECULARISM</u></p> <p>VII. <u>GOVERNMENT IN IPS</u></p> <p>VIII. <u>STRUCTURE OF ISLAMIC STATE</u></p> <p>IX. <u>RESPONSIBILITIES OF ISLAMIC STATE</u></p> <p>X. <u>GOVERNMENTAL RELATIONS</u></p> <p>XI. <u>PEACE IN IPS</u></p>		
Pre-requisite مخکيني اړين مضامين	Islamic Outlook (IO)		

Related Courses اړونده مضامين	PW, IMS, ISS, IES, QCT and IC.	
Teaching and Learning methods د تدريس ميتود	Lectures, tutorials, and assignments	
Computer Knowledge د كمپيوتر زده كړې ته اړتيا	Moderate computer knowledge such as MS Word, MS Excel, and MS PowerPoint.	
Course Materials and References د مضمون درسي مواد او اخليكونه	<u>Text Books:</u> <u>درسي كتاب</u>	
	<ul style="list-style-type: none"> Rahmani, Mowlawi Sharif (1389 Hij-Sham), <i>Islamic political science</i> 	
<u>Reference:</u> <u>اخليكونه</u>		
<ul style="list-style-type: none"> Qaiba Dainoree, Abu Mohammad Ben Muslim –Ebne- (1418 Hij-Qam), <i>Al-Emamah- wal- seeyasah</i> Zai, Zahidi Ahmad (1383 Hij-Sham), <i>Islamic political and republic system</i> 		
Evaluation activities and Grades د ارزوني فعاليتونه او نمري		
Activity فعاليت	Scope هدف	Marks نمري
Attendance and class contribution حاضري او په درس كې برخه اخستل	Attending class, contributions to knowledge and relationships with the group.	5
Assignments كورني دنده	Solving the indicated problems from the problem list and submitting on time.	5
Laboratory and field trip reports د لابراتوار/ ساحي راپورونه	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion and implication.	
Quizzes صنفي ارزوني	Quizzes include teaching materials and assignments from two previous classes.	10
Midterm exam	The midterm exam includes the	20

منځنی ازموینه	covered topics.							
Final exam وروستی ازموینه	The final exam includes the covered topics after the midterm exam.	60						
	Total Course Marks د کورس مجموعي نمرې	100						
Relationship of this Course to Program Learning Outcome د مضمون اړیکه د ځانګې له کلیدي بنوونیزو موخو سره								
No.	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7
		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team
1	Nature of politics in Islam	1	1	1	2	2	1	2
2	Relation between Islam and politics	1	1	1	2	2	1	2
3	Sentence of Secularism	1	2	1	2	2	1	1
4	Islamic government and its structure	1	1	1	2	2	1	1
5	International relations of Islamic state	1	1	1	2	2	1	1
6	Importance of peace in Islam	1	1	1	2	2	2	2
Total		1	1.16	1	2	2	1.16	1.5
Average		1.40						
		1= Some relation		2= Moderate relation		3= Extensive relation		

Sh. Isi 0601 Theology VI: Islamic Economic System (IES)

Item موضوع	Description توضیحات		
Title عنوان یا مضمون	Sh. Isi 0601 Theology VI: Islamic Economic System (IES)		
Credits and no. of hour د کړېدونو او درسي ساعتونو شمیر	Total ټوليزه	Theoretic نظري	Practical عملي
	1	1	0
Offering year and semester د تدریس کال او سمستر	Third year - Second semester		
Aim موخي	This course aims to provide information on relation between Quran and contemporary technology.		
Key Learning Outcomes کلیدي بنوونیز نتایج	<p>Key learning outcomes of this course follow:</p> <ul style="list-style-type: none"> • Importance of economics in human life • Nature of economics in Islam • Revenue and expenditure in Islam • Property and related issues in Islam • Financial worship 		
Academic Staff Responsible د تدریس مسنول استاد			
Syllabus مفردات	<p>I. <u>GENERAL INTRODUCTION</u></p> <p>II. <u>PRINCIPLES OF IES</u></p> <p>III. <u>PROPERTIES OF IES</u></p> <p>IV. <u>IMPORTANCE OF IES</u></p> <p>V. <u>RESOURCES OF IES</u></p> <p>VI. <u>MAJOR PHILOSOPHIES IN ECONOMICS</u></p> <p>VII. <u>PROPERTY IN IES</u></p>		
Pre-requisite مخکيني اړين مضامين	Islamic Outlook (IO)		
Related Courses اړونده مضامين	PW, IMS, ISS, IPS, QCT and IC.		
Teaching and Learning methods د تدریس میتود	Lectures, tutorials, and assignments		

Computer Knowledge د کمپیوتر زده کړې ته اړتیا	Moderate computer knowledge such as MS Word, MS Excel, and MS PowerPoint.							
Course Materials and References د مضمون درسي مواد او اخلیکونه	<u>Text Books:</u> <u>درسي کتاب</u>							
	<u>Reference:</u> <u>اخلیکونه</u>							
Evaluation activities and Grades د ارزونې فعالیتونه او نمرې								
Activity فعالیت	Scope هدف					Marks نمرې		
Attendance and class contribution حاضري او په درس کې برخه اخستل	Attending class, contributions to knowledge and relationships with the group.					5		
Assignments کورني دنده	Solving the indicated problems from the problem list and submitting on time.					5		
Laboratory and field trip reports د لابراتوار / ساحي راپورونه	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion and implication.					/		
Quizzes صنفي ارزونې	Quizzes include teaching materials and assignments from two previous classes.					10		
Midterm exam منځني ازمويڼه	The midterm exam includes the covered topics.					20		
Final exam وروستي ازمويڼه	The final exam includes the covered topics after the midterm exam.					60		
	Total Course Marks د کورس مجموعي نمرې					100		
Relationship of this Course to Program Learning Outcome د مضمون اړیکه د ځانګې له کلیدي بشوونیزو موخو سره								
No.	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7

		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team
1	Importance of economics in human life	2	1	1	2	2	1	2
2	Nature of economics in Islam	1	1	1	2	2	1	2
3	Revenue and expenditure in Islam	2	1	1	2	2	1	1
4	Property and related issues in Islam	1	1	1	1	2	1	1
5	Financial worship	1	1	1	2	2	1	2
Total		1.4	1	1	1.8	2	1	1.6
Average		1.4						
1= Some relation 2= Moderate relation 3= Extensive relation								

Sh.Isi 0701 Theology VII: Quran And Contemporary Technology (QCT)

Item موضوع	Description توضیحات		
Title عنوان یا مضمون	Sh.Isi 0701 Theology VII: Quran And Contemporary Technology (QCT)		
Credits and no. of hour د کړېدونو او درسي ساعتونو شمير	Total ټوليزه	Theoretic نظري	Practical عملي
	1	1	0
Offering year and semester د تدريس کال او سمسټر	Fourth year - First semester		
Aim موخي	This course aims to provide information on relation between Quran and contemporary technology.		

Key Learning Outcomes کلیدی بنیونیز نتایج	Key learning outcomes of this course follow: <ul style="list-style-type: none"> • Relation between Quran and modern science • Generality of Quranic teachings • Technology as mean of spreading Islam • Modern sciences prove Islam • Positive usage of technology 	
Academic Staff Responsible د تدریس مسؤل استاد		
Syllabus مفردات	I. <u>GENERAL INTRODUCTION</u> II. <u>A GLANCE TO QURAN</u> III. <u>QURAN AND CONTEMPORARY SCIENCES</u> IV. <u>QURAN AND MEDICINE</u> V. <u>QURAN AND ENGINEERING</u> VI. <u>QURAN AND GEOGRAPHY</u> VII. <u>QURAN AS BASE FOR CIVILIZATION</u> VIII. <u>ISLAM AND UNPROVEN IDEAS</u>	
Pre-requisite مخکینی اړین مضامین	Islamic Outlook (IO)	
Related Courses اړونده مضامین	PW, IMS, ISS, IPS, IES and IC.	
Teaching and Learning methods د تدریس میتود	Lectures, tutorials, and assignments	
Computer Knowledge د کمپیوتر زده کړې ته اړتیا	Moderate computer knowledge such as MS Word, MS Excel, and MS PowerPoint.	
Course Materials and References د مضمون درسي مواد او اخلیکونه	<u>Text Books:</u> <u>درسي کتاب</u> <ul style="list-style-type: none"> • Haroon Yahya, translation by Mohammad shafiq Haqpal (1387 Hij-Sham), Da quran Eajaz 	
	<u>Reference:</u> <u>اخلیکونه</u> <ul style="list-style-type: none"> • Qatan, Khalil Al (1421 Hij-Qam), Fe Ulom-El-quran • Sabir, Abdul Wasi (1390 Hij-Sham), Quran and science 	
Evaluation activities and Grades د ارزونې فعالیتونه او نمري		
Activity فعالیت	Scope هدف	Marks نمري

Attendance and class contribution حاضري او په درس كې برخه اخستل	Attending class, contributions to knowledge and relationships with the group.	5
Assignments كورني دنده	Solving the indicated problems from the problem list and submitting on time.	5
Laboratory and field trip reports د لابراتوار/ ساحي راپورونه	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion and implication.	
Quizzes صنفي ارزوني	Quizzes include teaching materials and assignments from two previous classes.	10
Midterm exam منځني ازموينه	The midterm exam includes the covered topics.	20
Final exam وروستي ازموينه	The final exam includes the covered topics after the midterm exam.	60
	Total Course Marks د كورس مجموعي نمري	100

Relationship of this Course to Program Learning Outcome
د مضمون اړيکه د ځانګړي له کليدي بنوونيزو موخو سره

No.	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7
		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team
1	Relation between Quran and modern science	1	1	1	2	2	1	1
2	Generality of Quranic teachings	1	1	1	2	2	1	1
3	Technology as mean of spreading Islam	1	1	1	2	2	1	1
4	Modern sciences prove	1	1	1	2	2	1	1

	Islam							
5	Positive usage of technology	1	1	1	2	2	1	1
Total		1	1	1	2	2	1	1
Average		1.28						
1= Some relation 2= Moderate relation 3= Extensive relation								

Sh. Isi 0801 Theology VIII: Islamic Civilization (IC)

Item موضوع	Description توضیحات		
Title عنوان یا مضمون	Sh. Isi 0801 Theology VIII: Islamic Civilization (IC)		
Credits and no. of hour د کربدتونو او درسي ساعتونو شمير	Total توليزه	Theoretic نظري	Practical عملي
	1	1	0
Offering year and semester د تدريس کال او سمسټر	Fourth year - Second semester		
Aim موخي	This course aims to provide information on local history of Islam.		
Key Learning Outcomes کلیدي بنوونيز نتايج	Key learning outcomes of this course follow: <ul style="list-style-type: none"> • Importance of understanding • Islamic civic history • Coherence of Islam with new area • Generality of Islamic civilization 		
Academic Staff Responsible د تدريس مسنول استاد			
Syllabus مفردات	I. <u>GENERAL INTRODUCTION</u> II. <u>ELEMENTS OF CIVILIZATION</u> III. <u>PROPERTIES OF IC</u> IV. <u>ROLE OF IC IN HUMAN DEVELOPMENT</u> V. <u>REASONS OF MUSLIMS BACKWARDNESS</u>		
Pre-requisite مخکيني اړين مضامين	Islamic Outlook (IO)		

Related Courses اړونده مضامين	PW, IMS, ISS, IPS, IES and QCT.	
Teaching and Learning methods د تدريس ميتود	Lectures, tutorials, and assignments	
Computer Knowledge د كمپيوتر زده كړې ته اړتيا	Moderate computer knowledge such as MS Word, MS Excel, and MS PowerPoint.	
Course Materials and References د مضمون درسي مواد او اخليكونه	<u>Text Books:</u> <u>درسي كتاب</u> <ul style="list-style-type: none"> Zahidi Ahmad zai, <i>Islamic civilization</i> 	
	<u>Reference:</u> <u>اخليكونه</u> <ul style="list-style-type: none"> Naizai, Dr. Mustafa (1391 Hij-Sham), The descending caused of Islamic Ummah Shahood, Ali Ben Naif Al, Al hizarh at-ul- Islamiayah Bain al Esalat-ul- mазee Wa amaal Fel Mustaqbal 	
Evaluation activities and Grades د ارزوني فعاليتونه او نمري		
Activity فعاليت	Scope هدف	Marks نمري
Attendance and class contribution حاضري او په درس كې برخه اخستل	Attending class, contributions to knowledge and relationships with the group.	5
Assignments كورني دنده	Solving the indicated problems from the problem list and submitting on time.	5
Laboratory and field trip reports د لابراتوار/ ساحي راپورونه	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion and implication.	
Quizzes صنفي ارزوني	Quizzes include teaching materials and assignments from two previous classes.	10
Midterm exam منځني ازموينه	The midterm exam includes the covered topics.	20

Final exam وروستی ازموینه	The final exam includes the covered topics after the midterm exam.	60						
	Total Course Marks د کورس مجموعي نمري	100						
Relationship of this Course to Program Learning Outcome د مضمون اړیکه د څانګې له کلیدي بنوونیزو موخو سره								
No.	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7
		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team
1	Importance of understanding	1	1	1	2	2	1	1
2	Islamic civic history	1	1	1	2	2	1	1
3	Coherence of Islam with new area	1	1	1	2	2	1	1
4	Generality of Islamic civilization	1	1	1	2	2	1	1
Total		1	1	1	2	2	1	1
Average		1.28						
1= Some relation 2= Moderate relation 3= Extensive relation								

4.6.2. Basic Courses {56credits (38%)}

En. Ene 0104 Calculus I (Differential & Integral Calculus)

Item موضوع	Description توضیحات		
Title عنوان یا مضمون	En. Ene 0104 Calculus I (Differential & Integral Calculus)		
Credits and no. of hour د کربدتونو او درسي ساعتونو شمير	Total ټوليزه	Theoretic نظري	Practical عملي
	4	4	0
Offering year and semester د تدريس کال او سمسټر	First year - First semester		
Aim موخي	The objective of this course is to provide a firm foundation in the concepts and techniques of the calculus, including standard functions, limits, continuity, differentiation, integration, differential equations, Sequences and Series.		
Key Learning Outcomes کلیدي بشونيز نتيچ	<p>Key learning outcomes of this course follow:</p> <ul style="list-style-type: none"> • Understanding the firm concepts of limits and functions • Able to understand the concepts of differentiation and integration and its application • Develop the idea of different technique of integration • Able to understand the firm concepts of differential equation, parametric equation and polar coordinates, infinite sequences and series 		
Academic Staff Responsible د تدريس مسنول استاد			
Syllabus مفردات	<p>I. <u>FUNCTIONS AND THEIR REPRESENTATIONS</u></p> <ol style="list-style-type: none"> 1. Representation of functions 2. Essential functions 3. New functions from old functions 4. Exponential Functions 5. Inverse functions and Logarithms <p>II. <u>LIMITS AND THEIR PROPERTIES</u></p> <ol style="list-style-type: none"> 1. Limits of functions 2. Theorems on limits 3. Infinity 4. Special limits 5. Continuity, Right- and left-hand continuity, Continuity in 		

an interval, Theorems on continuity, Piecewise continuity, Uniform continuity

III. DIFFERENTIATION

1. Interpretation of the Derivative
2. Differentiation rules
3. Derivatives of special Functions
4. Hyperbolic Functions
5. Higher order Derivatives
6. Linear Approximations and Differentials

IV. APPLICATIONS OF DIFFERENTIATION

1. Maximum and Minimum Values
2. Mean Value Theorem
3. Indeterminate Forms and L'Hospital's Rule
4. Curve Sketching
5. Optimization Problems
6. Ant derivatives

V. INTEGRATION AND APPLICATIONS OF INTEGRATION

1. Areas and Distances
2. Definite Integral
3. Fundamental Theorem of Calculus
4. Indefinite Integrals and Net Change Theorem
5. Connecting integral and differential calculus
6. Areas between Curves, Volumes, Moment of Inertia

VI. INTEGRATION TECHNIQUES

1. Integration by Parts
2. Trigonometric Integrals
3. Trigonometric Substitution
4. Integration of Rational Functions by Partial Fractions
5. Strategy for Integration
6. Approximate Integration
7. Improper Integrals

VII. DIFFERENTIAL EQUATIONS

1. Modeling with Differential Equations
2. Direction Fields and Euler's Method
3. Separable Equations
4. Exponential Growth and Decay
5. The Logistic Equation
6. Linear Equations
7. Predator-Prey Systems

VIII. PARAMETRIC EQUATION AND POLAR COORDINATES

1. Curves Defined by Parametric Equations
2. Calculus with Parametric Curves
3. Polar Coordinates
4. Areas and Lengths in Polar Coordinates

	<p>5. Conic Sections, Conic Sections in Polar Coordinates</p> <p>IX. <u>INFINITE SEQUENCES AND SERIES</u></p> <ol style="list-style-type: none"> 1. Sequences, Series, convergence or divergence 2. Alternating Series 3. Absolute Convergence and the Ratio and Root Tests 4. Power Series 5. Taylor and Maclaurin Series 6. Binomial Series 	
Pre-requisite مخکيني اړين مضامين	None	
Related Courses اړونده مضامين	Multivariable Calculus for Engineers, Differential Equations, Linear Algebra, Probability & Statistics	
Teaching and Learning methods د تدريس میتود	Lectures, tutorials and assignments	
Computer Knowledge د کمپیوتر زده کړي ته اړتیا	Moderate computer knowledge such as MS Word, MS Excel, MS PowerPoint, and CAD.	
Course Materials and References د مضمون درسي مواد او اخلیکونه	<u>Text Books:</u> <u>درسي کتاب</u> <ul style="list-style-type: none"> • Stewart, James (2011). <i>Calculus</i> (7th Edition). Cengage Learning. 	
	<u>Reference:</u> <u>اخلیکونه</u> <ul style="list-style-type: none"> • Larson, Hostetler and Edwards (2009). <i>Calculus</i> (9th Edition). Cengage Learning • Wrede, Robert C. and Murray Spiegel. <i>Schaum's Outline of Advanced Calculus, Third Edition</i> (Schaum's Outline Series) (3rd Edition). McGraw-Hill 	
Evaluation activities and Grades د ارزوني فعالیتونه او نمرې		
Activity فعالیت	Scope هدف	Marks نمرې
Attendance and class contribution حاضري او په درس کي برخه اخستل	Attending class, contributions to knowledge and relationships with the group.	5
Assignments	Solving the indicated problems from the problem list and submitting on	5

کورني دنده	time.	
Laboratory and field trip reports د لابراتوار/ ساحي راپورونه	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion and implication.	15
Quizzes صنفي ارزوني	The quiz includes teaching materials and assignments from two previous classes.	5
Midterm exam منځنۍ ازموينه	The midterm exam includes the covered topics.	20
Final exam وروستۍ ازموينه	The final exam includes the covered topics after the midterm exam.	50
	Total Course Marks د کورس مجموعي نمري	100

Relationship of this Course to Program Learning Outcome

د مضمون اړیکه د ځانګې له کلیدي بنوونیزو موخو سره

No.	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7
		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team
1	Understanding the firm concepts of limits and functions	1	1	1	2	2	1	1
2	Able to understand the concepts of differentiation and integration and its application	1	1	1	2	2	1	1

3	Develop the idea of different technique of integration	1	1	1	2	2	1	1
4	Able to understand the firm concepts of differential equation, parametric equation and polar coordinates, Infinite Sequences and Series	1	2	1	1	1	1	1
Total		1.3	1.16	1	1.5	1.5	1	1
Average		1.2						
1= Some relation 2= Moderate relation 3=Extensive relation								

En. Ene 0204 Calculus II (Multivariable Calculus for Engineers)

Item موضوع	Description توضیحات		
Title عنوان یا مضمون	En. Ene 0204 Calculus II (Multivariable Calculus for Engineers)		
Credits and no. of hour د کړېدونو او درسي ساعتونو شمير	Total ټوليزه	Theoretic نظري	Practical عملي
	4	4	0
Offering year and semester د تدريس كال او سمستر	First year - Second semester		
Aim موخي	This course is designed to acquire an active knowledge and understanding of the main concepts and techniques of multivariable calculus including differential equations, sequences and series, vectors, partial differentiation, multiple integration and higher order differential equations.		
Key Learning Outcomes كليدي بنوونيز	Key learning outcomes of this course should be as follows: <ul style="list-style-type: none"> • Able to understand the firm concepts of differential equation, parametric equation and polar coordinates, Infinite Sequences and Series 		

<p>نتائج</p>	<ul style="list-style-type: none"> • Understanding the basic idea of the vectors and vector functions • Develop the understanding of geometry of space • Able to understand the basic and application of the functions of several variables, partial differentiation, multiple integration and higher order differential equations
<p>Academic Staff Responsible د تدریس مسئول استاد</p>	
<p>Syllabus مفردات</p>	<p>I. <u>DIFFERENTIAL EQUATIONS</u></p> <ol style="list-style-type: none"> 1. Modeling with Differential Equations 2. Direction Fields and Euler's Method 3. Separable Equations 4. Exponential Growth and Decay 5. The Logistic Equation <p>II. <u>PARAMETRIC EQUATION AND POLAR COORDINATES</u></p> <ol style="list-style-type: none"> 1. Curves Defined by Parametric Equations 2. Calculus with Parametric Curves 3. Polar Coordinates 4. Areas and Lengths in Polar Coordinates 5. Conic Sections, Conic Sections in Polar Coordinates <p>III. <u>INFINITE SEQUENCES AND SERIES</u></p> <ol style="list-style-type: none"> 1. Sequences, Series, convergence or divergence 2. Alternating Series 3. Absolute Convergence and the Ratio and Root Tests 4. Power Series 5. Taylor and Maclaurin Series 6. Binomial Series <p>IV. <u>VECTORS AND THE GEOMETRY OF SPACE</u></p> <ol style="list-style-type: none"> 1. Three-Dimensional Coordinate Systems 2. Vectors 3. Vector products 4. Equations of Lines and Planes 5. Cylinders and Quadric Surfaces 6. Cylindrical and Spherical Coordinates <p>V. <u>VECTOR FUNCTIONS</u></p> <ol style="list-style-type: none"> 1. Vector Functions and Space Curves

	<p>2. Derivatives and Integrals of Vector Functions</p> <p>VI. <u>PARTIAL DIFFERENTIATION</u></p> <ol style="list-style-type: none"> 1. Functions of Several Variables 2. Limits and Continuity 3. Partial Derivatives 4. Tangent Planes 5. Chain Rule 6. Directional Derivatives and the Gradient Vector 7. Maximum and Minimum Values 8. Lagrange Multipliers 9. Higher order partial derivatives <p>VII. <u>MULTIPLE INTEGRALS</u></p> <ol style="list-style-type: none"> 1. Double Integrals over Rectangles 2. Iterated Integrals 3. Double Integrals over General Regions 4. Surface Area 5. Triple Integrals 6. Triple Integrals in Cylindrical and Spherical Coordinates 7. Change of Variables in Multiple Integrals <p>VIII. <u>VECTOR CALCULUS</u></p> <ol style="list-style-type: none"> 1. Vector Fields 2. Line Integrals 3. The Fundamental Theorem for Line Integrals 4. Green's Theorem 5. Curl and Divergence 6. Parametric Surfaces and Their Areas 7. Surface Integrals 8. Stokes' Theorem 9. The Divergence Theorem <p>IX. <u>SECOND-ORDER DIFFERENTIAL EQUATIONS</u></p> <ol style="list-style-type: none"> 1. Second-Order Linear Equations 2. Non homogeneous Linear Equations 3. Applications of Second-Order Differential Equations 4. Series Solutions
Pre-requisite مخکینی ارین مضامین	Calculus I (Differential & Integral Calculus)
Related Courses ارونده مضامین	Differential & Integral Calculus, Differential Equations, Linear Algebra, Probability & Statistics

Teaching and Learning methods د تدریس میتود	Lectures, tutorials and assignments	
Computer Knowledge د کمپیوتر زدہ کری تہ اړتیا	Moderate computer knowledge such as MS Word, MS Excel, MS PowerPoint, and CAD,	
Course Materials and References د مضمون درسي مواد او اخليکونه	<u>Text Books:</u> <u>درسي کتاب</u>	
	<ul style="list-style-type: none"> Stewart, James (2011). <i>Calculus</i> (7th Edition). Cengage Learning. 	
	<u>Reference:</u> <u>اخليکونه</u>	
	<ul style="list-style-type: none"> Larson, Hostetler and Edwards (2009). <i>Calculus</i> (9th Edition). Cengage Learning Wrede, Robert C. and Murray Spiegel. <i>Schaum's Outline of Advanced Calculus, Third Edition</i> (Schaum's Outline Series) (3rd Edition). McGraw-Hill 	
Evaluation activities and Grades د ارزوني فعالیتونه او نمري		
Activity فعالیت	Scope هدف	Marks نمري
Attendance and class contribution حاضري او په درس کي برخه اخستل	Attending class, contribution to knowledge and relationship with the group.	5
Assignments کورني دنده	Solving the indicated problems from the problem list and submitting on time.	5
Laboratory and field trip reports د لابراتوار/ ساحي راپورونه	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion and implication.	15
Quizzes صنفي ارزوني	Quizzes include teaching materials and assignments from two previous classes.	5
Midterm exam منځنی ازموینه	The midterm exam includes the covered topics.	20
Final exam وروستی ازموینه	The final exam includes the covered topics after the midterm exam.	50
	Total Course Marks د کورس مجموعي نمري	100

Relationship of this Course to Program Learning Outcome								
د مضمون اړیکه د څانګې له کلیدي بنوونیزو موخو سره								
No.	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7
		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team
1	Understanding the basic idea of the vectors and vector functions	1	1	1	1	1	1	1
2	Develop the understanding of geometry of space	1	1	1	2	2	1	1
3	Use the techniques, skills, and modern engineering tools necessary for engineering practice	1	1	1	1	1	1	1
4	Apply knowledge and skills to solve problems effectively and efficiently that contributes to the technical advancement of computer engineering.	1	1	1	2	2	1	1
Total		1	1	1	1.5	1.5	1	1
Average		1.14						
1= Some relation		2= Moderate relation		3=Extensive relation				

Ed. Ene 0304 Calculus III (Differential Equations)

Item موضوع	Description توضیحات		
Title عنوان یا مضمون	Ed. Ene 0304 Calculus III (Differential Equations)		
Credits and no. of hour د کړېدونو او درسي ساعتونو شمير	Total ټوليزه	Theoretic نظري	Practical عملي
	4	4	0
Offering year and semester د تدريس کال او سمسټر	Second year - First semester		
Aim موخي	This course is designed to acquire advanced topics of particular importance in engineering applications.		
Key Learning Outcomes کلیدي ښوونيز نتايج	<p>Key learning outcomes of this course should be as follows:</p> <ul style="list-style-type: none"> • Key understanding of the Differential equations • Key understanding of the partial Differential equations • Able to understand the numerical method and its application • Understanding the idea of special functions, fourier series and fourier integrals • Develop the understanding of Laplace transformation • Able to understand the complex analysis • Develop the key of Matrix basic 		
Academic Staff Responsible د تدريس مسنول استاد			
Syllabus مفردات	<p>I. <u>INTRODUCTION TO DIFFERENTIAL EQUATIONS</u></p> <ol style="list-style-type: none"> 1. Definitions and Terminology 2. Initial-Value Problems 3. Differential Equations as Mathematical Models <p>II. <u>FIRST-ORDER DIFFERENTIAL EQUATIONS</u></p> <ol style="list-style-type: none"> 1. Solution Curves Without a Solution 2. Separable Variables 3. Linear Equations 4. Exact Equations 5. Solutions by Substitutions 6. A Numerical Method <p>III. <u>MODELING WITH FIRST-ORDER DIFFERENTIAL EQUATIONS</u></p> <ol style="list-style-type: none"> 1. Linear Models 2. Nonlinear Models 3. Modeling with Systems of First-Order Des 		

	<p>IV. <u>HIGHER-ORDER DIFFERENTIAL EQUATIONS</u></p> <ol style="list-style-type: none"> 1. Preliminary Theory—Linear Equations 2. Reduction of Order 3. Homogeneous Linear Equations with Constant Coefficients 4. Undetermined Coefficients—Superposition Approach 5. Undetermined Coefficients—Annihilator Approach 6. Variation of Parameters 7. Cauchy-Euler Equation 8. Solving Systems of Linear DEs by Elimination 9. Nonlinear Differential Equations <p>V. <u>MODELING WITH HIGHER-ORDER DIFFERENTIAL EQUATIONS</u></p> <ol style="list-style-type: none"> 10. Linear Models: Initial-Value Problems 11. Linear Models: Boundary-Value Problems 12. Nonlinear Models <p>VI. <u>SERIES SOLUTIONS OF LINEAR EQUATIONS</u></p> <ol style="list-style-type: none"> 1. Solutions About Ordinary Points 2. Solutions About Singular Points 3. Special Functions <p>VII. <u>SYSTEMS OF LINEAR FIRST-ORDER DIFFERENTIAL EQUATIONS</u></p> <ol style="list-style-type: none"> 1. Preliminary Theory—Linear Systems 2. Homogeneous Linear Systems 3. Nonhomogeneous Linear Systems 4. Matrix Exponential <p>VIII. <u>PARTIAL DIFFERENTIAL EQUATIONS</u></p> <ol style="list-style-type: none"> 1. Existence and uniqueness 2. Euler-Tricomi equation 3. Equations of first order <p>IX. <u>NUMERICAL METHODS</u></p> <ol style="list-style-type: none"> 1. Direct and iterative methods, 2. Discretization and numerical integration 3. The generation and propagation of errors 4. Interpolation, extrapolation, and regression 5. Solving equations and systems of equations <p>X. <u>SPECIAL FUNCTIONS</u></p> <ol style="list-style-type: none"> 1. Gamma, Beta, Bessel, Legendre <p>XI. <u>FOURIER SERIES AND FOURIER INTEGRALS</u></p> <ol style="list-style-type: none"> 1. Fourier Series 2. Convergence of Fourier Series 3. Generalizations: Fourier Cosine Series: Fourier Sine series 4. Integration and Differentiation of Fourier series 5. Fourier-Legendre Series 6. Fourier-Bessel Series 7. Fourier Integral
--	---

	<p>XII. <u>LAPLACE TRANSFORMS</u></p> <ol style="list-style-type: none"> 1. Definition of the Laplace Transform 2. Inverse Transforms and Transforms of Derivatives 3. Operational Properties I 4. Operational Properties II 5. The Dirac Delta Function 6. Systems of Linear Differential Equations 7. Laplace transforms of some elementary functions 8. Sufficient conditions for existence of Laplace transform 9. Inverse Laplace transforms 10. Laplace transforms of derivatives 11. The unit step function 12. Periodic function 13. Some special theorems on Laplace transform 14. Partial fraction 15. Solutions of differential equations by Laplace transforms 16. Evaluation of improper integrals <p>XIII. <u>COMPLEX ANALYSIS</u></p> <ol style="list-style-type: none"> 1. Complex Functions 2. Integration 3. Cauchy's Theorem 4. Taylor and Laurent Series <p>XIV. <u>MATRICES</u></p> <ol style="list-style-type: none"> 1. Definition, types and algebra of matrix 2. Adjoint and inverse of a matrix 3. Rank and elementary transformations of matrices 4. Normal and canonical forms 5. Solution of linear equations 6. Quadratic forms 7. Matrix polynomials 8. Caley-hamilton theorem 9. Eigenvalues and eigenvectors
Pre-requisite مخکینی ارین مضامین	Calculus I & II
Related Courses ارونده مضامین	Differential & Integral Calculus, Multivariable Calculus for Engineers, Linear Algebra, Probability & Statistics
Teaching and Learning methods د تدریس میتود	Lectures, tutorials and assignments
Computer Knowledge د کمپیوتر زده کری ته اړتیا	Moderate computer knowledge such as MS Word, MS Excel, MS PowerPoint, and CAD

Course Materials and References د مضمون درسي مواد او اخليكونه	<u>Text Books:</u> <u>درسي كتاب</u>	
	<ul style="list-style-type: none"> Dennis G. Zill, Warren S. Wright, <i>Advanced Engineering Mathematics</i>, 5th Edition, 2014 	
	<u>Reference:</u> <u>اخليكونه</u>	
	<ul style="list-style-type: none"> Dennis G. Zill, <i>First Course in Differential Equations</i>, 9th Edition Howard Anton, Chris Rorres, <i>Elementary Linear Algebra Applications Version</i> (11th Edition) Hildebrand. <i>Advanced Calculus for Applications</i> (2nd Edition) Wrede and Spiegel. <i>Schaum's Outline of Advanced Calculus</i> (2nd Edition) 	
Evaluation activities and Grades د ارزوني فعاليتونه او نمري		
Activity فعاليت	Scope هدف	Marks نمري
Attendance and class contribution حاضري او په درس كې برخه اخستل	Attending class, contributions to knowledge and relationships with the group.	5
Assignments كورني دنده	Solving the indicated problems from the problem list and submitting on time.	5
Laboratory and field trip reports د لابراتوار/ ساحي راپورونه	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion and implication.	15
Quizzes صنفي ارزوني	Quizzes include teaching materials and assignments from two previous classes.	5
Midterm exam منځني ازموينه	The midterm exam includes the covered topics.	20
Final exam وروستي ازموينه	The final exam includes the covered topics after the midterm exam	50
	Total Course Marks د كورس مجموعي نمري	100

Relationship of this Course to Program Learning Outcome								
د مضمون اړیکه د څانګې له کلیدي بنوونیزو موخو سره								
No.	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7
		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team
1	Key understanding of the partial Differential equations	1	1	1	2	2	1	2
2	Able to understand the numerical method and its application	1	1	1	2	2	1	2
3	Understanding the idea of special functions, fourier series and fourier integrals	1	1	1	2	2	1	3
4	Develop the understanding of Laplace transformation	1	1	1	2	2	1	3
5	Able to understand the complex analysis	1	1	1	2	2	1	3
6	Develop the key of probability basic	1	1	1	2	2	2	2
Total		1	1	1	2	2	1.16	2.5
Average		1.52						
1= Some relation 2= Moderate relation 3= Extensive relation								

En. Ene 0404 Calculus IV (Probability and Statistics)

Item موضوع	Description توضیحات
Title عنوان یا مضمون	En. Ene 0404 Calculus IV (Probability and Statistics)
Credits and no. of	Total تولیزه
	Theoretic نظري
	Practical عملي

hour د کړېدونو او درسي ساعتونو شمير	4	4	0
Offering year and semester د تدریس کال او سمستر	Second year - Second semester		
Aim موخي	The objective of this is to introduce students to concepts of probability and statistics necessary to undertake basic modeling and statistical decisions techniques in engineering.		
Key Learning Outcomes کلیدي ښوونیز نتایج	<p>Key learning outcomes of this course should be as follows:</p> <ul style="list-style-type: none"> • Develop the key of probability basic • Use the theory of probability to estimate the likelihood of both discrete and continuous random variables. • Students will be able to calculate summary statistics for sample. • Students will be able to calculate probability related parameters from raw data 		
Academic Staff Responsible د تدریس مسئول استاد			
Syllabus مفردات	<p>I. <u>PROBABILITY BASIC I</u></p> <ol style="list-style-type: none"> 1. Experiments 2. Outcomes 3. Sample space 4. Sample point 5. Events 6. Set algebra 7. Probability & counting tools <p>II. <u>PROBABILITY BASIC II</u></p> <ol style="list-style-type: none"> 1. Independence of events 2. Conditional events 3. Bayes theorem 4. Calculating probability <p>III. <u>INTRODUCTION OF STATISTICS</u></p> <ol style="list-style-type: none"> 1. Frequency distribution 2. Mean median, mode and other measures of central tendency 3. Standard deviation and other measures of dispersion 4. Moments, skewness and kurtosis <p>IV. <u>FUNCTIONS OF RANDOM VARIABLES</u></p> <ol style="list-style-type: none"> 1. Distribution function technique 2. Transformation technique: one variable, several variables 3. Moment-generating function technique 		

	<p>V. <u>SAMPLING DISTRIBUTIONS</u></p> <ol style="list-style-type: none"> 1. The distribution of mean and variance 2. The distribution of differences of means and variances 3. The Chi-Square distribution 4. The t distribution 5. The F distribution <p>VI. <u>REGRESSION AND CORRELATION</u></p> <ol style="list-style-type: none"> 1. Linear regression 2. The methods of least squares 3. Normal regression analysis 4. Normal correlation analysis 5. Multiple linear regression (along with matrix notation) <p>VII. <u>DISCRETE PROBABILITY DISTRIBUTIONS</u></p> <ol style="list-style-type: none"> 1. Uniform, bernoulli and binomial distribution 2. Hypergeometric and geometric distribution 3. Negative binomial and Poisson distribution <p>VIII. <u>CONTINUOUS PROBABILITY DISTRIBUTIONS</u></p> <ol style="list-style-type: none"> 1. Uniform and exponential distribution 2. Gamma and beta distributions 3. Normal distribution <p>IX. <u>APPLICATION OF STATISTICS</u></p> <ol style="list-style-type: none"> 1. Curve fitting by the method of least squares-fitting of straight lines 2. Second degree parabolas and more general curves 3. Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations <p>X. <u>INTRODUCTION TO MATLAB</u></p> <ol style="list-style-type: none"> 1. Variable, Scripts & Operations 2. Visualization & Programming 3. Solving equations & Curve fitting 4. Advanced Methods 5. Symbolic, Simulink, File I/O, Building GUIs
Pre-requisite مخکینی ارین مضامین	Calculus I (Differential & Integral Calculus)
Related Courses ارونده مضامین	Differential & Integral Calculus, Multivariable Calculus for Engineers, Differential Equations, Probability & Statistics
Teaching and Learning methods د تدریس میتود	Lectures, tutorials and assignments
Computer Knowledge د کمپیوتر زده کری ته اړتیا	Moderate computer knowledge such as MS Word, MS Excel, MS PowerPoint, and CAD.

Course Materials and References د مضمون درسي مواد او اخليكونه	<u>Text Books:</u> <u>درسي كتاب</u>	
	<ul style="list-style-type: none"> Devore, JL (2008). <i>Probability and Statistics for Engineering and the Sciences</i> (7th Edition), Thomson Brooks/Cole, International Edition 	
	<u>Reference:</u> <u>اخليكونه</u>	
	<ul style="list-style-type: none"> Spiegel, Schiller and Srinivasan. <i>Schaum's Outline of Probability and Statistics</i> (4th Edition) B.S.Grewal (2008). <i>Higher Engineering Mathematics</i>, Khanna Publishers, Delhi. Stroock, Daniel W. (2000). <i>Probability Theory: An Analytic View</i>. Cambridge University Press, Revised Edition, ISBN-10:0521663490 	
Evaluation activities and Grades د ارزوني فعاليتونه او نمري		
Activity فعاليت	Scope هدف	Marks نمري
Attendance and class contribution حاضري او په درس كي برخه اخستل	Attending class, contributions to knowledge and relationships with the group.	5
Assignments كورني دنده	Solving the indicated problems from the problem list and submitting on time.	5
Laboratory and field trip reports د لابراتوار/ ساحي راپورونه	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion and implication.	15
Quizzes صنفي ارزوني	Quizzes include teaching materials and assignments from two previous classes.	5
Midterm exam منخني ازموينه	The midterm exam includes the covered topics.	20
Final exam وروستي ازموينه	The final exam includes the covered topics after the midterm exam.	50
	Total Course Marks د كورس مجموعي نمري	100

Relationship of this Course to Program Learning Outcome

د مضمون اړیکه د ځانګړي له کلیدي بشوونیزو موخو سره

No.	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7
		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team
1	Develop the key of probability basic	3	2	3	3	2	2	3
2	Use the theory of probability to estimate the likelihood of both discrete and continuous random variables.	3	1	3	3	2	2	3
3	Students will be able to calculate summary statistics for sample	3	2	3	3	2	3	3
4	Students will be able to calculate probability related parameters from raw data	3	1	3	3	3	3	3
Total		3	1.5	3	3	2.3	2.5	3
Average		2.6						
		1= Some relation 2= Moderate relation 3= Extensive relation						

En. Ene 0105 Physics I (Mechanics)

Item موضوع	Description توضیحات		
Title عنوان یا مضمون	En. Ene 0105 Physics I (Mechanics)		
Credits and no. of hour د کربدتونو او درسي ساعتونو شمير	Total توليزه	Theoretic نظري	Practical عملي
	4	3	1
Offering year and semester د تدريس کال او سمسټر	First year - First semester		
Aim موخي	This course is designed to provide a firm foundation in the concepts in mechanics, including measurements, basic statics, and dynamics.		
Key Learning Outcomes کلیدي پښوونيز نتايج	Key learning outcomes of this course follow: <ul style="list-style-type: none">• The student will learn the basic of dimensions and measurements.• The student will also get the basic knowledge of one- and two-dimensional kinematics.• Concepts in dynamic mechanical systems displacement, velocity and acceleration, vectors will be also explored among the students.• The student will also learn about the concept of force, Newton's laws on force system and its applications, center of gravity, static systems with distributed loads, angular motion, numerical molding in dynamics, kinetic and potential energy• Develop an understanding of the application of the theoretical knowledge with practical applications.		
Academic Staff Responsible د تدريس مسنول استاد			
Syllabus مفردات	I. <u>MEASUREMENTS</u> <ol style="list-style-type: none">1. Basic Dimensions2. Matter and Model Building3. Mass and Density4. Analysis of Dimensions and Units5. Measuring the Dimensions II. <u>KINEMATICS (ONE DIMENSION)</u> <ol style="list-style-type: none">1. Displacement, Velocity, Acceleration2. Diagrams of Displacement, Velocity and Acceleration3. Freely Falling Objects4. Derivation of Kinematics Equation III. <u>VECTORS</u> <ol style="list-style-type: none">1. Definition of Vectors2. Properties of Vectors3. Coordinate Systems4. Mathematical Operation of Vectors		

	<p>IV. <u>KINEMATICS (TWO DIMENSIONS)</u></p> <ol style="list-style-type: none"> 1. Displacement, Velocity, Acceleration 2. Angular Motion 3. Relative Velocity and Relative Acceleration <p>V. <u>BASIC LAWS OF MOTION</u></p> <ol style="list-style-type: none"> 1. The Concept of Force 2. Newton's First Law 3. Newton's Second Law, and Mass, Gravitational Force and Weight 4. Newton's Third Law 5. Applications of Laws of Motion <p>VI. <u>STATICS</u></p> <ol style="list-style-type: none"> 1. Center of Gravity of Objects 2. Equilibrium of Systems 3. Concept of Static Friction, and Static Analyses of Structural Systems 4. Analysis of Links and Pulley Systems <p>VII. <u>CIRCULAR MOTION</u></p> <ol style="list-style-type: none"> 1. Uniform Circular Motion 2. Non Uniform Circular Motion 3. Motion With to Resistive Forces, and Numerical Modeling in Particle Dynamics <p>VIII. <u>KINETIC ENERGY</u></p> <ol style="list-style-type: none"> 1. Definition of Energy 2. Calculation of Work with Constant and Varying Forces 3. Work–Kinetic Energy Theorem 4. Concept of Conservation of Energy 5. Definition of Power, and Energy in Mechanical Systems <p>IX. <u>POTENTIAL ENERGY</u></p> <ol style="list-style-type: none"> 1. Definition of Potential Energy 2. Conservative and Non Conservative Forces 3. System Equilibrium and Energy Diagrams <p>X. <u>INTRODUCTION TO MOMENTUM AND COLLISION</u></p> <ol style="list-style-type: none"> 1. Linear Momentum 2. Definition of Impulse, Collisions in one Dimension and Collision Based Motions in Practical Systems <p>XI. <u>LABORATORY SESSIONS</u></p> <ol style="list-style-type: none"> 1. Observation and Quantitative Measurements (Dimension Analysis, Unit Conversions) 2. Verification of the Laws of Motion (Newton's Laws, Friction, Gravitational Force) 3. Analysis and Measurement of Vectors 4. Study of A Kinematics of A Particle Moving in Two Dimensions
Pre-requisite مخکینی ارین مضامین	None
Related Courses ارونده مضامین	Physics II (Electromagnetism & Optics)

Teaching and Learning methods د تدریس میتود	Lectures, tutorials and assignments	
Computer Knowledge د کمپیوتر زده کړې ته اړتیا	Moderate computer knowledge such as MS Word, MS Excel, MS PowerPoint, and CAD.	
Course Materials and References د مضمون درسي مواد او اخلیکونه	<u>Text Books:</u> <u>درسي کتاب</u>	
	<ul style="list-style-type: none"> Raymond, A. Serway and John W. Jewett (2011). <i>Physics for Scientists and Engineers with Modern, Hybrid (with Enhanced Web Assign Homework and eBook LOE Printed Access Card for Multi Term Math and Science)</i> (8th Edition). Cengage Learning 	
	<u>Reference:</u> <u>اخلیکونه</u>	
	<ul style="list-style-type: none"> Cutnell, John D. and Kenneh W. Johnson (2010). <i>Physics</i> (9th Edition). John Wiley & Sons. Ginacoi, Douglas C. (2010). <i>Physics Principles with Applications</i> (6th Edition). Addison-Wesley Halliday, Resnick & Walker (2010). <i>Fundamentals of Physics</i> (9th Edition). Wiley. Young and Freedman (2007). <i>University Physics</i> (12th Edition), Addison-Wesley Publishers 	
Evaluation activities and Grades د ارزوني فعالیتونه او نمري		
Activity فعالیت	Scope هدف	Marks نمري
Attendance and class contribution حاضري او په درس کي برخه اخستل	Attending class, contributions to knowledge and relationship with the group.	5
Assignments کورني دنده	Solving the indicated problems from the problem list and submitting on time.	5
Laboratory and field trip reports د لابراتوار/ ساحي راپورونه	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion, and implication.	15
Quizzes صنفي ارزوني	Quizzes include teaching materials and assignments from two previous classes.	5
Midterm exam منځني ازموينه	The midterm exam includes the covered topics.	20
Final exam وروستي ازموينه	The final exam includes the covered topics after the midterm exam.	50
	Total Course Marks د کورس مجموعي نمري	100

Relationship of this Course to Program Learning Outcome د مضمون اړیکه د څانګې له کلیدي بنوونیزو موخو سره								
No.	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7
		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team
1	The student will learn the basic of dimensions and measurements.	1	1	1	1	1	1	1
2	The student will also get the basic knowledge of one and two dimensional kinematics.	1	1	2	1	2	1	1
3	Concepts in dynamic mechanical systems displacement, velocity and acceleration, vectors will be also explored among the students.	1	1	1	1	1	1	1
4	The student will also learn about the concept of force, Newton's laws on force system and its applications, centre of gravity, static systems with distributed loads, angular motion, numerical molding in dynamics, kinetic and potential energy	1	2	1	2	1	2	1
5	Develop an understanding of the application of the theoretical knowledge with practice application.	1	1	2	1	1	1	1
Total		1	1.2	1.2	1.2	1.2	1	1
Average		1.11						
1= Some relation 2= Moderate relation 3=Extensive relation								

En.Ene 0205 Physics II (Oscillations and Lights)

Item موضوع	Description توضیحات		
Title عنوان یا مضمون	En.Ene 0205 Physics II (Oscillations and Lights)		
Credits and no. of hour د کړېدونو او درسي ساعتونو شمير	Total ټوليزه	Theoretic نظري	Practical عملي
	4	3	1
Offering year and semester د تدريس کال او سمستر	First year - Second semester		
Aim موخي	This course is designed to develop basic background understanding of electromagnetic, mechanic, and matter waves to provide basic path towards wireless and optical communications.		
Key Learning Outcomes کلیدي بنوونيز نتايج	Key learning outcomes of this course follow: <ul style="list-style-type: none">• Understand the elements of heat, waves, thermodynamics• Able to understand about optics, lenses, and optical instruments and their applications• Understand firm concepts of modern physics• Develop an understanding of the application of the theoretical knowledge with practical applications.		
Academic Staff Responsible د تدريس مسنول استاد			
Syllabus مفردات	<p>I. <u>WAVES</u></p> <ol style="list-style-type: none">1. Wave Motion2. Sound Waves3. Superposition and Standing Waves <p>II. <u>THERMODYNAMICS</u></p> <ol style="list-style-type: none">1. Temperature2. The First Law of Thermodynamics3. The Kinetic Theory of Gases4. Heat Engines5. The Second Law of Thermodynamics <p>III. <u>THE ELECTROMAGNETIC SPECTRUM</u></p> <ol style="list-style-type: none">1. Radio Waves2. Microwaves3. IR Radiation4. UV, X-Rays, Gamma Rays <p>IV. <u>LIGHT AND OPTICS</u></p> <ol style="list-style-type: none">1. Focal Point2. Index of Refraction3. Snell's Law4. Total Internal Reflection		

	<p>5. Fiber Optics</p> <p>6. Lensmaker's Equation</p> <p>7. Refraction and Diffraction</p> <p>8. Polarization</p> <p>V. <u>LENSES AND OPTICAL INSTRUMENTS</u></p> <p>1. Cameras (<i>F</i>-Stop, Depth Of Field)</p> <p>2. Telephoto Lens</p> <p>3. Wide-Angle Lens</p> <p>4. Nearsightedness, Farsightedness, Magnifying Glass</p> <p>5. Astronomical (Refracting) Telescope, Reflecting Telescope, Terrestrial Telescope</p> <p>6. Microscopes, Resolution</p> <p>7. X-Rays, CAT Scan</p> <p>VI. <u>MODERN PHYSICS</u></p> <p>1. Introduction to Quantum Physics</p> <p>2. Quantum Mechanics</p> <p>3. Atomic Physics</p> <p>4. Molecules and Solids</p> <p>VII. <u>LABORATORY SESSIONS</u></p> <p>1. Investigation of Phenomenon of Total Internal Reflection – Demonstration on Optical Fibers</p> <p>2. Lenses and Optical Instruments</p> <p>3. Diffraction and Interference</p>
Pre-requisite مخکینی ارین مضامین	Physics I (Mechanics)
Related Courses ارونده مضامین	Physics I (Mechanics), Engineering Chemistry
Teaching and Learning methods د تدریس میتود	Lectures, tutorials and assignments
Computer Knowledge د کمپیوتر زده کری ته ارتیا	Moderate computer knowledge such as MS Word, MS Excel, MS PowerPoint, and CAD,
Course Materials and References د مضمون درسی مواد او اخلیکونه	<p><u>Text Books:</u></p> <p><u>درسی کتاب</u></p> <ul style="list-style-type: none"> Raymond, A. Serway and John W. Jewett (2011). Physics for Scientists and Engineers with Modern, Hybrid (with Enhanced Web Assign Homework and eBook LOE Printed Access Card for Multi Term Math and Science) (8th Edition). Cengage Learning
	<p><u>Reference:</u></p> <p><u>اخلیکونه</u></p> <ul style="list-style-type: none"> Cutnell, John D. and Kenneh W. Johnson (2010). Physics (9th Edition). John Wiley & Sons. Griffiths, David J. (2012). Introduction to Electrodynamics (4th Edition). Addison-Wesley

Evaluation activities and Grades د ارزوني فعاليتونه او نمري								
Activity فعاليت	Scope هدف	Marks نمري						
Attendance and class contribution حاضري او په درس كي برخه اخستل	Attending the class, contribution to knowledge and relationships with the group.	5						
Assignments كورني دنده	Solving the indicated problems from the problem list and submitting on time.	5						
Laboratory and field trip reports د لابراتوار/ ساحي راپورونه	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion, and implication.	15						
Quizzes صنفي ارزوني	Quizzes include teaching materials and assignments from two previous classes.	5						
Midterm exam منځني ازموينه	The midterm exam includes the covered topics.	20						
Final exam وروستي ازموينه	The final exam includes the covered topics after the midterm exam.	50						
	Total Course Marks د كورس مجموعي نمري	100						
Relationship of this Course to Program Learning Outcome د مضمون اړيکه د څانگي له كليدي بنوونيزو موخو سره								
No.	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7
		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team
1	Understand the elements of heat, waves, thermodynamics	1	1	1	2	2	2	2

2	Able to understand about optics, lenses and optical instruments and their applications	1	2	2	2	2	3	2
3	Understand the firm concepts of modern physics	1	1	2	3	2	3	3
4	Develop an understanding of the application of the theoretical knowledge with practice application	1	2	1	3	2	2	3
Total		1	1.5	1.5	2.5	2	2.5	2.5
Average		1.92						
1= Some relation 2= Moderate relation 3= Extensive relation								

En. Ene 0305 Physic-III (Electricity and Magnetism)

Item موضوع	Description توضیحات			
Title عنوان یا مضمون	En. Ene 0305 Physic-III (Electricity and Magnetism)			
Credits and no. of hour د کربدتونو او درسي ساعتونو شمير	Total توليزه	Theoretic نظري	Practical عملي	
	4	3	1	
Offering year and semester د تدريس کال او سمسټر	Second year - First semester			
Aim موخي	The objectives of this course are to provide for students the basic understanding and knowledge of university physics principles. The course is designed to be taught during two successive academic semesters in university physics I and II. Physics volume two course will cover electromagnetism and optics. Electromagnetism covers electric charge, some laws of charge, electric system and magnetic. Optics introduces the Nature and Propagation of Light, Geometric Optics, and Optical Instruments			
Key Learning Outcomes کلیدي بنوونيز نتایج	Understanding types of the concepts and methodologies for: <ul style="list-style-type: none"> • Understanding the elements of electricity • Understanding the firm concepts of magnetism • Develop an understanding of the application of the theoretical knowledge with practice application 			

<p>Academic Staff Responsible د تدریس مسئول استاد</p>	
<p>Syllabus مفردات</p>	<p>I. <u>ELECTRIC CHARGE AND ELECTRIC FIELD</u></p> <ol style="list-style-type: none"> 1. Electric Charge 2. Conductors, Insulators, and Induced Charges 3. Coulomb's Law 4. Electric Field and Electric Forces 5. Electric Field Calculations 6. Electric Field Lines 7. Electric Dipoles <p>II. <u>GAUSS'S LAW</u></p> <ol style="list-style-type: none"> 1. Charge and Electric Flux 2. Calculating Electric Flux 3. Gauss's Law 4. Applications of Gauss's Law 5. Charges on Conductors <p>III. <u>ELECTRIC POTENTIAL</u></p> <ol style="list-style-type: none"> 1. Electric Potential Energy 2. Electric Potential 3. Calculating Electric Potential 4. Equipotential Surfaces 5. Potential Gradient <p>IV. <u>CAPACITANCE AND DIELECTRICS</u></p> <ol style="list-style-type: none"> 1. Capacitors and Capacitance 2. Capacitors in Series and Parallel 3. Energy Storage in Capacitors and Electric Field Energy 4. Dielectrics 5. Molecular Model of Induced Charge 6. Gauss's Law in Dielectrics <p>V. <u>DIRECT-CURRENT CIRCUITS</u></p> <ol style="list-style-type: none"> 1. Resistors in Series and Parallel 2. Kirchhoff's Rules 3. Electrical Measuring Instruments 4. R-C Circuits 5. Power Distribution Systems <p>VI. <u>MAGNETIC FIELD AND MAGNETIC FORCES</u></p> <ol style="list-style-type: none"> 1. Magnetism 2. Magnetic Field 3. Magnetic Field Lines and Magnetic Flux 4. Motion of Charged Particles in a Magnetic Field 5. Applications of Motion of Charged Particles 6. Magnetic Force on a Current-Carrying Conductor <p>VII. <u>SOURCES OF MAGNETIC FIELD</u></p> <ol style="list-style-type: none"> 1. Magnetic Field of a Moving Charge 2. Magnetic Field of a Current Element 3. Magnetic Field of a Straight Current-Carrying Conductor

	<ol style="list-style-type: none"> 4. Force Between Parallel Conductors 5. Ampere's Law 6. Applications of Ampere's Law 7. Magnetic Materials <p>VIII. <u>ELECTROMAGNETIC INDUCTION</u></p> <ol style="list-style-type: none"> 1. Induction Experiments 2. Faraday's Law 3. Lenz's Law 4. Motional Electromotive Force 5. Induced Electric Fields 6. Eddy Currents 7. Displacement Current <p>IX. <u>INDUCTANCE</u></p> <ol style="list-style-type: none"> 1. Mutual Inductance 2. Self-Inductance and Inductors 3. Inductors and Magnetic-Field Energy 4. The R-L Circuit 5. The L-C Circuit <p>X. <u>GEOMETRIC OPTICS AND OPTICAL INSTRUMENTS</u></p> <ol style="list-style-type: none"> 1. Reflection and Refraction at a Plane Surface 2. Reflection at a Spherical Surface 3. Thin Lenses 4. Cameras 5. The Eye 6. The Magnifier 7. Microscopes and Telescopes
Pre-requisite مخکینی ایرین مضامین	Physics-I
Related Courses ایرونده مضامین	Physics-I, Electrical Circuit Analysis, Electrical Machines and Drives, Power System-I&II and Electrical Control.
Teaching and Learning methods د تدریس میتود	Lectures, tutorials, and assignments
Computer Knowledge د کمپیوتر زده کری ته ارتیا	Basic computing skills using MS Word, Excel, CAD, and/or SolidWorks with applications to electrical engineering computing
Course Materials and References د مضمون درسی مواد او اخلیکونه	<u>Text Books:</u> <u>درسی کتاب</u> <ul style="list-style-type: none"> • University physics (Young and Freedman, 12 Edition 2010) Volume2
	<u>Reference:</u> <u>اخلیکونه</u> <ul style="list-style-type: none"> • Youog, Hugh D.Sears and Zemansky's university physics: with moderm physics.-12th ed. /Hugh D. • Youog, Roger A. Freedman; contributing author, A. Lewis Ford.I. Freedman, Roger A. ll. Sears, Francis Weston, 1898-1975.

	University physics.III.							
	<ul style="list-style-type: none"> Title. Iv. Title: University physics.2007 Copyright © 2008 Pearson Education, 							
Evaluation activities and Grades د ارزوني فعالیتونه او نمرې								
Activity فعالیت	Scope هدف	Marks نمرې						
Attendance and class contribution حاضري او په درس کي برخه اخستل	Attending the class, contribution to knowledge and relationships with the group.	5						
Assignments کورني دنده	Solving the indicated problems from the problem list and submitting on time.	10						
Laboratory and field trip reports د لابراتوار/ ساحي راپورونه	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion, and implication.	10						
Quizzes صنفي ارزوني	Quizzes include teaching materials and assignments from two previous classes.	5						
Midterm exam منځني ازموينه	The midterm exam includes the covered topics.	20						
Final exam وروستي ازموينه	The final exam includes the covered topics after the midterm exams.	50						
	Total Course Marks د کورس مجموعي نمرې	100						
Relationship of this Course to Program Learning Outcome د مضمون اړیکه د څانگي له کلیدي بنوونیزو موخو سره								
	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7
No.		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team
1	Understanding the elements of electricity	2	2	2	2	2	2	2

2	Understanding the firm concepts of magnetism	3	3	3	2	2	1	1
3	Develop an understanding of the application of the theoretical knowledge with practice application	3	3	2	3	2	1	2
4	Able to utilize field concepts in electricity	3	3	2	2	1	2	2
5	Able to distinguish all laws of AC and DC currents	3	3	2	2	1	1	2
Total		2.8	2.8	2.2	2.2	1.6	1.4	1.8
Average		2.1						
1= Some relation 2= Moderate relation 3=Extensive relation								

Ed. Chem 0208 Engineering Chemistry

Item موضوع	Description توضیحات		
Title عنوان یا مضمون	Ed. Chem 0208 Engineering Chemistry		
Credits and no. of hour د کربدتونو او درسي ساعتونو شمير	Total ټوليزه	Theoretic نظري	Practical عملي
	3	2	1
Offering year and semester د تدريس کال او سمسټر	First year - Second semester		
Aim موخي	The objective of this course is to develop fundamental knowledge of physical, inorganic, and organic chemistry pertinent to engineering.		
Key Learning Outcomes کلیدي بنوونيز نتایج	<p>Key learning outcomes of this course follow:</p> <ul style="list-style-type: none"> Understanding the relationship between atomic/molecular structure and properties Able to understand the Lewis Structures for chemical species and determine ionic/covalent character of chemical bonds Develop the concepts of Valance-Bond Theory and Molecular Orbital Theory to predict electron arrangement and molecular shape Recognize, rationalize, and quantify acid/base behavior and also calculate and interpret solubility Understanding the development of theories resulting in Arrhenius temperature dependence of reaction rates Able to understand how energy is stored by molecules and analyze closed system and open systems, steady and unsteady processes 		

	<ul style="list-style-type: none"> • Understand the basic ideas of electrochemistry, nuclear chemistry, and organic chemistry • Develop an understanding of the application of theoretical knowledge with practical applications through laboratory works
Academic Staff Responsible د تدریس مسنول استاد	
Syllabus مفردات	<p>I. <u>INTRODUCTION AND REVIEW</u></p> <ol style="list-style-type: none"> 1. Units of Measure and Conversion 2. Scientific Notation 3. Significant Figures 4. Stoichiometry Review <p>II. <u>THE PERIODIC TABLE AND ATOMIC STRUCTURE</u></p> <ol style="list-style-type: none"> 1. The Periodic Table of the Elements 2. Atomic Models 3. Excitation and Ionization Energies 4. Ionization Energy 5. Electron Affinity <p>III. <u>INTRODUCTION TO QUANTUM THEORY</u></p> <ol style="list-style-type: none"> 1. Bohr's Theory of the Hydrogen Atom 2. Wave-Mechanical Description of Atoms 3. Quantum Numbers 4. Atomic Orbitals 5. Electron Configuration <p>IV. <u>CHEMICAL BONDING</u></p> <ol style="list-style-type: none"> 1. Ionic Bond 2. The Nature of Covalence 3. Electronegativity 4. The Concept of Resonance 5. Bond Enthalpy 6. Valence Bond Theory <p>V. <u>GAS</u></p> <ol style="list-style-type: none"> 1. Pressure of a Gas 2. The Gas Laws 3. The Ideal Gas Equation 4. Gas Stoichiometry 5. Imperfect Gases <p>VI. <u>CHEMICAL KINETICS</u></p> <ol style="list-style-type: none"> 1. Rate of a Reaction 2. Rate Law 3. Temperature Dependence of Rate Constants 4. Reaction Mechanism 5. Catalysis <p>VII. <u>CHEMICAL EQUILIBRIUM</u></p> <ol style="list-style-type: none"> 1. The Concept of Equilibrium and the Equilibrium Constant 2. The Relationship between Chemical Kinetics and Chemical

	<p>Equilibrium</p> <ol style="list-style-type: none">3. Predicting the Direction of a Reaction4. Calculation of Equilibrium Concentration5. Factors Affecting Chemical Equilibrium
	<p>VIII. <u>ACIDS, BASES AND SALTS</u></p> <ol style="list-style-type: none">1. Lewis Concept Acids and Bases2. Bronsted-Lowry Concept of Acids and Bases3. Acid-Base Titration4. Acid-Bases Indicators5. Hydrolysis of Salts6. pH and Buffer Solutions
	<p>IX. <u>THERMOCHEMISTRY AND INTRODUCTION TO THERMODYNAMICS</u></p> <ol style="list-style-type: none">1. Nature and Types of Energy2. Energy Changes in Chemical Reactions3. Introduction to Thermodynamics4. Enthalpy of Chemical Reactions5. Calorimetry
	<p>X. <u>CHEMICAL THERMODYNAMICS</u></p> <ol style="list-style-type: none">1. Three Laws of Thermodynamics2. Spontaneous Process3. Entropy4. Gibbs Free Energy5. Thermodynamics in Living Systems
	<p>XI. <u>ELECTROCHEMISTRY</u></p> <ol style="list-style-type: none">1. Redox Reactions2. Conductivity3. Galvanic Cells4. Standard Reduction Potentials5. Thermodynamics of Redox Reactions
	<p>XII. <u>NUCLEAR CHEMISTRY</u></p> <ol style="list-style-type: none">1. Nature of Nuclear Reactions2. Natural Radioactivity3. Uses of Isotopes4. Effects of Radiation5. Application of Nuclear Energy
	<p>XIII. <u>ORGANIC CHEMISTRY</u></p> <ol style="list-style-type: none">1. Classes of Organic Compounds2. Aliphatic Hydrocarbons3. Aromatic Hydrocarbons4. Chemistry of the Functional Groups
	<p>XIV. <u>LABORATORY SESSIONS</u></p> <ol style="list-style-type: none">1. Laboratory Information and Safety2. Periodic Relationships Among the Elements3. Paper Chromatography4. Acid-Base Titration and Volumetric Analysis

	5. Chemical Equilibrium – Vinegar Analysis 6. Gravimetric Analysis and Filtration Technique 7. Saponification	
Pre-requisite مخکینی اړین مضامین	None	
Related Courses اړونده مضامین	Physics-II and Biomass Energy	
Teaching and Learning methods د تدریس میتود	Lectures, tutorials and assignments	
Computer Knowledge د کمپیوټر زده کړې ته اړتیا	Moderate computer knowledge such as MS Word, MS Excel, MS PowerPoint, and CAD.	
Course Materials and References د مضمون درسي مواد او اخليکونه	<u>Text Books:</u> <u>درسي کتاب</u> <ul style="list-style-type: none"> Chang, R. (2010). <i>Chemistry</i> (10th Edition). McGraw-Hill Science. 	
	<u>Reference:</u> <u>اخليکونه</u> <ul style="list-style-type: none"> Brown, L. S. and Holmes, T. A. (2011). <i>Chemistry for Engineering Students</i> (2nd Edition). Cengage Learning Yen, T. F. (2008). <i>Chemistry for Engineers</i>. Imperial College Press, London 	
Evaluation activities and Grades د ارزونې فعالیتونه او نمرې		
Activity فعالیت	Scope هدف	Marks نمرې
Attendance and class contribution حاضري او په درس کې برخه اخستل	Attending the class, contribution to the knowledge and relationship with the group.	5
Assignments کورني دنده	Solving the indicated problems from the problem list and submitting on time.	5
Laboratory and field trip reports د لابراتوار/ ساحي راپورونه	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion, and implication.	15
Quizzes صنفي ارزونې	Quizzes include teaching materials and assignments from two previous classes.	5
Midterm exam منځنۍ ازموینه	The midterm exam includes the covered topics.	20
Final exam وروستۍ ازموینه	The final exam includes the covered topics after the midterm exam.	50
	Total Course Marks د کورس مجموعي نمرې	100

Relationship of this Course to Program Learning Outcome د مضمون اړیکه د ځانګړي له کلیدي بشپړونیزو موخو سره								
No.	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7
		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team
1	Understanding the relationship between atomic/molecular structure and properties	1	1	1	1	1	1	1
2	Able to understand the Lewis Structures for chemical species and determine the ionic/covalent character of chemical bonds	1	1	1	2	2	1	1
3	Develop the concepts of Valance-Bond Theory and Molecular Orbital Theory to predict electron arrangement and molecular shape	1	1	1	1	1	1	1
4	Recognize, rationalize and quantify the acid/base behavior and also calculate and interpret the solubility.	1	1	1	2	2	1	1
5	Understanding the development of theories resulting in Arrhenius temperature dependence of reaction rates	1	1	1	1	1	1	1
6	Able to understand how energy is stored by molecules and analyze closed system and open systems, steady and unsteady process	1	1	1	1	1	1	1
7	Understand the basic idea of electrochemistry, nuclear chemistry and organic chemistry	1	1	1	1	1	1	1
8	Develop an understanding of the application of the theoretical knowledge with practice application through laboratory works	1	1	1	1	1	1	1
Total		1	1	1	1.25	1.25	1	1
Average		1.07						
1= Some relation 2= Moderate relation 3=Extensive relation								

En. Ene 0107 Drawing-I

Item موضوع	Description توضیحات		
Title عنوان یا مضمون	En. Ene 0107 Drawing-I		
Credits and no. of hour د کريدتونو او درسي ساعتونو شمير	Total ټوليزه	Theoretic نظري	Practical عملي
	3	1	2
Offering year and semester د تدريس کال او سمستر	First year - First semester		
Aim موخي	The principle aim is to introduce the concept of drawing. The course covers aspects of drawing diagrams and after completing this course the attendees will be able to easily understand and implement drawings on projects such as dimension, planning, sections, and details.		
Key Learning Outcomes کلیدي بنوونيز نتايج	In the completion of this course the student will be able to: <ul style="list-style-type: none">• Understand and draw basic geometric shapes and forms.• Analyze and draw different projections systems (orthographic, oblique, perspective), and the projection different solid forms.• Understand and use the development of solid forms to build a model.• Read and understanding working drawings of a simple building.• Drawing of layouts, sections, and elevations of a simple building.		
Academic Staff Responsible د تدريس مسنول استاد			
Syllabus مفردات	<p>I. <u>DRAWING INSTRUMENTS AND THEIR USES</u></p> <ol style="list-style-type: none">1. Drawing Board T-Square, Set Square, and Compass Divider2. Scales and Protractor French Curves3. Drawing Papers, Drawing Pencil, and Eraser <p>II. <u>LINES AND DIMENSION</u></p> <ol style="list-style-type: none">1. Types of Lines2. Thickness and Shade of Lines3. Dimensioning4. Exercises <p>III. <u>GEOMETRICAL CONSTRUCTION</u></p> <ol style="list-style-type: none">1. Bisecting A Line, Perpendiculars, Parallel and Lines2. Division of Lines, Angles, Arcs of Circles and Equilateral3. Squares, Regular Polygons Regular and Polygons Inscribed in Circles4. Tangents, Lengths of Arcs, Circles and Lines in Contact Inscribed Circles5. Exercises		

	<p>IV. <u>SCALES</u></p> <ol style="list-style-type: none"> 1. Reducing and Increasing Scale 2. Representative Fraction 3. Types of Scales 4. Plain Scales 5. Exercises <p>V. <u>CURVES USED IN ENGINEERING PRACTICE</u></p> <ol style="list-style-type: none"> 1. Tangent 2. Shared Chapter 3. Hoop 4. Ellipse 5. Parabola 6. Hyperbola 7. Exercises <p>VI. <u>ORTHOGRAPHIC PROJECTION</u></p> <ol style="list-style-type: none"> 1. Projection and Orthographic Projection 2. Planes of Projection 3. First and Third Angle 4. Exercises <p>VII. <u>PROJECTIONS OF POINTS</u></p> <ol style="list-style-type: none"> 1. Point the View 2. Point Isometric 3. Exercises <p>VIII. <u>PROJECTIONS OF LINES</u></p> <ol style="list-style-type: none"> 1. Line Parallel to Planes 2. Types of Line in the View 3. Near Dimension of Two Lines 4. Traces Of A Line 5. Line Isometric 6. True Length of A Line and Its Inclinations with the Reference 7. Exercises <p>IX. <u>PROJECTIONS OF PLANES</u></p> <ol style="list-style-type: none"> 1. Traces of Planes 2. Types of Planes 3. Planes Isometric 4. True Length of A Planes and Its Inclinations with the Reference 5. Exercises <p>X. <u>PROJECTIONS OF SOLIDS</u></p> <ol style="list-style-type: none"> 1. Polyhedron—Solids of Revolution 2. Projections of Solid in Simple Position 3. Axis Perpendicular to the Planes 4. Sections of Pyramids , Cylinder and Cone 5. Projections of Spheres 6. Exercises <p>XI. <u>DEVELOPMENT OF SURFACES</u></p> <ol style="list-style-type: none"> 1. Development of Surfaces of Cubes 2. Development of Surfaces of Prisms 3. Development of Surfaces of Cylinders 4. Development of Surfaces of Cones
--	---

	<p>5. Development Of Surfaces Of Spheres</p> <p>6. Exercises</p> <p>XII. <u>ISOMETRIC PROJECTION</u></p> <p>1. Isometric Axes ,Line and Planes Isometric Scale</p> <p>2. Isometric Projection of Planes</p> <p>3. Isometric Projection of Prisms</p> <p>4. Isometric Projection of Cylinders</p> <p>5. Isometric Projection of Cones</p> <p>6. Isometric Projection of Spheres</p> <p>7. Exercises</p> <p>XIII. <u>SECTION OF SOLIDS</u></p> <p>1. Section Planes</p> <p>2. Section True Shape of Section</p> <p>3. Section of Prisms</p> <p>4. Section of Cylinders</p> <p>5. Section of Cones</p> <p>6. Section of Spheres</p> <p>7. Exercises</p> <p>XIV. <u>INTERSECTION OF SURFACES</u></p> <p>1. Line of Intersection</p> <p>2. Intersection of Prism and Prism</p> <p>3. Intersection of Cylinder and Prism</p> <p>4. Intersection of Cylinder and Cylinder</p> <p>5. Intersection of Cylinder and Cone</p> <p>6. Intersection of Prism and Cone</p> <p>7. Intersection of Cone and Cone</p> <p>8. Intersection of Sphere and Cylinder or Prism</p> <p>9. Exercises</p> <p>XV. <u>CONVERSION OF PICTORIAL VIEWS INTO ORTHOGRAPHIC VIEWS</u></p> <p>1. First-Angle Projection and Third-Angle Projection</p> <p>2. Procedure for Preparing A Scale Drawing</p> <p>3. Exercises</p> <p>XVI. <u>PROJECTS</u></p> <p>1. wall</p> <p>2. Home</p> <p>3. Culvert</p> <p>4. Exercises</p>
Pre-requisite مخکینی ارین مضامین	None
Related Courses ارونده مضامین	Drawing-II (Auto CAD)
Teaching and Learning methods د تدریس میتود	Lectures, tutorials, and assignments

Computer Knowledge د کمپیوٹر زدہ کری تہ اہلیت	Moderate computer knowledge such as MS Word, MS Excel, MS PowerPoint, and CAD.	
Course Materials and References د مضمون درسی مواد او اخلیکونہ	<u>Text Books:</u> <u>درسی کتاب</u>	
	<u>Reference:</u> <u>اخلیکونہ</u>	
Evaluation activities and Grades د ارزونی فعالیتونہ او نمری		
Activity فعالیت	Scope هدف	Marks نمري
Attendance and class contribution حاضری او پہ درس کی برخہ اخذل	Attending class, contributions to knowledge and relationships with the group.	5
Assignments کورنی دنہ	Solving the indicated problems from the problem list and submitting on time.	5
Laboratory and field trip reports د لابراتوار/ ساحی راپورونہ	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion and implication.	15
Quizzes صنفي ارزونی	Quizzes include teaching materials and assignments from two previous classes.	5
Midterm exam منخنی ازموینہ	The midterm exam includes the covered topics.	20
Final exam وروستی ازموینہ	The final exam includes the covered topics after the midterm exam.	50
	Total Course Marks د کورس مجموعی نمري	100

Relationship of this Course to Program Learning Outcome د مضمون اړیکه د څانګې له کلیدي بنسټونیزو موخو سره								
No.	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7
		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team
1	Understand and draw basic geometric shapes and forms.	1	1	1	1	1	1	1
2	Analyze and draw different projections systems (orthographic, oblique, perspective), and the projection different solid forms.	2	2	2	2	2	2	2
3	Understand and use the development of solid forms to build a model.	2	2	2	2	2	2	2
4	Read and understanding working drawings of a simple building.	2	2	2	2	2	2	2
5	Drawing of layouts, sections, and elevations of a simple building	3	3	3	3	3	3	3
Total		2	2	2	2	2	2	2
Average		2						
1= Some relation 2= Moderate relation 3=Extensive relation								

En.Ene 0207 Drawing-II: Computer-Aided Design (CAD)

Item موضوع	Description توضیحات		
Title عنوان یا مضمون	En.Ene 0207 Drawing-II: Computer-Aided Design(CAD)		
Credits and no. of hour د کربدتونو او درسي ساعتونو شمير	Total توليزه	Theoretic نظري	Practical عملي
	3	2	1
Offering year and semester د تدريس كال او سمستر	First year - Second semester		
Aim موخي	This course introduces the use of computer-aided drafting techniques using AutoCAD software. Using CAD, student will be able to complete the current design and construction industry and this course will give to students the ability to draw, edit, and manage project drawings conveniently, efficiently, and quickly. This course will also contribute to conceptualization of 3D modeling and visual understanding		
Key Learning Outcomes كليدي بنوونيز نتايج	<p>Key learning outcomes of this course follow:</p> <ul style="list-style-type: none"> • Demonstrate basic concepts of AutoCAD software. • Apply basic concepts to develop construction (drawing) techniques. • Ability to manipulate drawings through editing and plotting techniques. • Understand geometric construction. • Produce template drawings. • Produce 2D orthographic projections. • Understand and demonstrate dimensioning concepts and techniques. • Understand section and auxiliary views. • Become familiar with the use of blocks, design center, and tool palettes. • Become familiar with solid modeling concepts and techniques. 		
Academic Staff Responsible د تدريس مسنول استاد			
Syllabus مفردات	<p>I. <u>AUTO CAD ---- 2D TOOLBARS</u></p> <ol style="list-style-type: none"> 1. Introduction and Installation of Auto CAD 2. Introduction of 2D Toolbars and 3D Toolbars and Menu Bars 3. Command Line 4. Units 5. Status Bar <p>II. <u>DRAW BAR</u></p> <ol style="list-style-type: none"> 1. Line 2. Construction 		

	<ol style="list-style-type: none"> 3. Poly Line 4. Polygon 5. Rectangle 6. Arc 7. Circle 8. Revision Cloud 9. Spline 10. Ellipse 11. Gradient 12. Region 13. Table 14. Multiline Text <p>III. <u>MODIFY</u></p> <ol style="list-style-type: none"> 1. Erase 2. Copy 3. Mirror 4. Offset 5. Array 6. Break at Point 7. Break 8. Join 9. Chamfer 10. Fillet <p>IV. <u>DIMENSION</u></p> <ol style="list-style-type: none"> 1. Linear 2. Angular 3. Arc Length 4. Ordinate 5. Radius 6. Logged 7. Continue 8. Dimension 9. Tolerance 10. Center Mark 11. Inspection 12. Jogged Linear 13. Dimension Edit 14. Dimension Text <p>V. <u>FILE</u></p> <ol style="list-style-type: none"> 1. New 2. New Sheet Set 3. Open 4. Save 5. Save As 6. Page Setup Manager 7. Plot 8. Sent 9. Drawing Properties <p>VI. <u>EDIT</u></p> <ol style="list-style-type: none"> 1. Undo Exitctrl+Q 2. Copy with Base Point 3. Cop Link 4. Paste 5. Paste as Block
--	--

	6. Select All
VII.	<u>VIEWS</u>
	1. Redraw
	2. Regen All
	3. Zoom
	4. Clean Screen
	5. Viewports
	6. Named Views
	7. Display
	8. Toolbars
VIII.	<u>INSERT</u>
	1. Block
	2. Raster Image Reference
	3. Layout
	4. OLE Object
IX.	<u>FORMAT</u>
	1. Layer
	2. Scale List
	3. Text Style
	4. Dimension Style
	5. Table Style
	6. Multileader Style
	7. Point Style
	8. Multiline Style
	9. Drawing Limits
	10. Rename
X.	<u>TOOLS</u>
	1. Workspaces
	2. Toolbars
	3. Command Line
	4. Clean Screen
	5. Named UCS
	6. Options
XI.	<u>PARAMETRIC, WINDOW AND HELP</u>
	1. Geometric Constraints
	2. Lock Location
	3. Cascade
	4. Tile Horizontally
	5. Tile Vertically
	6. Help
	7. Exercises
XII.	<u>EXPRESS PROJECTS EXERCISES</u>
	1. Blocks
	2. Text
	3. Layout Tools
	4. Modify
	5. Draw
	6. Exercises of Wall Projects
	7. Exercises of Home Projects
	8. Exercises of Culvert Projects
XIII.	<u>3D TOOLBAR VIEW</u>
	1. Top
	2. Bottom
	3. Left
	4. Right
	5. Front

	6. Back 7. SW Isometric 8. SE Isometric 9. NE Isometric 10. NW Isometric XIV. <u>VISUAL STYLES AND ORBIT</u> 1. 2D Wireframe 2. 3D Wireframe Visual Styles 3. 3D Hidden Visual Styles 4. Realistic Visual Styles 5. Conceptual Visual Styles 6. Constrained Orbit 7. Free Orbit 8. Continues Orbit XV. <u>MODELING</u> 1. Poly Solid 2. Box 3. Wedge 4. Cone 5. Sphere 6. Cylinder 7. Loft 8. Union 9. Subtract 10. Intersect 11. 3D Move	
Pre-requisite مخکینی ارین مضامین	None	
Related Courses ارونده مضامین	Drawing-I	
Teaching and Learning methods د تدریس میتود	Lectures, tutorials, and assignments	
Computer Knowledge د کمپیوتر زده کری ته ارتیا	Moderate computer knowledge such as MS Word, MS Excel, MS PowerPoint, and Auto CAD.	
Course Materials and References د مضمون درسی مواد او اخلیکونه	<u>Text Books:</u> <u>درسی کتاب</u>	
	<u>Reference:</u> <u>اخلیکونه</u>	
Evaluation activities and Grades د ارزونی فعالیتونه او نمري		
Activity فعالیت	Scope هدف	Marks نمري

Attendance and class contribution حاضري او په درس كې برخه اخستل	Attending class, contributions to knowledge and relationships with the group.	5						
Assignments كورني دنده	Solving the indicated problems from the problem list and submitting on time.	5						
Laboratory and field trip reports د لابراتوار/ ساحي راپورونه	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion and implication.	15						
Quizzes صنفي ارزوني	Quizzes include teaching materials and assignments from two previous classes.	5						
Midterm exam منځني ازموينه	The midterm exam includes the covered topics.	20						
Final exam وروستي ازموينه	The final exam includes the covered topics after the midterm exam.	50						
	Total Course Marks د كورس مجموعي نمري	100						
Relationship of this Course to Program Learning Outcome د مضمون اړيکه د ځانگي له كليدي بنوونيزو موخو سره								
No.	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7
		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team
1	The student will learn about the basic principle of engineering drawing including lettering, applied geometry, orthographic drawing and sketching, sectional views and conventions, detail drawing, assembly drawing, dimensioning;	1	1	1	1	1	1	1
2	The student will also learn about the basic descriptive	2	2	2	2	2	2	2

	geometry dealing with points, lines & planes and their relationship in space and basic developed views							
3	Demonstrate knowledge and skills needed to design and draft projects ranging for two dimensional designs for commercial and residential buildings.	2	2	2	2	2	2	2
4	Demonstrate basic skills needed to view, print, edit, and create variations of two dimensional electronic designs.	2	2	2	2	2	2	2
Total		1.75	1.75	1.75	1.75	1.75	1.75	1.75
Average		1.75						
1= Some relation 2= Moderate relation 3=Extensive relation								

En. Ene 0106 Introduction to Engineering & Computer

Item موضوع	Description توضیحات		
Title عنوان یا مضمون	En. Ene 0106 Introduction to Engineering & Computer		
Credits and no. of hour د کربدتونو او درسي ساعتونو شمير	Total ټوليزه	Theoretic نظري	Practical عملي
	3	2	1
Offering year and semester د تدريس کال او سمستر	First year - First semester		
Aim موخي	The principal objectives of the course are to provide a general introduction to the field of engineering; to convey the social, professional, and ethical responsibilities of engineers and why they are important to an engineering education; and to provide a general description of the skills needed to become a practicing engineer. The course is designed to identify various aspects and areas of engineering to freshman engineering students and open the door to their discussions, questions, and inquiries.		
Key Learning Outcomes كليدي بنوونيز نتايج	Upon successful completion of this course, the student will be able to: <ul style="list-style-type: none"> • Discuss the history of engineering. • Define engineering. • Identify and describe the engineering fields of specialization. • Discuss career paths and initial career profiles for engineers. • Discuss engineering as a profession. • Identify the engineer's ethical and societal responsibilities. 		

	<ul style="list-style-type: none"> • Practice the engineering approach to problem solving. • Discuss the engineering method. • Discuss and apply engineering calculations. • Discuss learning and creative thought as they relate to engineering.
<p>Academic Staff Responsible د تدریس مسؤل استاد</p>	
<p>Syllabus مفردات</p>	<p>I. <u>HISTORY OF ENGINEERING</u></p> <ol style="list-style-type: none"> 1. Introduction 2. Contribution of Greeks 3. Contributions of the Romans 4. Engineering in the Middle Ages 5. The Advancement of Science: 6. Advancements in Engineering: 7. Engineering in the Twentieth Century <p>II. <u>DEFINITION OF ENGINEERING</u></p> <ol style="list-style-type: none"> 1. Engineering 2. Engineering Support Personnel 3. Engineering Fields of Specialization 4. Career Paths For Engineers 5. Initial Career Profiles <p>III. <u>THE ENGINEER AS A PROFESSIONAL</u></p> <ol style="list-style-type: none"> 1. Engineering as A Profession 2. Ideals and Obligations of Professional Engineers 3. Professional Registration 4. Professional Organizations 5. Engineering Ethics 6. Moral Foundations of Ethics 7. The Framework of Engineering Ethics <p>IV. <u>LEARNING AND CREATIVE THOUGHT</u></p> <ol style="list-style-type: none"> 1. Introduction 2. The Learning Process 3. Differences in the Way People Think 4. On Creativity <p>V. <u>KEY ELEMENTS OF ENGINEERING ANALYSIS</u></p> <ol style="list-style-type: none"> 1. Engineering Analysis 2. The SI Unit System 3. Force, Weight, and Mass 4. Significant Figures <p>VI. <u>SOLVING PROBLEMS AND SPREADSHEET ANALYSIS</u></p> <ol style="list-style-type: none"> 1. The Need-Know-How-Solve Method 2. Spreadsheet Analysis 3. Graphing in Spreadsheets <p>VII. <u>THE ENGINEERING APPROACH TO PROBLEM SOLVING</u></p> <ol style="list-style-type: none"> 1. The Nature of Engineering Design 2. The Engineering Method

	<p>VIII. <u>ENGINEERING COMMUNICATIONS</u></p> <ol style="list-style-type: none"> 1. Introduction 2. The Engineer as Writer 3. Graphical Communications 4. The Engineer as Speaker <p>IX. <u>ENGINEERING ECONOMICS</u></p> <ol style="list-style-type: none"> 1. Why is Economics Important? 2. The Cost of Money 3. When is an Investment Worth it? 	
Pre-requisite مخکینی ارین مضامین	None	
Related Courses ارونده مضامین	None	
Teaching and Learning methods د تدریس میتود	Lectures, tutorials and assignments	
Computer Knowledge د کمپیوتر زده کری ته اړتیا	Moderate Computer Knowledge such as, using MS Word, MS Excel, MS PowerPoint and CAD.	
Course Materials and References د مضمون درسی مواد او اخلیکونه	<p><u>Text Books:</u> <u>درسی کتاب</u></p> <ul style="list-style-type: none"> • Paul H. Wright. (2002), “Introduction to Engineering”, 3rd edition, John-Wiley & Sons. 	
	<p><u>Reference:</u> <u>اخلیکونه</u></p> <ul style="list-style-type: none"> • Burghardt, M. David. (1995), “Introduction to the Engineering Profession”, 2nd edition, HarperCollins. • John Dustin Kemper. (1993), “Introduction to the Engineering Profession”, Second Edition Oxford University Press, Inc. 	
<p>Evaluation activities and Grades د ارزونی فعالیتونه او نمری</p>		
Activity فعالیت	Scope هدف	Marks نمری
Attendance and class contribution حاضری او په درس کی برخه اخیستل	Attending class, contributions to knowledge and relationships with the group.	5
Assignments کورنی دنده	Solving the indicated problems from the problem list and submitting on time.	5
Laboratory and field trip	Weekly laboratory/field trip reports that include abstract,	15

reports د لابراتوار/ ساحي راپورونه	introduction, method, result, conclusion and implication.							
Quizzes صنفي ارزوني	Quizzes include teaching materials and assignments from two previous classes.	5						
Midterm exam منځني ازموينه	The midterm exam includes the covered topics	20						
Final exam وروستي ازموينه	The exam includes the covered topics after the midterm exam	50						
	Total Course Marks د کورس مجموعي نمري	100						
Relationship of this Course to Program Learning Outcome د مضمون اړيکه د څانگې له کليدي بنوونيزو موخو سره								
No.	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7
		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team
1	Understanding engineering disciplines	1	1	1	2	2	1	1
2	Understanding engineering various fields	1	1	1	2	2	1	1
3	Able to know the role of engineering fields in development	1	1	1	2	2	1	1
	Total	1	1	1	3	3	1	1
	Average	1.57						
1= Some relation 2= Moderate relation 3=Extensive relation								

En. Ce 0310 Engineering Mechanics I: Statics

Item موضوع	Description توضیحات		
Title عنوان یا مضمون	En. Ce 0310 Engineering Mechanics I: Statics		
Credits and no. of hour د کربدتونو او درسي ساعتونو شمير	Total ټوليزه	Theoretic نظري	Practical عملي
	3	3	0
Offering year and semester د تدريس کال او سمستر	Second year - First semester		
Aim موخي	This course is designed to provide an introduction to the application of mechanics in solving engineering problems related to particles and rigid bodies in equilibrium.		
Key Learning Outcomes کلیدي پښوونيز نتيچ	<p>Key learning outcomes of this course follow:</p> <ul style="list-style-type: none"> The student will learn about the concepts of center of mass, centroid, equilibrium of particles and the equilibrium of rigid bodies The student will learn about the concepts of forces and force systems, equilibrium of rigid bodies, center of gravity 		
Academic Staff Responsible د تدريس مسنول استاد			
Syllabus مفردات	<p>I. <u>INTRODUCTION</u></p> <ol style="list-style-type: none"> Basic Concepts Force System and Equilibrium Definition of Force Moment and Couple Principle of Transmissibility Varignon's Theorem <p>II. <u>VECTOR</u></p> <ol style="list-style-type: none"> Vectors and Components Dot and Cross Products; Mixed Triple Products General Principles – Newton's Laws <p>III. <u>FORCES AND FORCE SYSTEMS</u></p> <ol style="list-style-type: none"> Characteristics and Representation Of A Force Classification of Forces and Free-Body Diagrams Equilibrium of Particle <p>IV. <u>PLANE TRUSSES</u></p> <ol style="list-style-type: none"> Degrees of Freedom 		

	<ol style="list-style-type: none"> 2. Types of Supports and Reactions 3. Types of Loads 4. Analysis of Trusses-Method of Joints 5. Method of Sections <p>V. <u>FRICITION</u></p> <ol style="list-style-type: none"> 1. Introduction 2. Static Dry Friction 3. Simple Contact Friction Problems- Ladders, Wedges, Screws and Belt Friction <p>VI. <u>EQUILIBRIUM OF RIGID BODIES</u></p> <ol style="list-style-type: none"> 1. Rigid Bodies and Equivalent Systems 2. General Systems of Forces in A Plane (2D) and Static Equilibrium Conditions 3. General Systems of Forces in Space (3D) and Static Equilibrium Conditions <p>VII. <u>CENTER OF GRAVITY, CENTER OF MASS, AND CENTROID</u></p> <ol style="list-style-type: none"> 1. Center of Forces 2. Center of Gravity and Center of Mass 3. Centroid of An Area and Centroid of A Line <p>VIII. <u>MOMENT OF INERTIA</u></p> <ol style="list-style-type: none"> 1. Moments of Inertia of An Area 2. Polar Moment of Inertia of An Area 3. Product of Inertia of an Area 4. Parallel Axis Theorem 5. Composite Area 6. Rotated Set of Axes 7. Mohr's Circle 8. Moment of Inertia of A Mass 9. Product of Inertia of A Mass 10. Parallel Axis Theorem for A Mass 11. Composite Mass
Pre-requisite مخکینی ارین مضامین	None
Related Courses ارونده مضامین	Dynamics , Fluid Mechanics and Thermodynamics-I&II
Teaching and Learning methods د تدریس میتود	Lectures, tutorials, and assignments
Computer Knowledge د کمپیوتر زده کری ته ارتیا	Moderate computer knowledge such as MS Word, MS Excel, MS PowerPoint, and CAD.

Course Materials and References د مضمون درسي مواد او اخليكونه	<u>Text Books:</u> <u>درسي كتاب</u> <ul style="list-style-type: none"> Hibbler, R.C. (2012). <i>Engineering Mechanics: Statics and Dynamics</i> (13th Edition). Prentice Hall. 	
	<u>Reference:</u> <u>اخليكونه</u> <ul style="list-style-type: none"> Beer and Johnston (2008). <i>Mechanics for Engineers-Statics</i> (5th Edition). McGraw-Hill, New York. Beer, F. P., Johnston, E. R., Eisenberg, E., Cornwell, P. and Mazurek, D. (2009). <i>Vector Mechanics for Engineers: Statics-Dynamics</i> (9th Edition). McGraw-Hill Science/Engineering/Math Nelson, E., Best, Charles, McLean, W.G., and Merle Potter (2011). <i>Schaum's Outline of Engineering Mechanics Dynamics</i>. The McGraw-Hill Companies, Inc. 	
Evaluation activities and Grades د ارزوني فعاليتونه او نمري		
Activity فعاليت	Scope هدف	Marks نمري
Attendance and class contribution حاضري او په درس كي برخه اخستل	Attending class, contributions to knowledge and relationships with the group.	5
Assignments كورني دنده	Solving the indicated problems from the problem list and submitting on time.	5
Laboratory and field trip reports د لابراتوار/ ساحي راپورونه	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion, and implication.	15
Quizzes صنفي ارزوني	Quizzes include teaching materials and assignments from two previous classes.	5
Midterm exam منخني ازموينه	The midterm exam includes the covered topics.	20
Final exam وروستي ازموينه	The final exam includes the covered topics after the midterm exam.	50
	Total Course Marks د كورس مجموعي نمري	100

Relationship of this Course to Program Learning Outcome								
د مضمون اړیکه د څانګې له کلیدي بنوونیزو موخو سره								
No.	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7
		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team
1	The student will learn about the concepts of center of mass, centroid, equilibrium of particles and the equilibrium of rigid bodies	1	2	2	2	2	2	3
2	The student will learn about the concepts of forces and force systems, equilibrium of rigid bodies, center of gravity	1	2	2	2	2	3	3
Total		1	2	2	2	2	2.5	3
Average		2.1						
1= Some relation 2= Moderate relation 3= Extensive relation								

En. Ce 0412 Engineering Mechanics II: Dynamics

Item موضوع	Description توضیحات		
Title عنوان یا مضمون	En. Ce 0412 Engineering Mechanics II: Dynamics		
Credits and no. of hour د کړېدونو او درسي ساعتونو شمیر	Total ټولیزه	Theoretic نظري	Practical عملي
	3	3	0
Offering year and semester د تدریس کال او سمسټر	Second year - Second semester		
Aim موخي	This course develops a clear understanding of the basic principles that govern the dynamics of particles and rigid bodies; as well as an ability to use that understanding to solve engineering problems.		

Key Learning Outcomes کلیدی بنیونیز نتایج	Key learning outcomes of this course follow: <ul style="list-style-type: none"> The student will learn about kinematics of a particle, kinetics of a particles, kinematics of a rigid body, planar kinetics of a rigid body The student will learn about energy and momentum in rigid body dynamics
Academic Staff Responsible د تدریس مسنول استاد	
Syllabus مفردات	I. <u>KINEMATICS OF A PARTICLE</u> <ol style="list-style-type: none"> Coordinate Systems and Position Vectors Displacement, Velocity, and Acceleration Rectilinear Motion Curvilinear Motion II. <u>KINETICS OF A PARTICLE</u> <ol style="list-style-type: none"> Newton's Law of Motion Equation of Motion for A System of Particles III. <u>KINEMATICS OF A RIGID BODY</u> <ol style="list-style-type: none"> Rigid Body and Types of Motion Rotation about A Fixed Axis General Motions IV. <u>PLANAR KINETICS OF A RIGID BODY</u> <ol style="list-style-type: none"> Moment of Inertia Planar Kinetic Equations of Motion Equations of Motion: Translation Equations of Motion: Rotation about A Fixed Axis Equations of Motion: General Plane Motion V. <u>ENERGY AND MOMENTUM IN RIGID BODY DYNAMICS</u> <ol style="list-style-type: none"> Work and Energy for System of Particles Kinetic Energy of A Rigid Body Potential Energy The General Energy Principle, Virtual Work Linear Momentum and Moment of Momentum Conservation of Momentum
Pre-requisite مخکینی ایرین مضامین	None
Related Courses اړونده مضامین	Statics, Fluid Mechanics
Teaching and Learning methods د تدریس میتود	Lectures, tutorials, and assignments
Computer Knowledge د کمپیوتر زده کړې ته اړتیا	Moderate computer knowledge such as MS Word, MS Excel, MS PowerPoint, and CAD.
Course Materials and References د مضمون درسي مواد او اخلیکونه	<u>Text Books:</u> <ul style="list-style-type: none"> Hibbler, R.C. (2012). <i>Engineering Mechanics: Statics and Dynamics</i> (13th Edition). Prentice Hall. <u>Reference:</u> <ul style="list-style-type: none"> Bedford, A. and Fowler, W. (2005). <i>Engineering Mechanics:</i>

	<p>Dynamics, 4th Edition. Prentice Hall.</p> <ul style="list-style-type: none"> • Beer, F. P., Johnston, E. R., Eisenberg, E., Cornwell, P. and Mazurek, D. (2009). Vector Mechanics for Engineers: Statics-Dynamics (9th Edition). McGraw-Hill Science/Engineering/Math • Nelson, E., Best, Charles, McLean, W.G., and Merle Potter (2011). Schaum's Outline of Engineering Mechanics Dynamics. The McGraw-Hill Companies, 							
Evaluation activities and Grades								
د ارزوني فعاليتونه او نمري								
Activity فعاليت	Scope هدف	Marks نمري						
Attendance and class contribution حاضري او په درس کي برخه اخستل	Attending class, contributions to knowledge and relationships with the group.	5						
Assignments کورني دنده	Solving the indicated problems from the problem list and submitting on time.	5						
Laboratory and field trip reports د لابراتوار/ ساحي راپورونه	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion and implication.	15						
Quizzes صنفي ارزوني	Quizzes includes teaching materials and assignments from two previous classes.	5						
Midterm exam منخني ازموينه	The midterm exam includes the covered topics.	20						
Final exam وروستي ازموينه	The final exam includes the covered topics after the midterm exam.	50						
	Total Course Marks د کورس مجموعي نمري	100						
Relationship of this Course to Program Learning Outcome								
د مضمون اړيکه د څانگي له کلیدي بشوونيزو موخو سره								
No.	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7
		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team
1	The student will learn about Kinematics of a particle, kinetics	1	2	2	3	2	2	3

	of a particles, kinematics of a rigid body, planar kinetics of a rigid body							
2	The student will learn about energy and momentum in rigid body dynamics	2	2	2	3	2	3	3
Total		1.5	2	2	3	2	2.5	3
Average		2.9						
1= Some relation 2= Moderate relation 3= Extensive relation								

En.Ene 0413 Engineering Circuit Analysis I

Item موضوع	Description توضیحات						
Title عنوان یا مضمون	En.Ene 0413 Engineering Circuit Analysis I						
Credits and no. of hour د کربدتونو او درسي ساعتونو شمير	<table border="1"> <tr> <td>Total ټوليزه</td> <td>Theoretic نظري</td> <td>Practical عملي</td> </tr> <tr> <td>3</td> <td>2</td> <td>1</td> </tr> </table>	Total ټوليزه	Theoretic نظري	Practical عملي	3	2	1
Total ټوليزه	Theoretic نظري	Practical عملي					
3	2	1					
Offering year and semester د تدريس کال او سمسټر	Second year - Second semester						
Aim موخي	After studying this course student will be able to understand working of electrical circuits, network theorems						
Key Learning Outcomes کلیدي ښوونيز نتيایج	<p>Key learning outcomes of this course follow:</p> <ul style="list-style-type: none"> To explain the different areas of electrical and electronics engineering To use the knowledge of mathematics, fundamental sciences, and engineering to electrical and electronics engineering problems <p>To analyze the electric circuits and theorems To analyze series and parallel electric circuits</p>						
Academic Staff Responsible د تدريس مسنول استاد							
Syllabus مفردات	<p><u>I. INTRODUCTION</u></p> <ol style="list-style-type: none"> Introducing the Course on Basic Electrical Generation, Transformation and Distribution of Electric Power an Overview Review of Kirchhoff's Law <p><u>II. ELECTRIC CIRCUITS</u></p> <ol style="list-style-type: none"> Introduction to Linear and Nonlinear Circuit Loop Analysis of Resistive Circuit in the Context of DC Voltages and Currents Node-Voltage Analysis of Resistive Circuit in the Context of DC Voltages and Currents Transformations 						

	<ol style="list-style-type: none"> 5. Superposition Theorem in the Context of DC Voltage and Current Sources Acting in a Resistive Network 6. Thevenin's and Norton's Theorems in the Context of DC Voltage And Current Sources Acting in a Resistive Network 7. Analysis of DC Resistive Network in Presence of One Non-Linear Element <p>III. <u>R-L & R-C TRANSIENTS</u></p> <ol style="list-style-type: none"> 1. Study of DC Transients in R-L and R-C Circuits 2. Study of DC Transients in R-L-C Circuits <p>IV. <u>SINGLE-PHASE AC CIRCUITS</u></p> <ol style="list-style-type: none"> 1. Generation of Sinusoidal Voltage Waveform (AC) and Some Fundamental Concepts 2. Representation of Sinusoidal Signal by a Phasor and Solution of Current in R-L-C Series Circuits 3. Solution of Current in R-L-C Series Circuits 4. Solution of Current in AC Series and Parallel Circuits 5. Solution of Current in AC Parallel and Series-parallel Circuits 6. Resonance in Series and Parallel Circuits <p>V. <u>THREE-PHASE AC CIRCUITS</u></p> <ol style="list-style-type: none"> 1. Magnetic Circuits 2. Eddy Current & Hysteresis Loss 3. Phase Sequence 4. Relation between line and phase voltages and currents in Star-Star, Delta-Delta, Star-Delta and Delta-Star balanced connections 5. analysis of unbalanced three phase circuits 6. measurement of active and reactive power <p>VI. <u>NETWORK PARAMETERS AND TWO PORT NETWORKS</u></p> <ol style="list-style-type: none"> 1. Driving point and transfer impedance function networks, poles and zeros necessary conditions for driving point function and for transfer function. 2. Two port network parameters 3. Z, Y, hybrid, inverse hybrid, transmission and inverse transmission parameters 4. Relation between various parameters 5. Condition for symmetry and reciprocity for above parameters, two port network parameters using transformed variables <p>VII. <u>MEASURING INSTRUMENTS</u></p> <ol style="list-style-type: none"> 1. Study of DC-AC Measuring Instruments 2. Study of Electro-Dynamic Type Instruments 3. Study of Single Phase Induction Type Energy Meter or Watt-hour Meter <p>VIII. <u>LABORATORY SESSION</u></p> <ol style="list-style-type: none"> 1. Characteristics of a Practical DC source 2. Current vs. Voltage Graph 3. Light Controlled Switch 4. Rectifier and Voltage Regulator 5. Frequency Response 6. Time Constant, Oscillator and Counter 7. Operational Amplifiers
Pre-requisite مخکینی ارین مضامین	Engineering Physics-III
Related Courses ارونده مضامین	Basic Electronics

Teaching and Learning methods د تدریس میتود	Lectures, tutorials, and assignments	
Computer Knowledge د کمپیوتر زده کړې ته اړتیا	Moderate computer knowledge such as MS Word, MS Excel, MS PowerPoint, and CAD	
Course Materials and References د مضمون درسي مواد او اخلیکونه	<u>Text Books:</u> <u>درسي کتاب</u> <ul style="list-style-type: none"> Herrick, Robert J. (2003). <i>DC/AC Circuits and Electronics: Principles and Applications</i>. Thomson Delmar Learning, ISBN: 0-7668-2083-1 Fundamentals of Electric Circuits by Charles K.Alexander, Matthew N.O.Sadiku, Tata McGraw Hill Company. Engineering Circuit Analysis by William H.Hayt.Jr, Jack E.Kemmerly and Steven M.Durbin by Tata McGraw Hill Company. Circuits and Networks by T.K.Nagasarkar and M.S.Sukhija, Oxford University Press 	
	<u>Reference:</u> <u>اخلیکونه</u> <ul style="list-style-type: none"> Cotton, H., Electrical Technology. Sir Isaac Pitman & Sons Cook, Nigel P. (1998). <i>Introductory AC/DC Circuits</i>. Prentice-Hall Horowitz and Hill (1989). <i>The Art of Electronics</i>. Cambridge Press, ISBN 0-521-37095-7. Berube, Richard H. (1997). <i>Computer Simulated Experiments for Electric Circuits Using Electronics Workbench</i>. Prentice Hall, ISBN 0-13-359621-4 	
Evaluation activities and Grades د ارزوني فعالیتونه او نمرې		
Activity فعالیت	Scope هدف	Marks نمرې
Attendance and class contribution حاضري او په درس کې برخه اخستل	Attending class, contributions to knowledge and relationships with the group.	5
Assignments کورني دنده	Solving the indicated problems from the problem list and submitting on time.	5
Laboratory and field trip reports د لابراتوار/ ساحي راپورونه	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion and implication.	15
Quizzes صنفي ارزوني	Quizzes include teaching materials and assignments from two previous classes.	5
Midterm exam منځني ازموینه	The midterm exam includes the covered topics.	20
Final exam وروستی ازموینه	The final exam includes the covered topics after the midterm exam.	50
	Total Course Marks د کورس مجموعي نمرې	100

Relationship of this Course to Program Learning Outcome د مضمون اړیکه د ځانګړي له کلیدي بنوونیزو موخو سره								
No.	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7
		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team
1	To explain the different areas of electrical and electronics engineering	3	2	2	1	1	2	2
2	To use the knowledge of mathematics, fundamental sciences, and engineering to electrical and electronics engineering problems	3	3	2	2	2	2	1
3	To analyze the electric circuits and theorems	3	2	3	2	2	2	2
4	To analyze series and parallel electric circuits	3	2	1	2	1	2	2
Total		3	2.25	2	1.75	1.5	2	1.75
Average		2						
1= Some relation 2= Moderate relation 3=Extensive relation								

En. Ce 0311 Surveying

Item موضوع	Description توضیحات		
Title عنوان یا مضمون	En. Ce 0311 Surveying		
Credits and no. of hour د کړېدونو او درسي ساعتونو شمیر	Total ټوليزه	Theoretic نظري	Practical عملي
	3	2	1
Offering year and semester د تدريس کال او سمسټر	Second year - First semester		

<p>Aim مؤخي</p>	<p>This course is designed to impart necessary knowledge and skills to perform surveying and leveling, and do the relevant drawing and computations for engineering applications.</p>
<p>Key Learning Outcomes كليدي بنونيز نتايج</p>	<p>Key learning outcomes of this course follow:</p> <ul style="list-style-type: none"> • Understand basic principles of surveying • Able to get knowledge of the basic principle of chain surveying, leveling, total station and theodolite traversing, tachometry, and identify the erroneous measurements and the sources of these errors • Ability to use the chain, tape, level, total station, theodolite and other surveying equipment to perform field surveys, produce relevant maps and drawings, and do associated computations required for engineering applications • Work efficiently in a group environment
<p>Academic Staff Responsible د تدریس مسؤل استاد</p>	
<p>Syllabus مفردات</p>	<p>I. <u>BASICS OF SURVEYING</u></p> <ol style="list-style-type: none"> 1. Overview 2. Surveying Defined 3. Types of Surveys 4. Classes of Surveys 5. Definitions 6. Surveying Instrumentation 7. Overview of a Modern Surveying Data System—The Science of Geomatics 8. Survey Geographic Reference 9. Survey Grid Reference 10. Survey Legal Reference 11. Survey Vertical Reference 12. Distance Measurement 13. Units of Measurement 14. Location Methods 15. Accuracy and Precision 16. Accuracy Ratio 17. Errors 18. Mistakes 19. Stationing 20. Field Notes 21. Field Management <p>II. <u>LEVELING</u></p> <ol style="list-style-type: none"> 1. General Background 2. Theory of Differential Leveling 3. Curvature and Refraction 4. Types of Surveying Levels 5. Leveling Rods 6. Definitions for Differential Leveling 7. Techniques of Leveling 8. Benchmark Leveling (Vertical Control Surveys) 9. Profile and Cross-Section Leveling 10. Reciprocal Leveling 11. Peg Test 12. Three-Wire Leveling 13. Trigonometric Leveling 14. Level Loop Adjustments

	<ul style="list-style-type: none"> 15. Suggestions for Rod Work 16. Suggestions for Instrument Work 17. Mistakes in Leveling III. <u>DISTANCE MEASUREMENT</u> <ul style="list-style-type: none"> 1. Methods of Distance Determination 2. Distance Measuring Techniques 3. Other Indirect Measuring Techniques 4. Gunter's Chain 5. Taping 6. Taping Accessories 7. Taping Techniques 8. Standard Conditions for the Use of Steel Tapes 9. Taping Corrections: General Background 10. Systematic Slope Corrections 11. Erroneous Tape Length Corrections 12. Temperature Corrections 13. Tension and Sag Corrections 14. Random Errors Associated with Systematic Taping Errors 15. Random Taping Errors 16. Techniques for Ordinary Taping Precision 17. Mistakes in Taping 18. Electronic Distance Measurement 19. Electronic Angle Measurement 20. Principles of Electronic Distance Measurement (EDM) 21. EDM Instrument Characteristics 22. Prisms 23. EDM Instrument Accuracies 24. EDM Instruments Without Reflecting Prisms IV. <u>ANGLES AND DIRECTIONS</u> <ul style="list-style-type: none"> 1. General Background 2. Reference Directions for Vertical Angles 3. Meridians 4. Horizontal Angles 5. Azimuths 6. Bearings 7. Relationships Between Bearings and Azimuths 8. Reverse Directions 9. Azimuth Computations 10. Bearing Computations 11. Comments on Bearings and Azimuths 12. Magnetic Direction V. <u>TOTAL STATIONS AND THEODOLITES</u> <ul style="list-style-type: none"> 1. Introduction 2. Electronic Theodolites 3. Total Station 4. Instrument Setup 5. Geometry of the Theodolite and the Total Station 6. Adjustment of the Theodolite and the Total Station 7. Laying Off Angles 8. Prolonging a Straight Line 9. Bucking-In 10. Intersection of Two Straight Lines 11. Prolonging a Measured Line by Triangulation over an Obstacle 12. Prolonging a Line Past an Obstacle 13. Total Station Field Techniques 14. Summary of Typical Total Station Characteristics
--	---

	<ul style="list-style-type: none"> 15. Field Procedures for Total Stations 16. Motorized Total Stations 17. Handheld Total Stations 18. Summary of Modern Total Station Characteristics 19. Ground-Based LiDAR Imaging 20. Instruments Combining Total Station Capabilities and GPS Receiver Capabilities
	<p>VI. <u>TRAVERSE SURVEYS</u></p> <ul style="list-style-type: none"> 1. General Background 2. Open Traverse 3. Closed Traverse 4. Balancing Angles 5. Latitudes and Departures 6. Computation of Latitudes and Departures to Determine the Error of Closure and the Precision of a Traverse 7. Traverse Precision and Accuracy 8. Traverse Adjustments 9. Compass Rule Adjustment 10. Effects of Traverse Adjustments on the Original Data 11. Omitted Measurements 12. Rectangular Coordinates of Traverse Stations 13. Area of a Closed Traverse by the Coordinate Method 14. Review Problem 15. Geometry of Rectangular Coordinates 16. Illustrative Problems in Rectangular Coordinates
	<p>VII. <u>SATELLITE POSITIONING SYSTEMS</u></p> <ul style="list-style-type: none"> 1. General Background 2. United States' Global Satellite Positioning System (GPS) 3. GPS Codes, Signals, and Frequencies 4. Receivers 5. GPS Position Measurements 6. GPS Carrier Phase Measurement 7. Continuously Operating Reference Station (CORS) 8. Canadian Active Control System 9. Survey Planning 10. GPS Field Procedures 11. GPS Applications 12. Vertical Positioning 13. Conclusion 14. GPS Glossary 15. Recommended Readings
	<p>VIII. <u>TOPOGRAPHIC SURVEYING AND MAPPING</u></p> <ul style="list-style-type: none"> 1. General Background 2. Maps and Plans 3. Scales and Precision 4. Plan Plotting 5. Introduction to Contours 6. Summary of Contour Characteristics 7. Topographic (Planimetric) Surveys 8. Cross Sections and Profiles 9. Cross Sections, End Areas, and Volumes 10. Prismoidal Formula 11. Construction Volumes 12. Area Computations 13. Area by Graphical Analysis 14. Hydrographic Surveys

IX. GEOGRAPHIC INFORMATION SYSTEMS

1. Background
2. Scope of GIS
3. Day-to-Day GIS
4. What Surveyors Need to Know
5. Construction of Data
6. Basic Analysis of Data
7. Components of GIS
8. Types of Data
9. Glossary
10. Internet Websites
11. Publications

X. CONTROL SURVEYS

1. General Background
2. Plane Coordinate Grids
3. Lambert Projection
4. Transverse Mercator Grid System
5. Universal Transverse Mercator (UTM) Grid System
6. Use of Grid Coordinates
7. Illustrative Examples
8. Horizontal Control Techniques
9. Project Control
10. Control Survey Markers
11. Direction of a Line by Gyrotheodolite

XI. SATELLITE IMAGERY

1. General Background
2. Techniques of Remote Sensing
3. Electromagnetic Spectrum
4. Selection of Radiation Sensors
5. An Introduction to Image Analysis
6. Classification
7. Feature Extraction
8. Ground-Truth or Accuracy Assessment
9. U.S. National Land-Cover Data (NLCD) 2006
10. Remote-Sensing Satellites
11. Imaging Radar Satellites
12. Satellite Imagery Versus Airborne Imagery
13. Remote Sensing Internet Websites and Further Reading
14. Further Reading

XII. AIRBORNE IMAGERY

1. General Background
2. Aerial Camera Systems
3. Photographic Scale
4. Flying Heights and Altitude
5. Relief (Radial) Displacement
6. Flight Lines and Photograph Overlap
7. Ground Control for Mapping
8. Mosaics
9. Stereoscopic Viewing and Parallax
10. Photogrammetric Stereoscopic Plotting Techniques
11. Airborne Digital Imagery
12. LiDAR Mapping
13. Aerial Surveying and Photogrammetric Mapping
14. Aerial Photography Interpretation
15. Applications of Air Photo Interpretation for the Engineer and the

	<p>Surveyor</p> <p>16. Airborne Imaging Websites</p> <p>17. Further Reading</p> <p>XIII. ENGINEERING SURVEYS</p> <ol style="list-style-type: none"> 1. Route Surveys and Highway Curves 2. Circular Curves: General Background 3. Circular Curve Geometry 4. Circular Curve Deflections 5. Chord Calculations 6. Metric Considerations 7. Field Procedure 8. Moving Up on the Curve 9. Offset Curves 10. Vertical Curves: General Background 11. Geometric Properties of the Parabola 12. Computation of the High or Low Point on a Vertical Curve 13. Procedure for Computing a Vertical Curve 14. Municipal Services Construction Practices 15. Highway Construction 16. Sewer Construction 17. Pipeline Construction 18. Culvert Construction 19. Building Construction 20. Other Construction Surveys 21. Construction Survey Specifications <p>XIV. LAND SURVEYS</p> <ol style="list-style-type: none"> 1. General Background 2. Public Land Surveys 3. Property Conveyance 4. Surveys of Simultaneous Conveyances 5. Surveys of Sequential Conveyances 6. Title or Mortgage Surveys 7. Cadastral Surveying 8. Land Surveying Websites
Pre-requisite مخکینی ایرین مضامین	None
Related Courses ایرونده مضامین	Hydropower, Wind Energy, Biomass Energy, Solar Energy, Petroleum and Gas Engineering
Teaching and Learning methods د تدریس میتود	Lectures, tutorials, and assignments
Computer Knowledge د کمپیوتر زده کری ته ارتیا	Moderate computer knowledge such as MS Word, MS Excel, MS PowerPoint, and CAD.
Course Materials and References د مضمون درسی مواد او اخلیکونه	<p><u>Text Books:</u></p> <p><u>درسی کتاب</u></p> <ul style="list-style-type: none"> • Kavanagh, B. and Mastin, T. (2014), Surveying principles and Application (9th Edition). Pearson.
	<p><u>Reference:</u></p> <p><u>اخلیکونه</u></p> <ul style="list-style-type: none"> • Davis, R.E., Surveying Theory and Practice. McGraw Hill • Irvine, W. (2006), Surveying for Construction (5th Edition). McGraw Hill

Evaluation activities and Grades د ارزوني فعالیتونه او نمرې								
Activity فعالیت	Scope هدف	Marks نمرې						
Attendance and class contribution حاضري او په درس کي برخه اخستل	Attending class, contributions to knowledge and relationships with the group.	5						
Assignments کورني دنده	Solving the indicated problems from the problem list and submitting on time.	5						
Laboratory and field trip reports د لابراتوار/ ساحي راپورونه	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion and implication.	15						
Quizzes صنفي ارزوني	Quizzes include teaching materials and assignments from two previous classes.	5						
Midterm exam منځنی ازموینه	The midterm exam includes the covered topics.	20						
Final exam وروستی ازموینه	The final exam includes the covered topics after the midterm exam.	50						
	Total Course Marks د کورس مجموعي نمرې	100						
Relationship of this Course to Program Learning Outcome د مضمون اړیکه د ځانګي له کلیدي ښوونیزو موخو سره								
No.	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7
		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team
1	Understanding the basic principle of surveying	1	2	2	3	2	2	3
2	Able to get knowledge of the basic principle of chain surveying, Leveling, Theodolite traversing, tachometry and identify the erroneous measurements	2	2	2	3	2	3	3

	and the sources of these errors							
3	Ability to use the chain, tape, level, theodolite and other surveying equipment to carry out field surveys, produce relevant maps and drawings, and do associated computations required for engineering applications	1	2	2	3	3	2	2
4	Work efficiently in a group environment	1	1	2	2	2	3	2
Total		1.25	1.75	2	2.75	2.25	2.5	2.5
Average		2.14						
		1= Some relation		2= Moderate relation		3= Extensive relation		

En. Ene 0519 Engineering Economics

Item موضوع	Description توضیحات		
Title عنوان یا مضمون	En. Ene 0519 Engineering Economics		
Credits and no. of hour د ګرېډټونو او درسي ساعتونو شمير	Total ټوليزه	Theoretic نظري	Practical عملي
	3	3	0
Offering year and semester د تدريس کال او سمسټر	Fourth year - First semester		
Aim موخي	The aim of the course is to acquire and independently apply concepts and techniques of economic analysis used to form engineering decisions; to assess cost implication in engineering design and application; to select a preferred course of action based upon monetary and non-monetary considerations; to assess risks and uncertainty associated with energy engineering economic decisions		
Key Learning Outcomes کلیدي بنوونيز نتيایج	Key learning outcomes of this course follow: <ul style="list-style-type: none"> • Understand basic concepts in economic analysis • Able to understand cost concepts and the time value of money • Measure the worth of investment and comparison of alternatives • Able to assess project feasibility analysis and ability to make decisions under risk and uncertainty 		
Academic Staff Responsible د تدريس مسنول استاد			

<p>Syllabus مفردات</p>	<p>I. <u>INTRODUCTION/ENGINEERING ECONOMIC DECISION</u></p> <ol style="list-style-type: none"> 1. Introduction 2. Origins of Engineering Economics 3. What Are the Principles of Engineering Economics? 4. Engineering Economics and Design Process <p>II. <u>COST CONCEPTS AND DESIGN ECONOMICS</u></p> <ol style="list-style-type: none"> 1. Introduction 2. Cost Estimating and Cost Terminology 3. The General Economic Environment 4. Cost-Driven Design Optimization <p>III. <u>MONEY-TIME RELATIONSHIPS AND EQUIVALENCE</u></p> <ol style="list-style-type: none"> 1. Introduction 2. Why Consider Return to Capital? 3. Origin of Interest, Simple Interest and Compound Interest 4. The Concept of Equivalence 5. Notation and Cash-Flow Diagrams and Tables <p>IV. <u>APPLICATIONS OF MONEY-TIME RELATIONSHIPS</u></p> <ol style="list-style-type: none"> 1. Introduction 2. Determining the Minimum Attractive Rate of Return 3. The Present Worth Method, The Future Worth Method and the Annual Worth Method 4. The Internal Rate Of Return Method and External Rate of Return Method <p>V. <u>COMPARING ALTERNATIVES</u></p> <ol style="list-style-type: none"> 1. Introduction 2. The Basic Concepts for Comparing Alternatives 3. The Study (Analysis) Period 4. Case 1: Useful Lives Are Equal to the Study Period 5. Case2: Useful Lives Are Different Among the Alternatives <p>VI. <u>PROJECT FEASIBILITY ANALYSIS</u></p> <ol style="list-style-type: none"> 1. Financial Feasibility 2. Market Price Analysis 3. Cost of Capital and Weighted Average 4. Benefit-Cost Analysis <p>VII. <u>SENSITIVITY AND RISK MANAGEMENT</u></p> <ol style="list-style-type: none"> 1. Introduction 2. What Are Risk, Uncertainty and Sensitivity? 3. Sources of Uncertainty 4. Sensitivity Analysis
<p>Pre-requisite مخکینی ایرین مضامین</p>	<p>None</p>
<p>Related Courses ایرونده مضامین</p>	<p>Engineering Accounting</p>
<p>Teaching and Learning methods د تدریس میتود</p>	<p>Lectures, tutorials, and assignments</p>
<p>Computer Knowledge د کمپیوتر زده کری ته ارتیا</p>	<p>Moderate computer knowledge such as MS Word, MS Excel, MS PowerPoint, and CAD.</p>

Course Materials and References د مضمون درسي مواد او اخليكونه	<u>Text Books:</u> <u>درسي كتاب</u>							
	<ul style="list-style-type: none"> Park, Chan S.(2004), Fundamentals of Engineering, Economics Edition, Upper Saddle River, NJ., Prentice Hall 							
Evaluation activities and Grades د ارزوني فعاليتونه او نمري	<u>Reference:</u> <u>اخليكونه</u>							
	<ul style="list-style-type: none"> Sullivan, W.G., Wicks, E.M and J.T Luxor (2003). <i>Engineering Economy</i> (12th Edition). Prentice Hall Pannerselvam, R. (2006). <i>Engineering Economics</i> (5th Edition). Prentice-Hall. 							
Activity فعاليت	Scope هدف						Marks نمري	
Attendance and class contribution حاضري او په درس كي برخه اخستل	Attending class, contributions to knowledge and relationships with the group.					5		
Assignments كورني دنده	Solving the indicated problems from the problem list and submitting on time.					5		
Laboratory and field trip reports د لابراتوار/ ساحي راپورونه	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion and implication.					15		
Quizzes صنفي ارزوني	Quizzes include teaching materials and assignments from two previous classes.					5		
Midterm exam منخني ازموينه	The midterm exam includes the covered topics.					20		
Final exam وروستي ازموينه	The final exam includes the covered topics after the midterm exam.					50		
		Total Course Marks د كورس مجموعي نمري					100	
Relationship of this Course to Program Learning Outcome د مضمون اړيکه د ځانگي له كليدي بشونيزو موخو سره								
No.	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7
		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team

1	Understanding the basic concepts in economic analysis	2	1	1	2	2	1	1
2	Able to understand the cost concepts and the time value of money	2	1	1	2	2	1	1
3	Measuring the worth of investment and comparison of alternatives;	2	2	1	2	2	1	1
4	Able to get the idea of project feasibility analysis and capability of decision making under risk and uncertainty	2	2	1	3	2	2	2
Total		2	1.5	1	2.25	2	1.25	1.25
Average		1.60						
		1= Some relation		2= Moderate relation		3= Extensive relation		

En. Ene 0625 Seminar I (Research Methodology)

Item موضوع	Description توضیحات		
Title عنوان یا مضمون	En. Ene 0625 Seminar I (Research Methodology)		
Credits and no. of hour د کړېدونو او درسي ساعتونو شمير	Total ټوليزه	Theoretic نظري	Practical عملي
	1	1	0
Offering year and semester د تدريس کال او سمستر	Third year - Second semester		
Aim موخي	The objective of this course is to provide a basic overview of research methods used in education in addition to those concepts needed to make those ideas and conclusions accessible to others.		
Key Learning Outcomes کلیدي ښوونيز	Key learning outcomes of this course follow: <ul style="list-style-type: none"> Understand research terminology Be aware of the ethical principles of research, ethical challenges, and approval processes 		

<p>نتایج</p>	<ul style="list-style-type: none"> • Describe quantitative, qualitative, and mixed methods approaches to research • Identify the components of a literature review process • Critically analyze published research
<p>Academic Staff Responsible د تدریس مسؤل استاد</p>	
<p>Syllabus مفردات</p>	<p>I. <u>INTRODUCTION TO RESEARCH</u></p> <ol style="list-style-type: none"> 1. What is Research? 2. Research Concepts 3. Types of Research 4. Research Questions 5. Literature Reviews 6. Research Ethics and Integrity <p>II. <u>QUANTITATIVE RESEARCH METHODS</u></p> <ol style="list-style-type: none"> 1. The Scientific Method 2. Design of Quantitative Surveys 3. Quantitative Research Methods <p>III. <u>QUALITATIVE RESEARCH</u></p> <ol style="list-style-type: none"> 1. Introduction to Qualitative Research and Research Approaches 2. Qualitative Research Methods 3. Data Analysis and Theory in Qualitative Research Articles <p>IV. <u>DATA COLLECTION AND SAMPLING</u></p> <ol style="list-style-type: none"> 1. Descriptive and Inferential Statistics 2. Constructing A Questionnaire <p>V. <u>MIXED-METHODS DESIGN</u></p> <ol style="list-style-type: none"> 1. Introduction to Mixed Methods Research 2. Design of Mixed Methods Research 3. Evaluation of Mixed Methods Research <p>VI. <u>RESEARCH PROPOSAL</u></p> <ol style="list-style-type: none"> 1. Writing A Research Proposal 2. Presentations and Proposals
<p>Pre-requisite مخکینی ارین مضامین</p>	<p>None</p>
<p>Related Courses ارونده مضامین</p>	<p>Research/Project</p>

Teaching and Learning methods د تدریس میتود	Lectures, tutorials, and assignments	
Computer Knowledge د کمپیوٹر زدہ کری تہ اہتیا	Moderate computer knowledge such as MS Word, MS Excel, MS PowerPoint and CAD.	
Course Materials and References د مضمون درسی مواد او اخلیکونہ	<u>Text Books:</u> <u>درسی کتاب</u> <ul style="list-style-type: none"> Johnson, R., B., & Christensen, L., (2010). <i>Educational Research: Quantitative, Qualitative, and Mixed Approaches</i> (4th Edition). SAGE Publications 	
	<u>Reference:</u> <u>اخلیکونہ</u> <ul style="list-style-type: none"> American Psychological Association. (2009). Publication manual of the American Psychological Association (6th Edition.). Washington, D.C Creswell, J. W. (2013). Research design: Qualitative, quantitative and mixed methods approach (4th Edition). SAGE Publications Evans, I., Thornton, H., & Chalmers, I. (2011). Testing treatments: Better research for better healthcare (2nd Edition) London: Pinter & Martin. TRU Library (2011). APA Citation Style - Quick Guide (6th Edition) 	
Evaluation activities and Grades د ارزونی فعالیتونہ او نمري		
Activity فعالیت	Scope هدف	Marks نمري
Attendance and class contribution حاضري او پہ درس کي برخہ اخستل	Attending class, contributions to knowledge and relationships with the group.	5
Assignments کورني دنده	Solving the indicated problems from the problem list and submitting on time.	5

Laboratory and field trip reports د لابراتوار / ساحي راپورونه	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion and implication.	15
Quizzes صنفي ارزوني	Quizzes include teaching materials and assignments from two previous classes.	5
Midterm exam منځنۍ ازموينه	The midterm exam includes the covered topics.	20
Final exam وروستۍ ازموينه	The final exam includes the covered topics after the midterm exam.	50
	Total Course Marks د کورس مجموعي نمري	100

Relationship of this Course to Program Learning Outcome

د مضمون اړیکه د ځانګړي له کلیدي بنوونیزو موخو سره

No	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7
		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team
1	Understand research terminology	1	2	1	2	1	1	1
2	Be aware of the ethical principles of research, ethical challenges and approval processes	1	1	1	2	2	1	2
3	Describe quantitative, qualitative and mixed	1	2	1	2	2	1	2

	methods approaches to research							
4	Identify the components of a literature review process	2	1	1	2	2	2	1
5	Critically analyze published research	2	2	1	2	2	1	1
Total		1.4	1.6	1	2	1.8	1.2	1.4
Average		1.48						
1= Some relation 2= Moderate relation 3= Extensive relation								

4.6.3. Professional Courses {73 credits (50%)}

En. Ene 0309 Thermodynamics-I

Item موضوع	Description توضیحات		
Title عنوان یا مضمون	En. Ene 0309 Thermodynamics-I		
Credits and no. of hour د کړېدونو او درسي ساعتونو شمیر	Total تولیزه	Theoretic نظري	Practical عملي
	3	2	1
Offering year and semester د تدریس کال او سمسټر	Second Year-First Semester		
Aim موخي	This course introduces introductory level materials in engineering thermodynamics to all engineering students. A combination of visual demonstration, problem solutions and conceptual design approaches for engineering thermodynamic systems is used for enhancing fundamental understanding and engineering applications. Issues of communication skills and contemporary problems are also discussed.		
Key Learning Outcomes کلیدي بنوونیز نتایج	<p>Key learning outcomes of this course should be as follows:</p> <ul style="list-style-type: none"> • Use of surface and volume integration, ordinary and partial differentiation, conservation of mass and energy, concept of efficiency in energy utilization. • Design of thermodynamic systems and components such as turbines, pumps, heat exchangers, nozzles and diffusers in addition to the other devices involving heat and fluid flow in industrial processing. • Students learn how to conceive engineering problems, how to relate them to thermodynamic fundamentals, and finally how to express them in mathematical terms. 		
Academic Staff Responsible د تدریس مسئول استاد			
Meeting time and place دملاقات وخت او ځای	Student Can meet instructor from 01:00 PM to 02:00 PM every day at his office.		
Syllabus مفردات	<p>I. <u>INTRODUCTION AND BASIC CONCEPTS</u></p> <ol style="list-style-type: none"> 1. Thermodynamics and Energy 2. Importance of Dimensions and Units 3. Systems and Control Volumes 4. Properties of a System 5. Density and Specific Gravity 6. State and Equilibrium 7. Processes and Cycles 8. Temperature and the Zeroth Law of Thermodynamics 9. Pressure 		

	<ul style="list-style-type: none"> 10. The Manometer 11. The Barometer and Atmospheric Pressure 12. Problem Solving Technique
	<p>II. <u>ENERGY CONVERSION AND GENERAL ENERGY ANALYSIS</u></p> <ul style="list-style-type: none"> 1. Introduction 2. Forms of Energy 3. Energy Transfer by Heat 4. Energy Transfer by Work 5. Mechanical Forms of Work 6. The First Law of Thermodynamics 7. Energy Conversion Efficiencies 8. Energy and Environment
	<p>III. <u>PROPERTIES OF A PURE SUBSTANCE</u></p> <ul style="list-style-type: none"> 1. Pure Substance 2. Phases of a Pure Substance 3. Phase-Change Processes of Pure Substances 4. Property Diagrams for Phase-Change Processes 5. Property Tables 6. The Ideal-Gas Equation of State 7. Compressibility Factor—A Measure of Deviation from Ideal-Gas Behavior 8. Other Equation of State
	<p>IV. <u>ENERGY ANALYSIS OF CLOSED SYSTEM</u></p> <ul style="list-style-type: none"> 1. Moving Boundary Work 2. Energy Balance for Closed Systems 3. Specific Heats 4. Internal Energy, Enthalpy, and Specific Heats of Ideal Gases 5. Internal Energy, Enthalpy, and Specific Heat of Solids and Liquids
	<p>V. <u>MASS AND ENERGY ANALYSIS OF CONTROL VOLUMES</u></p> <ul style="list-style-type: none"> 1. Conservation of Mass 2. Flow Work and the Energy of a Flowing Fluid 3. Energy Analysis of Steady-Flow Systems 4. Some Steady-Flow Engineering Devices 5. Energy Analysis of Unsteady-Flow Processes
	<p>VI. <u>SECOND LAW OF THERMODYNAMICS</u></p> <ul style="list-style-type: none"> 1. Introduction to the Second Law 2. Thermal Energy Reservoirs 3. Heat Engines 4. Refrigerators and Heat Pumps 5. Perpetual-Motion Machines 6. Reversible and Irreversible Processes

	<p>7. The Carnot Cycle 8. The Carnot Principles 9. The Thermodynamic Temperature Scale 10. The Carnot Heat Engine 11. The Carnot Refrigerator and Heat Pump</p> <p>VII. <u>ENTROPY</u></p> <p>1. Entropy 2. The Increase of Entropy Principle 3. Entropy Change of Pure Substances 4. Isentropic Processes 5. Property Diagrams Involving Entropy 6. What is Entropy? 7. The Tds Relations 8. Entropy Change of Liquids and Solids 9. The Entropy Change of Ideal Gases 10. Reversible Steady-Flow Work 11. Minimizing the Compressor Work 12. Isentropic Efficiencies of Steady-Flow Devices 13. Entropy Balance</p>
Pre-requisite مخکینی ارین مضامین	None
Related Courses ارونده مضامین	Physics-II, Engineering Mechanics: Statics
Teaching and Learning methods د تدریس میتود	Lectures, tutorials and assignments
Computer Knowledge د کمپیوتر زده کری ته ارتیا	Moderate Computer Knowledge such as, using MS Word, MS Excel, MS PowerPoint and CAD,
Course Materials and References د مضمون درسی مواد او اخلیکونه	<u>Text Books:</u> <u>درسی کتاب</u> <ul style="list-style-type: none"> Yunus. A. Çengel and Michael A. Boles (2015). <i>Thermodynamics an Engineering Approach</i> (8th Edition). McGraw-Hill
	<u>Reference:</u> <u>اخلیکونه</u> <ul style="list-style-type: none"> Nag, P. K. (2008). <i>Engineering Thermodynamics</i>. Tata McGraw Hill Helrich, Carl S. (2009). <i>Modern Thermodynamics with Statistical Mechanics</i>, XIV, 402 p. 111 illus., ISBN: 978-3-540-85417-3 Cengel, Yunus A. (2008). <i>Introduction to Thermodynamics and Heat Transfer</i> (2nd Edition). McGraw-Hill

Evaluation activities and Grads د ارزوني فعاليتونه او نمري								
Activity فعاليت	Scope هدف	Marks نمري						
1. Attendance and class contribution حاضري او په درس كې برخه اخستل	Attending the class, contribution to the knowledge and relationship with the group.	5						
2. Assignments كورني دنده	Solving the indicated problems from the problem list and submitting on time.	5						
3. Laboratory and field trip reports د لابراتوار/ ساحي راپورونه	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion and implication.	5						
4. Quizzes صنفي ارزوني	The quiz includes teaching materials and assignments from two previous classes.	5						
5. Midterm exam منځني ازمويڼه	The midterm exam includes the covered topics	20						
6. Final exam وروستي ازمويڼه	The exam includes the covered topics after the midterm exam	60						
	Total Course Marks د كورس مجموعي نمري	100						
Relationship of this Course to Program Learning Outcome د مضمون اړيکه د ځانگي له كليدي بشونيزو موخو سره								
No.	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7
		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team
1	Identify the unique vocabulary associated with thermodynamics through the precise definition of basic concepts to form a sound foundation for the development of the principles of thermodynamics.	2	2	2	2	3	3	3

2	Introduce the concept of energy and define its various forms.	3	3	3	3	3	3	3
3	Introduce the concept of a pure substance. Discuss the physics of phase change processes. Illustrate the P-v, T-v, and P-T property diagrams and P-v-T surfaces of pure substances.	3	3	3	3	3	3	3
4	Examine the moving boundary work or P dV work commonly encountered in reciprocating devices such as automotive engines and compressors.	3	3	3	3	3	3	3
5	Develop the conservation of mass principle.	3	3	3	3	3	3	3
6	Introduce the second law of thermodynamics. Identify valid processes as those that satisfy both the first and second laws of thermodynamics.	3	3	3	3	3	3	3
7	Define a new property called entropy to quantify the second law effects.	3	3	3	3	3	3	3
Total		2.9	2.9	2.9	2.9	3.0	3.0	3.0
Average		2.9						
1= Some relation 2= Moderate relation 3= Extensive relation								

En.Ene 0409 Thermodynamics-II

Item موضوع	Description توضیحات		
Title عنوان یا مضمون	En.Ene 0409 Thermodynamics-II		
Credits and no. of hour د کړېدونو او درسي ساعتونو شمیر	Total ټوليزه	Theoretic نظري	Practical عملي
	3	2	1
Offering year and semester د تدريس کال او سمسټر	Second Year - Second semester		
Aim موخي	This course introduces introductory-level materials in engineering thermodynamics only to energy engineering students. A combination of visual demonstration, problem solutions, and conceptual design approaches for engineering thermodynamic systems is used to enhance fundamental understanding and engineering applications. Issues of communication skills and contemporary problems are also discussed.		
Key Learning Outcomes کلیدي بنوونيز نتایج	Key learning outcomes of this course follow: <ul style="list-style-type: none"> • Understand entropy, increase of entropy principle, exergy and the decrease of exergy principle. • Analyze gas power cycles, vapor and combined power cycles and refrigeration cycles • Understand the thermodynamic property relations.. 		

<p>Academic Staff Responsible د تدریس مسئول استاد</p>	
<p>Syllabus مفردات</p>	<p>I. <u>EXERGY: A MEASURE OF WORK POTENTIAL</u></p> <ol style="list-style-type: none"> 1. Exergy: Work Potential of Energy 2. Reversible Work and Irreversibility 3. Second Law Efficiency, η_{II} 4. Exergy Change of a System 5. Exergy Transfer by Heat, Work and Mass 6. The Decrease of Exergy Principle and Exergy Destruction 7. Exergy Balance: Closed Systems 8. Exergy Balance: Control Volumes <p>II. <u>GAS POWER CYCLES</u></p> <ol style="list-style-type: none"> 1. Basic Consideration in the Analysis of Power Cycles 2. The Carnot Cycle and Its Value in Engineering 3. Air-Standard Assumptions 4. An Overview of Reciprocating Engines 5. Otto Cycle: The Ideal Cycle for Spark-Ignition Engines 6. Diesel Cycle: The Ideal Cycle for Compression-Ignition Engines 7. Stirling and Ericsson Cycle 8. Brayton Cycle: The Ideal Cycle for Gas-Turbine Engines 9. The Brayton Cycle with Regeneration 10. The Brayton Cycle with Intercooling, Reheating and Regeneration 11. Ideal Jet-Propulsion Cycles 12. Second-Law Analysis of Gas Power Cycles <p>III. <u>VAPOR AND COMBINED POWER CYCLES</u></p> <ol style="list-style-type: none"> 1. The Carnot Vapor Cycle 2. Rankine Cycle: The Ideal Cycle for Vapor Power Cycle 3. Deviation of Actual Vapor Power Cycles from the Idealized Ones 4. How Can We Increase the Efficiency of the Rankine Cycle 5. The Ideal Reheat Rankine Cycle 6. The Ideal Regenerative Rankine Cycle 7. Second-Law Analysis of Vapor Power Cycle 8. Cogeneration 9. Combined Gas-Vapor Power Cycles <p>IV. <u>REFRIGERATION CYCLES</u></p> <ol style="list-style-type: none"> 1. Refrigerators and Heat Pumps 2. The Reversed Carnot Cycle 3. The Ideal Vapor-Compression Refrigeration Cycle 4. Actual Vapor-Compression Refrigeration Cycle 5. Second Law Analysis of Vapor-Compression Refrigeration Cycle 6. Selecting the Right Refrigerant 7. Heat Pump Systems 8. Innovative Vapor-Compression Refrigeration Systems

	9. Gas Refrigeration Cycles 10. Absorption Refrigeration Systems V. <u>THERMODYNAMIC PROPERTY RELATION</u> 1. A Little Math-Partial Derivatives and Associated Relations 2. The Maxwell Relations 3. The Clapeyron Equation 4. General Relations for du , dh , ds , C_v and C_p 5. The Joule-Thomson Coefficient 6. The ΔH , ΔU and ΔS of Real Gases	
Pre-requisite مخکینی ارین مضامین	Thermodynamics I	
Related Courses ارونده مضامین	Physics-II, Power plant Engineering, Heat Transfer and Engineering Mechanics: Statics	
Teaching and Learning methods د تدریس میتود	Lectures, tutorials, and assignments	
Computer Knowledge د کمپیوتر زده کری ته اړتیا	Moderate computer knowledge such as MS Word, MS Excel, MS PowerPoint, and CAD.	
Course Materials and References د مضمون درسی مواد او اخلیکونه	<u>Text Books:</u> <u>درسی کتاب</u> <ul style="list-style-type: none"> Yunus. A. Çengel and Michael A. Boles (2015). <i>Thermodynamics an Engineering Approach</i> (8th Edition). McGraw-Hill 	
	<u>Reference:</u> <u>اخلیکونه</u> <ul style="list-style-type: none"> Nag, P. K. (2008). <i>Engineering Thermodynamics</i>. Tata McGraw Hill Helrich, Carl S. (2009). <i>Modern Thermodynamics with Statistical Mechanics</i>, XIV, 402 p. 111 illus., ISBN: 978-3-540-85417-3 Cengel, Yunus A. (2008). <i>Introduction to Thermodynamics and Heat Transfer</i> (2nd Edition). McGraw-Hill 	
Evaluation activities and Grades د ارزونې فعالیتونه او نمرې		
Activity فعالیت	Scope هدف	Marks نمرې
Attendance and class contribution حاضری او په درس کی برخه اخستل	Attending class, contributions to knowledge and relationships with the group.	5
Assignments کورنی دنده	Solving the indicated problems from the problem list and submitting on time.	5

Laboratory and field trip reports د لابراتوار/ ساحي راپورونه	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion and implication.	15
Quizzes صنفي ارزوني	Quizzes include teaching materials and assignments from two previous classes.	5
Midterm exam منځني ازمويڼه	The midterm exam includes the covered topics.	20
Final exam وروستي ازمويڼه	The final exam includes the covered topics after the midterm exam.	50
	Total Course Marks د کورس مجموعي نمري	100

Relationship of this Course to Program Learning Outcome

د مضمون اړیکه د څانګې له کلیدي بنوونیزو موخو سره

No.	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7
		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team
1	Define exergy.	2	2	2	2	2	2	2
2	Evaluate the performance of power cycles.	3	3	3	3	3	3	3
3	Analyze both closed and open gas power cycles.	3	3	3	3	3	3	3
4	Perform second-law analysis of power cycles.	3	3	3	3	3	3	3
5	Analyze power generation coupled with process heating called cogeneration.	3	3	3	3	3	3	3
6	Introduce the concepts of refrigerators and heat pumps and the measure of their performance..	3	3	3	3	3	3	3

7	Analyze the ideal and actual vapor compression refrigeration cycle.	3	3	3	3	3	3	3
8	Develop fundamental relations between commonly encountered thermodynamic properties.	3	3	3	3	3	3	3
Total		2.9	2.9	2.9	2.9	2.9	2.9	2.9
Average		2.9						
		1= Some relation		2= Moderate relation		3= Extensive relation		

En. Wee 0414 Fluid Mechanics

Item موضوع	Description توضیحات		
Title عنوان یا مضمون	En. Wee 0414 Fluid Mechanics		
Credits and no. of hour د کربدتونو او درسي ساعتونو شمير	Total ټوليزه	Theoretic نظري	Practical عملي
	3	2	1
Offering year and semester د تدريس کال او سمسټر	Second year - Second semester		
Aim موخي	This course covers the principles of continuity, momentum, and energy concepts applied to fluid motion. Topics include properties of fluids, fluid statics, kinematics and dynamics, flow in open channels and pressure conduits (pipes) and turbines, fluid measurements, and similitude and dimensional analysis.		
Key Learning Outcomes کلیدي بنوونيز نتايج	<p>Key learning outcomes of this course follow:</p> <ul style="list-style-type: none"> • Understanding the basic of fluid properties and hydrostatics; • Able to understand fluid kinematics • Develop the idea of conservation of mass, momentum, and energy • Understanding the basic of flow in open channels • Understanding the basic of pipe flow • Able to understand turbo machinery and fluid measurements • Understand similitude and dimensional analysis 		
Academic Staff Responsible د تدريس مسنول استاد			

Syllabus مفردات	<p>I. <u>FLUID PROPERTIES</u></p> <ol style="list-style-type: none"> 1. Fluid Mass, Weight, Density, and Volume 2. Viscosity 3. Vapor Pressure 4. Surface Tension <p>II. <u>HYDROSTATICS</u></p> <ol style="list-style-type: none"> 1. Pressure Variation in Fluid at Rest and in Motion 2. Forces on Plane and Curved Surfaces 3. Buoyancy and Flotation <p>III. <u>FLUID KINEMATICS AND DYNAMICS</u></p> <ol style="list-style-type: none"> 1. Concepts of Systems and Control Volume 2. Conservation of Mass - Continuity Equation 3. Newton's 2nd Law – Momentum Equation 4. 1st Law of Thermodynamics – Energy Equation 5. Bernoulli Equation <p>IV. <u>SIMILITUDE AND DIMENSIONAL ANALYSIS</u></p> <ol style="list-style-type: none"> 1. Dimensional Homogeneity 2. The Pi Theorem 3. Correlation of Experimental Data 4. Modeling and Similitude <p>V. <u>TURBO MACHINERY</u></p> <ol style="list-style-type: none"> 1. Classification of Pumps 2. Mixed and Axial Flow Pumps – The Specific Speed 3. Centrifugal Pumps and Compressors 4. Reaction and Impulse Turbines <p>VI. <u>FLUID MEASUREMENTS</u></p> <ol style="list-style-type: none"> 1. Pressure Measurement – Manometers 2. Velocity Measurement – Current Meters 3. Discharge Measurement – Orifice, Weirs, Flumes 4. Viscosity Measurement
Pre-requisite مخکینی ارین مضامین	None
Related Courses ارونده مضامین	Engineering Mechanics I & II
Teaching and Learning methods د تدریس میتود	Lectures, tutorials, and assignments
Computer Knowledge د کمپیوتر زده کری ته اړتیا	Moderate computer knowledge such as MS Word, MS Excel, MS PowerPoint, and CAD.
Course Materials and References د مضمون درسي مواد او اخلیکونه	<p><u>Text Books:</u> <u>درسي کتاب</u></p> <ul style="list-style-type: none"> • White, F. (2010). <i>Fluid Mechanics</i> (7th Edition). McGraw-Hill Science/Engineering/Math <p><u>Reference:</u> <u>اخلیکونه</u></p> <ul style="list-style-type: none"> • Daugherty, R.L., Franzine, J.B. and Finnemore, E.J. (1985). Fluid

	<p>Mechanics with Engineering Applications (8th Edition) McGraw Hill, New York.</p> <ul style="list-style-type: none"> • Munson, B.R., Okiishi, T.H., Rothmayer, Alric P. and Huebsch, Wade W. (2012). Fundamentals of Fluid Mechanics (7th Edition), John Wiley and Sons. • Elger, Donald F., Williams, Barbara C., Crowe, Clayton T. and Roberson, John A. (2012). Engineering Fluid Mechanics (10th Edition). Wiley • Streeter, V., Wylie E.B, and Bedford, K. (1997). Fluid Mechanics, McGraw-Hill 							
Evaluation activities and Grades د ارزوني فعاليتونه او نمري								
Activity فعاليت	Scope هدف				Marks نمري			
Attendance and class contribution حاضري او په درس كې برخه اخستل	Attending class, contributions to knowledge and relationships with the group.				5			
Assignments كورني دنده	Solving the indicated problems from the problem list and submitting on time.				5			
Laboratory and field trip reports د لابراتوار/ ساحي راپورونه	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion, and implication.				15			
Quizzes صنفي ارزوني	Quizzes include teaching materials and assignments from two previous classes.				5			
Midterm exam منځنۍ ازموينه	The midterm exam includes the covered topics.				20			
Final exam وروستۍ ازموينه	The final exam includes the covered topics after the midterm exam.				50			
	Total Course Marks د كورس مجموعي نمري				100			
Relationship of this Course to Program Learning Outcome د مضمون اړيکه د څانگې له كليدي بنوونيزو موخو سره								
No.	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7
		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team

1	Understanding the basic of Fluid properties and Hydrostatics	3	2	3	2	2	2	2
2	Able to understand the fluid kinematics	3	1	3	2	2	2	2
3	Develop the idea of conservation of mass, momentum and energy	3	2	3	2	2	1	2
4	Understanding the basic of flow in open channels	3	1	3	2	2	2	2
5	Understanding the basic of pipe flow	3	2	2	2	1	2	2
6	Able to understand the turbo machinery and fluid measurements	3	2	3	2	1	2	2
7	Understanding the similitude and dimensional analysis	3	2	3	2	1	2	2
Total		3	1.7	2.9	2	1.5	1.9	2
Average		2.2						
		1= Some relation		2= Moderate relation		3= Extensive relation		

En. Ene 0515 Energy Conversion I

Item موضوع	Description توضیحات		
Title عنوان یا مضمون	En. Ene 0515 Energy Conversion I		
Credits and no. of hour د کریڈتوں او درسی ساعتوں شمار	Total تولیزہ	Theoretic نظری	Practical عملی
	3	2	1
Offering year and semester د تدریس کال او سمسٹر	Third year- First Semester		
Aim موخی	This course is designed: <ul style="list-style-type: none"> To learn the fundamentals of electrical machines for designing a system that meets specific need. of the basic concepts and principles of physics and electricity To know the conversion of energy. 		

	<ul style="list-style-type: none"> • To examine the need of various machines like AC, machines, DC machines, and transformer. • Develop strong problem-solving skills through an effectively organized approach. • To meet these objectives, we emphasize well-organized physical arguments and a focused problem-solving strategy. At the same time, we attempt to motivate the student through practical examples that demonstrate the role of electrical machines in other disciplines.
<p>Key Learning Outcomes كليدي بنوونيز نتايج</p>	<p>On successful completion of this course, students should be able to:</p> <ul style="list-style-type: none"> • Apply the electrical machines theory to energy conversion principles. • Analyze the economic dispatch problem in electrical machines • Design energy machines based on the problem requirements and realistic constraint
<p>Academic Staff Responsible د تدریس مسنول استاد</p>	<p>Eng. Ahmad Shah Irshad</p>
<p>Course Contents & Topics مفردات</p>	<p>This course will introduce and discuss the following topics:</p> <p>I. <u>ELEMENT OF ELECTRO MECHANICAL ENERGY CONVERSION</u></p> <ol style="list-style-type: none"> 1. Introduction 2. Salient aspects of conversion 3. Energy Balance 4. Magnetic Field System: Energy and Co-energy 5. Linear System 6. A simple Electromechanical System 7. In Term of Field Energy 8. In Term of field Co Energy 9. Energy in Term of Electrical Parameters 10. Rotary Motion 11. Description of Simple System 12. Energy Stored in Coils 13. Different Categories 14. One Coil each on Stator and on Rotor 15. Vital Role of Air gap 16. Statically Induced emf and Dynamically Induced emf. <p>II. <u>D.C GENERATORS</u></p> <ol style="list-style-type: none"> 1. Generator Principle 2. Simple Loop Generator 3. Practical Generator 4. Yoke 5. Pole Cores and Pole Shoes

6. Pole Coils
7. Armature Core
8. Armature Winding
9. Bushes and Bearings
10. Pole Pitch
11. Conductor Coil and Winding Element
12. Coil Span or Coil Pitch
13. Pitch of a Winding
14. Back Pitch
15. Front Pitch
16. Resultant Pitch
17. Commutator Pitch
18. Single Layer Winding
19. Two Layer Winding
20. Degree of Reentrancy of an Armature Winding
21. Multiplex Winding
22. Lap and Wave Winding
23. Simplex –Lap Winding
24. Numbering of Coils and Commutator Segments
25. Simplex Wave Winding
26. Dummy or Idle Coils
27. Uses of Lap and Wave Winding
28. Types of Generators
29. Brush Contact Drop
30. Generated E.M.F or E.M.F Equation of a Generator
31. Iron Losses in Armature
32. Total Losses in a D.C Generator
33. Stray Losses
34. Constant or Standing Losses
35. Power Stages
36. Condition for Maximum Efficiency

III. ARMATURE REACTION AND COMMUTATION

1. Armature Reaction
2. Demagnetizing and Cross Magnetizing Conductors
3. Demagnetizing AT per Pole
4. Cross Magnetizing AT per Pole
5. Compensating Winding
6. Number of Compensating Winding
7. Commutation
8. Value of Reactance Voltage
9. Methods of Improving Commutation
10. Resistance Commutation
11. E.M.F Commutation
12. Inter poles or Com poles
13. Equalizing Connections
14. Parallel Operation of shunt Generators
15. Parallel D.C Generators
16. Load Sharing

17. Procedure for Paralleling D.C Generators

18. Compound Generators in Parallel

19. Series Generator in Parallel

IV. GENERATOR CHARACTERISTICS

1. Characteristics of D.C Generators

2. Separately Excited Generator

3. No Load Curve for Self Excited Generator

4. How to Find Critical Resistance R? How to Draw O.C.C at Different Speeds?

5. Critical Speeds

6. Voltage Building up a Shunt Generator

7. Condition for building up Shunt Generator

8. Other Factors Affecting Voltage Building of a D.C Generator

9. External Characteristics

10. Voltage Regulation

11. Internal or Total Characteristics

12. Series Generator

13. Compound Wound Generators

14. How to Calculate Required Series Turns

15. Uses of D.C Generators Question and Answer on D.C Generators

V. D.C MOTORS

1. Motor Principle

2. Comparison of Generator and Motor Action

3. Significance of Back emf

4. Voltage Equation of a motor

5. Condition for Maximum Power

6. Torque

7. Armature Torque of a Motor

8. Shaft Torque

9. Speed of a D.C Motor

10. Speed Regulation Torque and Speed of a D.C. Motor

11. Motor Characteristics

12. Characteristics of Series Motor

13. Characteristics of Shunt Motors

14. Compound Motors

15. Performance Curves

16. Comparison of Shunt and Series Motors

17. Losses and Efficiency

18. Power Stages

VI. SPEED CONTROL D.C MOTORS

1. Factor Controlling Motor Speed

2. Speed Control of Shunt Motors

3. Speed Control of Series Motors

4. Merits and Demerits of Rheostat Control Method

5. Series Parallel Control
6. Electric Braking
7. Electric Braking of Shunt Motor
8. Electric Braking of Series Motor
9. Electronic Speed Control Method for D.C Motor
10. Uncontrolled Rectifier
11. Controlled Rectifiers
12. Thyristor Choppers
13. Thyristor Inverter
14. Thyristor Speed Control of Separately Excited D.C Motor
15. Thyristor Speed Control of D.C Motor
16. Full Wave Speed Control of Shunt Motor
17. Thyristor Control of Shunt Motor
18. Thyristor Speed Control of a Series D.C Motor
19. Necessity of a Starter
20. Shunt Motor Starter
21. Three Point Starter
22. Four Point Starter
23. Starting and Speed Control of Series Motor
24. Grading of Starting Resistance
25. Shunt Motors
26. Series Motor Starters
27. Thyristor Controller Starter

VII. TESTING OF D.C MACHINES

1. Brake Test
2. Swinburne's Test
3. Advantages of Swinburne's Test
4. Main Disadvantage
5. Regenerative or Hopkinson Test
6. Alternative Connection for Hopkinson Test
7. Merits of Hopkinson Test
8. Retardation or Running Down Test
9. Field Test for Series Motors
10. Objective Tests
11. Question and Answer on D.C Motors

VIII. TRANSFORMER

1. Working Principle of Transformer
2. Transformer Construction
3. Core Type Transformer
4. Shell Type Transformer
5. Elementary Theory of an Ideal Transformer
6. E.M.F. Equation of Transformer
7. Voltage Transformer Ratio
8. Transformer with Losses but no Magnetic Leakage
9. Transformer on no Load
10. Transformer on Load

	<ol style="list-style-type: none"> 11. Transformer with Winding Resistance but no magnetic Leakage 12. Equivalent Resistance 13. Magnetic Leakage 14. Transformer with Resistance and Leakage Reactance 15. Simplified Diagram 16. Total Approximate Voltage Drop in Transformer 17. Exact Voltage Drop 18. Equivalent Circuit Transformer Test 19. Open Circuit or no Load Test 20. Separation of Core Losses 21. Short Circuit or Impedance Test 22. Why Transformer Rating in KVA 23. Regulation of a Transformer 24. Percentage Resistance, Reactance and Impedance 25. Kapp Regulation Diagram 26. Sumpner or Back to Back Test 27. Efficiency of a Transformer 28. Condition for Maximum efficiency 29. Variation of Efficiency with Power Factor 30. All Day Efficiency 31. Auto Transformer 32. Conversion of Two Winding Transformer to Auto Transformer 33. Parallel Operation of Single Phase Transformer 34. Questions and Answers on Transformers <p>IX. <u>TRANSFORMER: THREE PHASE</u></p> <ol style="list-style-type: none"> 1. Three Phase Transformer 2. Three Phase Transformer Connection 3. Star/Star or Y/Y Connection 4. Delta - Delta Connection 5. Y/Delta or Y Connection 6. Delta/Y or /Y Connection 7. Open Delta or V-V Connection 8. Power Supplied by V-V Bank 9. Scott Connection or T-T Connection 10. Three Phase to Two Phase Conversion and Vice Versa 11. Parallel Operation of Three Phase Transformer 12. Instrument Transformer 13. Current Transformer 14. Potential Transformer
<p>Pre-requisite مخکینی ارین مضامین</p>	<p>Fundamental of Electric circuit, Electrical Physics</p>
<p>Related Courses ارونده مضامین</p>	<p>Electric Physic, Basic electronics, Differential & Integral Calculus, Multivariable Calculus for Engineers, Linear Algebra, Probability & Statistics</p>

Teaching and Learning methods د تدریس میتود	Lectures, tutorials and assignments	
Computer Knowledge د کمپیوٹر زدہ کری تہ ارتیا	Basic computing skills using MS Word, Excel, Matlab, and CAD.	
Course Materials and References د مضمون درسی مواد او اخلیکونہ	<u>Text Books:</u> <u>درسی کتاب</u> A Text Book of Electrical Technology in S.I Unit Volume 2 AC and DC Machines by (B.L THERAJA and A.K. THERAJA)	
	<u>Reference:</u> <u>اخلیکونہ</u> <ul style="list-style-type: none"> • Gerling D (2008) Analysis of the Magneto motive Force of a Three-Phase Winding with Concentrated Coils and Different Symmetry Features. In: International Conference on Electrical Machines and Systems (ICEMS), Wuhan, China • Libert F, Soulard J (2004) Investigation on pole-slot combinations for permanent-magnet machines with concentrated windings. In: International Conference on Electrical Machines (ICEM), Cracow, Poland • Dajaku G, Gerling D (2011) A novel 24-slots/10-poles winding topology for electric machines. In: IEEE International Electric Machines and Drives Conference (IEMDC), Niagara Falls, Ontario, Canada • Chapman, S. J. 1999. Electric machinery fundamentals. New York: McGraw. • Trzynadlowski, A. M. (1994). The Field Orientation Principle in Control of Induction Motors. Norwell, MA: Kluwer Academic Publishers.. 	
Evaluation activities and Grads د ارزونی فعالیتونہ او نمري		
Activity فعالیت	Scope هدف	Marks نمري
1. Attendance and class contribution حاضری او پہ درس کی برخہ اخستل	Attending the class, contribution to the knowledge and relationship with the group.	5
2. Assignments کورنی دندہ	Solving the indicated problems from the problem list and submitting on time.	10
3. Laboratory and field trip reports د لابراتوار/ ساحي راپورونہ	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion and implication.	10
4. Quizzes صنفي ارزونی	The quiz includes teaching materials and assignments from two previous classes.	5
5. Midterm exam منخی آزموینہ	The midterm exam includes Chapters X, X and X.	20

6. Final exam وروستی ازموینه	The exam includes Chapters X, X, and X.	50						
	Total Course Marks د کورس مجموعی نمری	100						
Relationship of this Course to Program Learning Outcome د مضمون اړیکه د ځانګی له کلیدي بنوونیزو موخو سره								
No.	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7
		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team
1	Apply the electrical machines theory to energy conversion principles.	2	2	2	2	2	2	2
2	Analyze the economic dispatch problem in electrical machines	3	3	3	3	3	3	3
3	Design energy machines based on the problem requirements and realistic constraint	3	3	3	3	3	3	3
Total		2.7	2.7	2.7	2.7	2.7	2.7	2.7
Average		2.7						
1= Some relation 2= Moderate relation 3= Extensive relation								

En. Ene 0516 Combustion Technology and Materials

Item موضوع	Description توضیحات		
Title عنوان یا مضمون	En. Ene 0516 Combustion Technology and Materials		
Credits and no. of hour د کربدتونو او درسي ساعتونو شمير	Total توليزه	Theoretic نظري	Practical عملي
	3	2	1
Offering year and semester د تدريس کال او سمستر	Third year - First semester		
Aim موخي	<p>By completing this course the student will be able to accomplish the following:</p> <ul style="list-style-type: none"> • Know different types of fuel resources. • Know the type of gaseous fuels, Liquid fuels and Solid fuels. • Know the Basic Combustion Calculations • Know the environmental impact of fossil fuels. • Know the measurement methods of flame and energy contents 		
Key Learning Outcomes کلیدي بنوونيز نتایج	<p>Key learning outcomes of this course follow:</p> <ul style="list-style-type: none"> • Knowledge of different types of fossil fuel resources. • Understanding and analyze of different fossil fuels to energy process. • Understanding the Basic Combustion Calculations. • Understanding the usage of Burners, Boilers and Industrial Technologies. • Understanding the Safety Issues of fire and combustion. 		
Academic Staff Responsible د تدريس مسنول استاد			
Syllabus مفردات	<p>I. <u>HISTORY OF COMBUSTION</u></p> <ol style="list-style-type: none"> 1. Introduction 2. Timetable 3. Outlook <p>II. <u>FUELS</u></p> <ol style="list-style-type: none"> 1. Introduction 2. Gaseous Fuels 3. Liquid Fuels 4. Solid Fuels <p>III. <u>COMBUSTION PRINCIPLES</u></p> <ol style="list-style-type: none"> 1. Basic Combustion Calculations 2. Heat-, Mass- and Momentum Transport and Balance 3. Ignition <p>IV. <u>ENVIRONMENTAL IMPACTS</u></p> <ol style="list-style-type: none"> 1. Pollutants: Formation and Impact 2. Combustion and Climate Change 		

	<p>V. <u>MEASUREMENT METHODS</u></p> <ol style="list-style-type: none"> 1. Introduction 2. In Situ versus Ex Situ Measurements 3. Fuel Characterization 4. Proximate and Ultimate Analysis 5. Investigation of Combustion Processes <p>VI. <u>APPLICATIONS</u></p> <ol style="list-style-type: none"> 1. Burners 2. Industrial Boilers 3. Industrial Technologies <p>VII. <u>Safety Issues</u></p> <ol style="list-style-type: none"> 1. Introduction 2. Fundamentals 3. Fire Classes 4. Working Mechanism of Fire Extinguishing Media 5. Fire Detectors 6. Deflagrations and Detonations 7. Dust Explosions 8. Legal Framework: Example of ATEX in Europe 9. Preventing and Mitigating the Effect of Explosions in Industry 10. Aspects of Preventive Fire Protection 11. Fire Suppression by Oxygen Reduction 12. Safety by Process Design
Pre-requisite مخکینی ارین مضامین	None
Related Courses ارونده مضامین	Physics-I&II, Engineering Chemistry, Thermodynamics-I&II and Heat Transfer and Biomass
Teaching and Learning methods د تدریس میتود	Lectures, tutorials, and assignments
Computer Knowledge د کمپیوتر زده کری ته ارتیا	Moderate computer knowledge such as MS Word, MS Excel, MS PowerPoint, and CAD.
Course Materials and References د مضمون درسی مواد او اخلیکونه	<p><u>Text Books:</u></p> <p><u>درسی کتاب</u></p> <ul style="list-style-type: none"> • Maximilian Lackner, Aacute;rpád Palotás, Franz Winter (2013). Combustion: From Basics to Applications 1st Edition
	<p><u>Reference:</u></p> <p><u>اخلیکونه</u></p> <ul style="list-style-type: none"> • Stephen R. Turns, (2012). An Introduction to Combustion Concepts and Applications 3rd Ed. • F. EL Mahallawy and Saad El- Din Habik (2002). FUNDAMENTALS AND TECHNOLOGY OF COMBUSTION. • Kenneth K. Kuo (2005). Principles of combustion. Second Edition

Evaluation activities and Grades د ارزوني فعاليتونه او نمري									
Activity فعاليت	Scope هدف	Marks نمري							
Attendance and class contribution حاضري او په درس كې برخه اخستل	Attending class, contributions to knowledge and relationships with the group.	5							
Assignments كورني دنده	Solving the indicated problems from the problem list and submitting on time.	5							
Laboratory and field trip reports د لابراتوار/ ساحي راپورونه	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion and implication.	15							
Quizzes صنفي ارزوني	Quizzes include teaching materials and assignments from two previous classes.	5							
Midterm exam منځني ازموينه	The midterm exam includes the covered topics.	20							
Final exam وروستي ازموينه	The final exam includes the covered topics after the midterm exam.	50							
	Total Course Marks د كورس مجموعي نمري	100							
Relationship of this Course to Program Learning Outcome د مضمون اړيکه د څانګې له كليدي بنوونيزو موخو سره									
No.	Course Outcomes	Program Outcomes							
		1	2	3	4	5	6	7	
		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team	
1	To understand the	2	2	2	3	3	3	3	3

	Knowledge of different types of fossil fuel resources.							
2	To understand and analyze of different fossil fuels to energy process.	2	2	2	3	3	3	3
3	To understand the Basic Combustion Calculations.	2	2	3	3	3	3	3
4	To understand the usage of Burners, Boilers and Industrial Technologies.	3	3	3	3	3	2	2
5	To understanding the Safety Issues of fire and combustion.	1	2	3	2	3	3	3
Total		2.0	2.2	2.6	2.8	3.0	2.8	2.8
Average		2.6						
1= Some relation 2= Moderate relation 3=Extensive relation								

En. Ene 0517 Heat Transfer

Item موضوع	Description توضیحات		
Title عنوان یا مضمون	En. Ene 0517 Heat Transfer		
Credits and no. of hour د کړېدونو او درسي ساعتونو شمير	Total ټوليزه	Theoretic نظري	Practical عملي
	4	3	1
Offering year and semester د تدريس کال او سمسټر	Third year - First semester		
Aim موخي	Upon completing this course, students will be able to (i) describe the fundamental physical principles underlying heat flow by conduction, convection, and radiation mechanisms; and (ii) apply this knowledge to solve problems relevant to the design of energy engineering systems, especially heat exchangers. This course will also help students develop important problem-solving and critical thinking skills that will be broadly applicable throughout their lives and careers.		
Key Learning Outcomes کلیدي ښوونيز نتيایج	Key learning outcomes of this course follow: <ul style="list-style-type: none"> Describe the physical mechanisms of heat transport by conduction, convection, and radiation. Identify heat transfer processes and energy flows. 		

	<ul style="list-style-type: none"> • Apply relevant rate equations, conservation laws, and material properties to solve problems involving heat transfer by conduction, convection, and radiation. • Apply critical and creative thinking skills to solve complex problems with multiple transport modes. • Apply fundamentals of heat transfer to understand the design of heat exchangers and to be able to specify the type and size of heat exchanger to satisfy the needs of a particular engineering process application. • Gain enhanced capabilities for treating steady-state and transient one- and two-dimensional conduction problems • Solve the governing ordinary and partial differential equations for each of the boundary value problems above. • Apply computer solutions and parametric studies that explore related design or operating conditions.
<p>Academic Staff Responsible د تدریس مسئول استاد</p>	
<p>Syllabus مفردات</p>	<p>I. <u>INTRODUCTION AND BASIC CONCEPTS</u></p> <ol style="list-style-type: none"> 1. Thermodynamics and Heat Transfer 2. Engineering Heat Transfer 3. Heat and Other Forms of Energy 4. The First Law of Thermodynamics 5. Heat Transfer Mechanisms 6. Conduction 7. Convection 8. Radiation 9. Simultaneous Heat Transfer Mechanisms 10. Prevention Through Design 11. Problem-Solving Technique <p>II. <u>HEAT CONDUCTION EQUATION</u></p> <ol style="list-style-type: none"> 1. Introduction 2. One-Dimensional Heat Conduction Equation 3. General Heat Conduction Equation 4. Boundary and Initial Conditions 5. Solution of Steady One-Dimensional Heat Conduction Problems 6. Heat Generation in a Solid 7. Variable Thermal Conductivity, $k(T)$ <p>III. <u>STEADY HEAT CONDUCTION</u></p> <ol style="list-style-type: none"> 1. Steady Heat Conduction in Plane Walls 2. Thermal Contact Resistance 3. Generalized Thermal Resistance Networks 4. Heat Conduction in Cylinders and Spheres 5. Critical Radius of Insulation

6. Heat Transfer from Finned Surfaces
7. Bioheat Transfer Equation
8. Heat Transfer in Common Configurations

IV. TRANSIENT HEAT CONDUCTION

1. Lumped System Analysis
2. Transient Heat Conduction in Large Plane Walls, Long Cylinders, and Spheres with Spatial Effects
3. Transient Heat Conduction in Semi-Infinite Solids
4. Transient Heat Conduction in Multidimensional Systems

V. FUNDAMENTALS OF CONVECTION

1. Physical Mechanism of Convection
2. Classification of Fluid Flows
3. Velocity Boundary Layer
4. Thermal Boundary Layer
5. Laminar and Turbulent Flows
6. Heat and Momentum Transfer in Turbulent Flow
7. Derivation of Differential Convection Equations
8. Solutions of Convection Equations for a Flat Plate
9. Nondimensionalized Convection Equations and Similarity
10. Functional Forms of Friction and Convection Coefficients
11. Analogies Between Momentum and Heat Transfer

VI. EXTERNAL FORCED CONVECTION

1. Drag and Heat Transfer in External Flow
2. Parallel Flow over Flat Plates
3. Flow across Cylinders and Spheres
4. Flow across Tube Banks

VII. INTERNAL FORCED CONVECTION

1. Introduction
2. Average Velocity and Temperature
3. The Entrance Region
4. General Thermal Analysis
5. Laminar Flow in Tubes
6. Turbulent Flow in Tubes

VIII. NATURAL CONVECTION

1. Physical Mechanism of Natural Convection
2. Equation of Motion and the Grashof Number
3. Natural Convection over Surfaces
4. Natural Convection from Finned Surfaces and PCBs
5. Natural Convection Inside Enclosures
6. Combined Natural and Forced Convection

IX. BOILING AND CONDENSATION

	<ol style="list-style-type: none"> 1. Boiling Heat Transfer 2. Pool Boiling 3. Flow Boiling 4. Condensation Heat Transfer 5. Film Condensation 6. Film Condensation Inside Horizontal Tubes 7. Dropwise Condensation <p>X. <u>HEAT EXCHANGERS</u></p> <ol style="list-style-type: none"> 1. Types of Heat Exchangers 2. The Overall Heat Transfer Coefficient 3. Analysis of Heat Exchangers 4. The Log Mean Temperature Difference Method 5. The Effectiveness–NTU Method 6. Selection of Heat Exchangers <p>XI. <u>FUNDAMENTALS OF THERMAL RADIATION</u></p> <ol style="list-style-type: none"> 1. Introduction 2. Thermal Radiation 3. Blackbody Radiation 4. Radiation Intensity 5. Radiative Properties 6. Atmospheric and Solar Radiation <p>XII. <u>RADIATION HEAT TRANSFER</u></p> <ol style="list-style-type: none"> 1. The View Factor 2. View Factor Relations 3. Radiation Heat Transfer: Black Surfaces 4. Radiation Heat Transfer: Diffuse, Gray Surfaces 5. Radiation Shields and the Radiation Effects 6. Radiation Exchange with Emitting and Absorbing Gases
Pre-requisite مخکینی ارین مضامین	None
Related Courses ارونده مضامین	Thermodynamics, Thermal Power plant, Solar and HVAC
Teaching and Learning methods د تدریس میتود	Lectures, tutorials, and assignments
Computer Knowledge د کمپیوتر زده کری ته ارتیا	Moderate computer knowledge such as MS Word, MS Excel, MS PowerPoint, and CAD.
Course Materials and References د مضمون درسی مواد او اخلیکونه	<u>Text Books:</u> <u>درسی کتاب</u> <ul style="list-style-type: none"> • Yunus. A. Çengel and Afshin J. Ghajar (2015). <i>Heat and Mass Transfer, Fundamentals & Applications</i> (5th Edition). McGraw-Hill

	<p><u>Reference:</u> <u>اخليكونه</u></p> <ul style="list-style-type: none"> • F.D. Incropera, D.P. DeWitt, T.L. Bergman, A.S. Lavine, Fundamentals of Heat and Mass Transfer, 7e, John Wiley & Sons, 2011, ISBN 9780470501979. • Janna, William S., Engineering Heat Transfer, 2e. Yunus A. Cengel, Heat Transfer (A practical approach), 2e. • Morris G. Davies, Building Heat Transfer John Wiley & Sons, Ltd, 2004, ISBN: 0-470-84731-X. • Introduction to Thermodynamics and Heat Transfer (2nd Edition). McGraw-Hill 	
<p>Evaluation activities and Grades د ارزوني فعاليتونه او نمري</p>		
Activity فعاليت	Scope هدف	Marks نمري
Attendance and class contribution حاضري او په درس كي برخه اخستل	Attending class, contributions to knowledge and relationships with the group.	5
Assignments كورني دنده	Solving the indicated problems from the problem list and submitting on time.	5
Laboratory and field trip reports د لابراتوار/ ساحي راپورونه	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion and implication.	15
Quizzes صنفي ارزوني	Quizzes include teaching materials and assignments from two previous classes.	5
Midterm exam منخني ازموينه	The midterm exam includes the covered topics.	20
Final exam وروستي ازموينه	The final exam includes the covered topics after the midterm exam.	50
	Total Course Marks د كورس مجموعي نمري	100

Relationship of this Course to Program Learning Outcome د مضمون اړیکه د څانګې له کلیدي بنوونیزو موخو سره								
No.	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7
		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team
1	Describe the physical mechanisms of heat transport by conduction, convection, and radiation.	2	2	2	2	3	3	3
2	Identify heat transfer processes and energy flows.	3	3	3	3	3	3	3
3	Apply relevant rate equations, conservation laws, and material properties to solve problems involving heat transfer by conduction, convection, and radiation.	3	3	3	3	3	3	3
4	Apply critical and creative thinking skills to solve complex problems with multiple transport modes.	3	3	3	3	3	3	3
5	Apply fundamentals of heat transfer to understand the design of heat exchangers and to be able to specify the type and size of heat exchanger to satisfy the needs of a particular engineering process application.	3	3	3	3	3	3	3
6	Gain enhanced capabilities for treating steady-state and transient one- and two-dimensional conduction problems	3	3	3	3	3	3	3
7	Solve the governing ordinary and partial differential equations for each of the boundary value problems above.	3	3	3	3	3	3	3
Total		2.9	2.9	2.9	2.9	3.0	3.0	3.0
Average		2.9						
1= Some relation 2= Moderate relation 3= Extensive relation								

En. Ene 0518 POWER SYSTEM I

Item موضوع	Description توضیحات			
Title عنوان یا مضمون	En. Ene 0518 Power system I			
Credits and no. of hour د کړېدونو او درسي ساعتونو شمېر	Total ټوليزه	Theoretic نظري	Practical عملي	
	3	2	1	
Offering year and semester د تدريس کال او سمستر	Third year- First Semester			
Aim موخي	<p>This course is designed:</p> <ul style="list-style-type: none">• To learn the fundamentals of power system for designing a system that meets specific need. of the basic concepts and principles of physics and electricity• To know the necessity of load flow in a regulated system.• To examine the need of various analysis like fault analysis, short circuit analysis stability analysis, steady state and transient analysis.• Develop strong problem-solving skills through an effectively organized approach.• To meet these objectives, we emphasize well-organized physical arguments and a focused problem-solving strategy. At the same time, we attempt to motivate the student through practical examples that demonstrate the role of power system analysis in other disciplines.			
Key Learning Outcomes کلیدي بنوونيز نتيایج	<p>On successful completion of this course, students should be able to:</p> <ul style="list-style-type: none">• apply the load flow application to various power system problems like minimization of transmission line losses, minimization of the total fuel cost etc.,• analyze the economic dispatch problem in thermal power plant• design a power system solution based on the problem requirements and realistic constraint			
Academic Staff Responsible د تدريس مسنول استاد	Eng. Ahmad Shah Irshad			
Course Contents & Topics مفردات	<p>I. <u>INTRODUCTION</u></p> <ol style="list-style-type: none">1. Importance of Electrical Energy2. Generation of Electrical Energy3. Source of Energy4. Comparison of Energy sources5. Units of Energy6. Relationship Among Energy Units7. Efficiency8. Calorific Value of Fuels			

9. Advantages of Liquid Fuels Over Solid fuels
10. Advantages of Solid Fuels Over Liquid Fuels

II. GENERATING STATIONS

1. Generating Station
2. Steam Power Station (Thermal Station)
3. Schematic Arrangement of steam Power Station
4. Choice of Site for Steam Power Stations
5. Efficiency of Steam Power Station
6. Equipment of Steam Power Station
7. Hydro-electric Power Station
8. Schematic Arrangement of Hydro-electric Power Station
9. Choice of Site for Hydro-electric Power Stations
10. Constituents of Hydro-electric Plant
11. Diesel Power Station
12. Schematic Arrangement of Diesel Power Station
13. Nuclear Power Station
14. Schematic Arrangement of Nuclear Power Station
15. Selection of Site for Nuclear Power Station
16. Gas Turbine Power Plant
17. Schematic Arrangement of Gas Turbine Power Plant
18. Comparison of the Various Power Plants

III. VARIABLE LOAD ON POWER STATIONS

1. Structure of Electric Power Station
2. Variable Load on Power Station
3. Load curves
4. Important Terms and Factors
5. Units Generated Per Annum
6. Load Duration Curve
7. Types of Loads
8. Typical Demand and Diversity factors
9. Load Curves and Selection of Generating units
10. Important Points in the Selection of Units
11. Base Load and Peak Load on Power Station
12. Method of Meeting the Load
13. Interconnected Grid System

IV. ECONOMICS OF POWER GENERATION

1. Economics of Power Generation
2. Cost of Electrical Energy
3. Expressions for Cost of Electrical Energy
4. Methods of Determining Depreciation
5. Importance of High Load Factor

V. TARIFF

1. Tariff
2. Desirable Characteristics of a Tariff
3. Types of Tariff

VI. POWER FACTOR IMPROVEMENT

1. Power Factor
2. Power Triangle
3. Disadvantages of Low Power Factor
4. Causes of Low Power Factor
5. Power Factor Improvement
6. Power Factor Improvement Equipment
7. Calculation of Power Factor Correction
8. Importance of Power Factor Improvement
9. Most Economical Power Factor
10. Meeting the Increased KW Demand on Power Stations

VII. SUPPLY SYSTEMS

1. Electric Supply System
2. Typical a.c Power Supply Scheme
3. Comparison of D.C and A.C Transmission
4. Advantages of High Transmission Voltage
5. Various Systems of Power Transmission
6. Comparison of Conductor Material in Overhead system
7. Comparison of Conductor Material in Underground system
8. Comparison of Various Systems of Transmission
9. Elements of a Transmission line
10. Economics of Power Transmission
11. Economics Choice of Conductors Size
12. Economics Choice of Transmission Voltage
13. Requirements of Satisfactory Electric Supply

VIII. MECHANICAL DESIGN OF OVERHEAD LINES

1. Main components of Overhead Lines
2. Conductor Materials
3. Line Supports
4. Insulators
5. Types of Insulators
6. Potential Distribution over Suspension Insulator String
7. String Efficiency
8. Methods of Improving String Efficiency
9. Important Points
10. Corona
11. Factors Affecting Corona
12. Important Terms
13. Advantages and Disadvantages of Corona
14. Methods of Reducing Corona Effects
15. Sag in Overhead Lines
16. Calculation of Sag
17. Some Mechanical Principle

IX. ELECTRICAL DESIGN OF OVERHEAD LINES

1. Constants of a Transmission Line

	<ol style="list-style-type: none"> 2. Resistance of a Transmission 3. Skin Effect 4. Flux Linkages 5. Inductance of a Single Phase Two-Wire Line 6. Inductance of a 3-Phase Overhead line 7. Concept of Self-GMD and Mutual-GMD 8. Inductance Formulas in Terms of GMD 9. Capacitance of a Single Phase Two-Wire Line 10. Capacitance of a 3-Phase Overhead line <p>X. <u>PERFORMANCE OF TRANSMISSION LINES</u></p> <ol style="list-style-type: none"> 1. Classification of Overhead Transmission Lines 2. Important Terms 3. Performance of Single Phase Short Transmission Lines 4. Three-Phase Short Transmission Lines 5. Effect of Load p.f on Regulation and Efficiency 6. Medium Transmission Lines 7. End condenser Method 8. Nominal T Method 9. Nominal π Method 10. Long Transmission Lines 11. Analysis of Long Transmission Line (Rigorous Method) 12. Generalized Circuit constants of Transmission Line 13. Determination of Generalized Constants for Transmission Lines <p>XI. <u>UNDERGROUND CABLE</u></p> <ol style="list-style-type: none"> 1. Underground Cables 2. Construction of Cables 3. Insulating Materials for Cables 4. Classification of Cables 5. Cables for 3-Phase Service 6. Laying of Underground Cables 7. Insulation Resistance of a Single-Core Cable 8. Capacitance of a Single-Core Cable 9. Dielectric Stress in a Single-Core Cable 10. Most Economical Conductor Size in a Cable 11. Grading of Cables 12. Capacitance Grading 13. Inters heath Grading 14. Capacitance of 3-Core Cables 15. Measurements of C_e and C_c 16. Current-carrying Capacity of Underground Cables 17. Thermal Resistance 18. Thermal Resistance of Dielectric of Single-Core Cable 19. Permissible Current Loading 20. Types of Cable Faults 21. Loop Tests for Location of Faults in Underground Cables 22. Murray Loop Test
--	---

	<p>23. Varley Loop Test</p> <p>XII. <u>Distribution System- General</u></p> <ol style="list-style-type: none"> 1. Distribution System 2. Classification of Distribution System 3. A.C Distribution 4. D.C Distribution 5. Methods of Obtaining 3-Wire D.C. System 6. Overhead Versus Underground System 7. Connection Schemes of Distribution System 8. Requirements of a Distribution system 9. Design Considerations_in Distribution System <p>XIII. <u>D.C DISTRIBUTION</u></p> <ol style="list-style-type: none"> 1. Types of D.C. Distribution 2. D.C. Distribution Calculation 3. D.C. Distributor Fed at one End-Concentrated Loading 4. Uniformly Loaded Distributor Fed at one End 5. Distributor Fed at Both Ends-Concentrated Loading 6. Uniformly Loaded Distributor Fed at Both Ends 7. Distributor with Both Concentrated and Uniform Loading 8. Ring Distributor 9. Ring Main Distributor with Interconnector 10. 3-Wire D.C. System 11. Current Distribution in 3-Wire D.C. System 12. Balancers in 3-Wire D.C. System 13. Booster 14. Comparison of 3-Wire and 2-Wire D.C. Distribution 15. Ground Detectors
Pre-requisite مخکینی اړین مضامین	Fundamental of Electric circuit,
Related Courses اړونده مضامین	Electric Physic, Basic electronics, Differential & Integral Calculus, Multivariable Calculus for Engineers, Linear Algebra, Probability & Statistics
Teaching and Learning methods د تدریس میتود	Lectures, tutorials and assignments
Computer Knowledge د کمپیوتر زده کړی ته اړتیا	Basic computing skills using MS Word, Excel, Mathlab, power system software, CAD, and/or SolidWorks with applications to electrical engineering computing
Course Materials and References د مضمون درسي مواد او اخلیکونه	<p><u>Text Books:</u> <u>درسي کتاب</u> Principle of power system by (V.K Mehta and Rohit Mehta.)</p>
	<p><u>Reference:</u> <u>اخلیکونه</u></p> <ul style="list-style-type: none"> • Hadi Saadat, "Power System Analysis", Tata Mc Graw-Hill Publishing Company Limited, 2nd Edition, New Delhi, 2009. • Gupta, B.R., "Power System Analysis and Design", S.Chand & Company Ltd., Reprint Edition, New Delhi, 2007. • 1. Weedy B.M., Cory B.J., "Electric Power Systems", John Wiley

	& Sons Limited, 4th Edition, Reprint, England, 2009. • 2. Wadhwa C. L., “Electrical Power Systems”, New Age International Private Limited, 6th Edition, New Delhi, 2010. • 3. Nagsarkar T.K., Sukhija M.S., “Power system Analysis” Oxford University Press, 1st Edition, London, 2007. • 4. Arthur R. Bergen, Vijay Vittal., “Power System Analysis”, Pearson Education Inc., 2nd Edition, New Delhi, 2000. • 5. Kothari. D. P., Nagrath. I. J., “Power System Engineering”, Tata McGraw-Hill Publishing Company Limited, 2nd Edition, Third Reprint, New Delhi, 2008.							
Evaluation activities and Grads د ارزوني فعاليتونه او نمري								
Activity فعاليت	Scope هدف	Marks نمري						
Attendance and class contribution حاضري او په درس كې برخه اخستل	Attending the class, contribution to the knowledge and relationship with the group.	5						
Assignments كورني دنده	Solving the indicated problems from the problem list and submitting on time.	10						
Laboratory and field trip reports د لابراتوار/ ساحي راپورونه	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion and implication.	10						
Quizzes صنفي ارزوني	The quiz includes teaching materials and assignments from two previous classes.	5						
Midterm exam منځني ازموينه	The midterm exam includes Chapters X, X and X.	20						
Final exam وروستي ازموينه	The exam includes Chapters X, X, and X.	50						
	Total Course Marks د كورس مجموعي نمري	100						
Relationship of this Course to Program Learning Outcome د مضمون اړيکه د څانگي له كليدي بنوونيزو موخو سره								
No.	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7
		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team

1	Explain concept of energy and its resources.	2	2	2	2	2	2	2
2	Analyze the economic problem in power system.	3	3	3	3	3	3	3
3	Design a power system solution based on the problem requirements and realistic constraint	3	3	3	3	3	3	3
4	Prepare economical solutions for power system.	3	3	3	3	3	3	3
5	Design a power system network for base don standard regulations.	3	3	3	3	3	3	3
6	Apply the load flow application to various power system problems like minimization of transmission line losses, minimization of the total fuel cost etc.	3	3	3	3	3	3	3
Total		2.8	2.8	2.8	2.8	2.8	2.8	2.8
Average		2.8						
1= Some relation 2= Moderate relation 3= Extensive relation								

En. Ene 0626 Power System II

Item موضوع	Description توضیحات		
Title عنوان یا مضمون	En. Ene 0626 Power system II		
Credits and no. of hour د کریڈٹونو او درسی ساعتونو شمپر	Total تولیزہ	Theoretic نظری	Practical عملی
	3	2	1
Offering year and semester د تدریس کال او سمسٹر	Third year- Second Semester		
Aim موخی	This course is designed to: <ul style="list-style-type: none"> Explain concept of energy and its resources 		

	<ul style="list-style-type: none"> Analyze the economic problem in power system. Design a power system solution based on the problem requirements and realistic constraint. To meet these objectives, we emphasize well-organized physical arguments and a focused problem-solving strategy. At the same time, we attempt to motivate the student through practical examples that demonstrate the role of power system analysis in other disciplines.
<p>Key Learning Outcomes كليدي بنونيز نتايج</p>	<p>On successful completion of this course, students should be able to:</p> <ul style="list-style-type: none"> Prepare economical solutions for power system. Design a power system network for base don standard regulations design. a power system solution based on the problem requirements and realistic constraint
<p>Academic Staff Responsible د تدريس مسنول استاد</p>	Eng.Ahmad Shah Irshad
<p>Course Contents & Topics مفردات</p>	<p>I. <u>A.C Distribution</u></p> <ol style="list-style-type: none"> A.C Distribution Calculation Methods of Solving A.C. Distribution Problems 3-Phase Unbalanced Loads Four-Wire Star-Connected Unbalanced Loads Ground Detectors <p>II. <u>Voltage Control</u></p> <ol style="list-style-type: none"> Importance of Voltage Control Location of Voltage Control Equipment Methods of Voltage Control Excitation Control Terrill Regulator Brown-Boveri Regulator Tap-Changing Transformers Auto-Transformer Tap-Changing Booster Transformer Induction Regulators Voltage Control by Synchronous Condenser <p>III. <u>INTRODUCTION TO SWITCHGEAR</u></p> <ol style="list-style-type: none"> Switchgear Essential Features of Switchgear Switchgear Equipment Bus-Bar Arrangements Switchgear Accommodation Shor-Circuit Short-Circuit Currents Faults in a Power System <p>IV. <u>SYMMETRICAL FAULT CALCULATION</u></p> <ol style="list-style-type: none"> Symmetrical Faults on 3-Phase System Limitation of Fault Current Percentage Reactance

	<ol style="list-style-type: none"> 4. Percentage Reactance and Base kVA 5. Short-Circuit kVA 6. Reactor Control of Short-Circuit Currents 7. Location of Reactors 8. Steps for Symmetrical Fault Calculations <p>V. <u>UNSYMMETRICAL FAULT CALCULATION</u></p> <ol style="list-style-type: none"> 1. Unsymmetrical Faults on 3-Phase System 2. Symmetrical Components Method 3. Operator 'a' 4. Symmetrical Components in Terms of Phase Currents 5. Some Facts about Sequence Currents 6. Sequence Impedances 7. Sequence Impedances of Power System Elements 8. Analysis of Unsymmetrical Faults 9. Single Line-to-Ground Fault 10. Line-to-Line Fault 11. Double Line-to-Ground Fault 12. Sequence Networks 13. Reference Bus for Sequence Networks <p>VI. <u>CIRCUIT BREAKERS</u></p> <ol style="list-style-type: none"> 1. Circuit Breakers 2. Arc Phenomenon 3. Principles of Arc Extinction 4. Methods of Arc Extinction 5. Important Terms 6. Classification of Circuit Breakers 7. Oil Circuit Breakers 8. Types of Oil Circuit Breakers 9. Plain Break Oil Circuit Breakers 10. Arc Control Oil Circuit Breakers 11. Low Oil Circuit Breakers 12. Maintenance of Oil Circuit Breakers 13. Air-Blast Circuit Breakers 14. Types of Air- Blast Circuit Breakers 15. Sulphur Hexafluoride (SF₆) Circuit Breakers 16. Vacuum Circuit Breakers (VCB) 17. Switchgear Components 18. Problems of Circuit Interruption 19. Resistance Switching 20. Circuit Breaker Ratings <p>VII. <u>FUSES</u></p> <ol style="list-style-type: none"> 1. Fuses 2. Desirable Characteristics of Fuse Element 3. Fuse Element Materials 4. Important Terms 5. Types of Fuses 6. Low Voltage Fuses 7. High Voltage Fuses 8. Current Carrying Capacity of Fuse Element
--	---

	<p>9. Difference Between a Fuse and Circuit Breaker</p> <p>VIII. <u>PROTECTIVE RELAYS</u></p> <p>1. Protective Relays</p> <p>2. Fundamental Requirements of Protective Relaying</p> <p>3. Basic Relays</p> <p>4. Electromagnetic Attraction Relays</p> <p>5. Induction Relays</p> <p>6. Relay Timing</p> <p>7. Important Terms</p> <p>8. Time/P.S.M. Curve</p> <p>9. Calculation of Relay Operating Time</p> <p>10. Functional Relay Types</p> <p>11. Induction Type Overcurrent Relay (non-directional)</p> <p>12. Induction Type Directional Power Relay</p> <p>13. Induction Type Directional Overcurrent Relay</p> <p>14. Distance or Impedance Relays</p> <p>15. Definite – Distance Type Impedance Relay</p> <p>16. Time – Distance Impedance Relay</p> <p>17. Differential Relays</p> <p>18. Current Differential Relay</p> <p>19. Voltage Balance Differential Relay</p> <p>20. Trans lay System</p> <p>21. Types of Protection</p> <p>IX. <u>PROTECTION OF ALTERNATORS AND TRANSFORMERS</u></p> <p>1. Protection of Alternators</p> <p>2. Differential Protection of Alternators</p> <p>3. Modified Differential Protection for Alternators</p> <p>4. Balanced Earth-Fault Protection</p> <p>5. Stator Inter-Turn Protection</p> <p>6. Protection of Transformers</p> <p>7. Protection Systems for Transformers</p> <p>8. Buchholz Relay</p> <p>9. Earth-Fault or Leakage Protection</p> <p>10. Combined Leakage and Overload Protection</p> <p>11. Applying Circulating-Current System to Transformers</p> <p>12. Circulating-Current Scheme for Transformer Protection</p> <p>X. <u>PROTECTION OF BUS-BARS AND LINES</u></p> <p>1. bus bar Protection</p> <p>2. Protection of Lines</p> <p>3. Time-Graded Overcurrent Protection</p> <p>4. Differential Pilot-Wire Protection</p> <p>5. Distance Protection</p> <p>XI. <u>PROTECTION AGAINST OVER VOLTAGES</u></p> <p>1. Voltage Surge</p> <p>2. Causes of Overvoltage</p> <p>3. Internal Causes of overvoltage</p> <p>4. Lightning</p> <p>5. Mechanism of Lightning Discharge</p>
--	---

	<ol style="list-style-type: none"> 6. Types of Lightning Strokes 7. Harmful Effects of Lightning 8. Protection Against Lightning 9. The Earthing Screen 10. Overhead Ground Wires 11. Lightning Arresters 12. Types of Lightning Arresters 13. Surge Absorber <p>XII. <u>SUB- STATIONS</u></p> <ol style="list-style-type: none"> 1. Sub-Station 2. Classification of Sub-Stations 3. Comparison between Outdoor and Indoor Sub-Stations 4. Transformer Sub-Stations 5. Pole-Mounted Sub-Station 6. Underground Sub-Station 7. Symbols for Equipment in Sub-Stations 8. Equipment in a Transformer Sub-Station 9. Bus-Bar Arrangements in Sub-Stations 10. Terminal and Through Sub-Stations 11. Key Diagram of 66/11 kV Sub-Station 12. Key Diagram of 11kV/400 V Indoor Sub-Station <p>XIII. <u>NEUTRAL GROUNDING</u></p> <ol style="list-style-type: none"> 1. Grounding or Earthing 2. Equipment Grounding 3. System Grounding 4. Ungrounded Neutral System 5. Neutral Grounding 6. Advantages of Neutral Grounding 7. Methods of Neutral Grounding 8. Solid Grounding 9. Resistance Grounding 10. Reactance Grounding 11. Arc Suppression Coil Grounding (or Resonant Grounding) 12. Voltage Transformer Earthing 13. Grounding Transformer
Pre-requisite مخکینی اړین مضامین	Power system I
Related Courses اړونده مضامین	Fundamental of Electric Circuit, Electric Physic, Basic electronics, Differential & Integral Calculus, Multivariable Calculus for Engineers, Linear Algebra, Probability & Statistics
Teaching and Learning methods د تدریس میتود	Lectures, tutorials and assignments
Computer Knowledge د کمپیوتر زده کړې ته اړتیا	Basic computing skills using MS Word, Excel, Mathlab, power system software, CAD, and/or SolidWorks with applications to electrical engineering computing

Course Materials and References د مضمون درسي مواد او اخليكونه	<u>Text Books:</u> <u>درسي كتاب</u> Principle of power system by V.K Mehta and Rohit Mehta.)	
	<u>Reference:</u> <u>اخليكونه</u> <ul style="list-style-type: none"> • Hadi Saadat, "Power System Analysis", Tata Mc Graw-Hill Publishing Company Limited, 2nd Edition, New Delhi, 2009. • Gupta, B.R., "Power System Analysis and Design", S.Chand & Company Ltd., Reprint Edition, New Delhi, 2007. • 1. Weedy B.M., Cory B.J., "Electric Power Systems", John Wiley & Sons Limited, 4th Edition, Reprint, England, 2009. • 2. Wadhwa C. L., "Electrical Power Systems", New Age International Private Limited, 6th Edition, New Delhi, 2010. • 3. Nagsarkar T.K., Sukhija M.S., "Power system Analysis" Oxford University Press, 1st Edition, London, 2007. • 4. Arthur R. Bergen, Vijay Vittal., "Power System Analysis", Pearson Education Inc., 2nd Edition, New Delhi, 2000. • 5. Kothari. D. P., Nagrath. I. J., "Power System Engineering", Tata McGraw-Hill Publishing Company Limited, 2nd Edition, Third Reprint, New Delhi, 2008. 	
Evaluation activities and Grads د ارزوني فعاليتونه او نمري		
Activity فعاليت	Scope هدف	Marks نمري
Attendance and class contribution حاضري او په درس کي برخه اخستل	Attending the class, contribution to the knowledge and relationship with the group.	5
Presentation سمينار	Preparing and presenting the presentation which is selected by the lecturer.	8
Projects پروژي	Estimation of the electrical design	7
Midterm exam منځني ازموينه	The midterm exam includes Chapters X, X and X.	20
Final exam وروستي ازموينه	The exam includes Chapters X, X, and X.	50
	Total Course Marks د کورس مجموعي نمري	100
Relationship of this Course to Program Learning Outcome د مضمون اړیکه د ځانګې له کلیدي بڼوونیزو موخو سره		

No.	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7
		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team
1	Explain basic equipment and methods of distribution system.	2	2	2	2	2	2	2
2	Analyze fault condition in power system.	3	3	3	3	3	3	3
3	Select suitable equipment for power system network.	3	3	3	3	3	3	3
4	Prepare economical solutions for protection of power system.	3	3	3	3	3	3	3
5	Design a power system network based on standard regulations.	3	3	3	3	3	3	3
6	Apply standard methods to maximize efficiency and minimize network cost.	3	3	3	3	3	3	3
Total		2.8	2.8	2.8	2.8	2.8	2.8	2.8
Average		2.8						
1= Some relation 2= Moderate relation 3= Extensive relation								

En. Ene 0620 Biomass Energy Engineering

Item موضوع	Description توضیحات		
Title عنوان یا مضمون	En. Ene 0620 Biomass Energy Engineering		
Credits and no. of hour د کړېدونو او درسي ساعتونو شمیر	Total تولیزه	Theoretic نظري	Practical عملي
	3	2	1
Offering year and semester د تدریس کال او سمستر	Third year - Second semester		
Aim موخي	<p>By completing this course the student will be able to accomplish the following:</p> <ul style="list-style-type: none"> • Know different types of biomass resources and energy conversion processes. • Identify the right usage of different types of biomass for energy generation. • Estimate biomass resources for energy generation. • Analyze and design different kinds of biomass energy technologies. 		
Key Learning Outcomes کلیدي ښوونیز نتایج	<p>Key learning outcomes of this course follow:</p> <ul style="list-style-type: none"> • Knowledge of different types of biomass resources. • Understanding and analyze of different biomass to energy processes. • Understanding the appropriate use of biomass for energy generation. • Estimation of biomass resources for energy generation. • Analyze and design of biomass-based energy technologies. 		
Academic Staff Responsible د تدریس مسئول استاد			
Syllabus مفردات	<p>VIII. <u>BIOMASS AS ENERGY SOURCE</u></p> <ol style="list-style-type: none"> 1. Introduction 2. World Energy Use and Needs 3. Future of Agriculture 4. Advantages and Disadvantages in Use Of Biomass Source 5. Sources of Biomass Available for Energy Use <p>IX. <u>BIOMASS CONVERSION PROCESSES</u></p> <ol style="list-style-type: none"> 1. Introduction 2. Overview of Biomass Conversion Processes 3. Chemical Conversion Processes 4. Biological Conversion Processes 5. Hybrid Conversion Processes 6. Application of Biomass Conversion Products <p>X. <u>BIOMASS PROPERTIES FOR THERMAL CONVERSION</u></p> <ol style="list-style-type: none"> 1. Introduction 		

	<ol style="list-style-type: none"> 2. Physical Properties of Biomass 3. Important Thermal Related Properties 4. Other Standard Methods for Biomass Analysis
XI.	<u>BIOMASS PROPERTIES FOR BIOLOGICAL CONVERSION</u> <ol style="list-style-type: none"> 1. Introduction 2. Properties of Biomass Important for Biological Conversion 3. Standard Method for Analysis 4. Summary of ASTM Procedures for Compositional Analysis 5. Biomass Pretreatment
XII.	<u>BIODIESEL PRODUCTION</u> <ol style="list-style-type: none"> 1. Introduction 2. Available Oil Production in the World 3. Vegetable Oil and Animal Fat Characteristics 4. Fatty Acid Composition 5. Other Basic Oil Properties 6. Oil Extraction Process 7. Oil Refining Process 8. Transesterification 9. ASTM Characteristics 10. Engine Performance and Exhaust Emissions 11. Design of Biodiesel Plant
XIII.	<u>BIOETHANOL PRODUCTION</u> <ol style="list-style-type: none"> 1. Introduction 2. Sugar Crops 3. Starchy Crops 4. Cellulosic Biomass 5. Biomass Pretreatment Process 6. Household and Village Level Ethanol Production System 7. Pilot Scale Ethanol Production Systems 8. Cellulosic Ethanol Studies
XIV.	<u>BIOGAS PRODUCTION</u> <ol style="list-style-type: none"> 1. Introduction 2. Biomass/Waste Parameters Important in Anaerobic Digestion 3. Acid and Methane Farming Microbes 4. Advantages and Disadvantages of Anaerobic Digestion Process 5. Biogas Conversion Process and Digester Designs 6. First and Second Generation Biogas Digesters 7. Design of Biogas Digester
XV.	<u>TORREFACTION</u> <ol style="list-style-type: none"> 1. Introduction 2. Bio-Physico-Chemical Changes in Biomass During Torrefaction 3. Torrefaction Products 4. Physical Properties of Torrefied Biomass 5. Comparison Between Torrefied Biomass and Pelleted Biomass 6. Thermal Gravimetric Analysis Studies of Biomass 7. Chemical Composition Changes During Torrefaction of

	<p>Biomass</p> <p>8. Advantages and Disadvantages of Torrefaction Process</p> <p>XVI. <u>PYROLYSIS</u></p> <p>1. Introduction</p> <p>2. Various Pyrolysis Processes Based on Heating Rates</p> <p>3. Effect of Temperature on Product Yields From Pyrolysis of Microalgae</p> <p>4. Application of Products From Fast Pyrolysis</p> <p>5. Bio-Oil Characterizations Process</p> <p>6. Bio-Oil Upgrade Processes</p> <p>7. Studies on Pyrolysis of Various Biomass Resources</p> <p>XVII. <u>GASIFICATION</u></p> <p>1. Introduction</p> <p>2. Chemistry of Biomass Gasification</p> <p>3. Various Types of Gasifiers</p> <p>4. Application of Biomass Gasifiers</p> <p>5. Gasifiers TDR and Throughput</p> <p>XVIII. <u>ADVANCE GASIFICATION</u></p> <p>1. Introduction</p> <p>2. Determining Average Particle Size of Bed Material</p> <p>3. Minimum Fluidizing Velocity, Terminal Velocity and Pressure Drop in Fluidized Bed Reactors</p> <p>4. Operation of 0.3048 Fluidized Bed Gasifier</p> <p>5. Designing Dimensions of Fluidized Bed Gasifier</p> <p>6. Designing Dimensions of Series Cyclone Char Removal System</p> <p>7. Direct Use Of Synthesis Gas for Heat and Steam Production</p> <p>8. Electrical Power Production from Fluidized Bed Gasification</p> <p>XIX. <u>BIOMASS LIQUEFACTION</u></p> <p>1. Introduction</p> <p>2. Indirect Liquefaction Process</p> <p>3. Direct Liquefaction Process</p> <p>4. Advantages and Disadvantages of Biomass Liquefaction Process</p> <p>XX. <u>BIOMASS COMBUSTION</u></p> <p>1. Introduction</p> <p>2. Types of Biomass Combustion Systems</p> <p>3. Co-Combustion of Biomass and Co-Firing with Coal</p> <p>4. Slagging and Fouling Issues with Agricultural Biomass</p> <p>5. Detering Melting Point of Biomass Ash Pellets</p> <p>6. Application of Biomass Combustion Systems</p> <p>XXI. <u>BIOMASS SUSTAINABILITY ISSUES</u></p> <p>1. Introduction</p>
--	--

	2. Well-To-Wheel Approach 3. Discussion of Software and Programs for LCA and Related Biomass Analysis 4. Biofuels Economics 5. Sustainability of Biofuels Production	
Pre-requisite مخکینی اړین مضامین	None	
Related Courses اړونده مضامین	Physics-I&II, Engineering Chemistry, Thermodynamics-I&II and Heat Transfer	
Teaching and Learning methods د تدریس میتود	Lectures, tutorials, and assignments	
Computer Knowledge د کمپیوتر زده کړې ته اړتیا	Moderate computer knowledge such as MS Word, MS Excel, MS PowerPoint, and CAD.	
Course Materials and References د مضمون درسي مواد او اخلیکونه	<u>Text Books:</u> <u>درسي کتاب</u> <ul style="list-style-type: none"> Sergio Capareda (2014). <i>Introduction to Biomass Energy Conversion</i>. CRC Press 	
	<u>Reference:</u> <u>اخلیکونه</u> <ul style="list-style-type: none"> Kassebom T. <i>Afghanistan Biogas Construction Manual</i>. MRRD Nijaguna B. T. <i>Biogas Technology</i>. New Age International (P) Ltd., Publishers 	
Evaluation activities and Grades د ارزونې فعالیتونه او نمرې		
Activity فعالیت	Scope هدف	Marks نمرې
Attendance and class contribution حاضري او په درس کې برخه اخیستل	Attending class, contributions to knowledge and relationships with the group.	5
Assignments کورني دنده	Solving the indicated problems from the problem list and submitting on time.	5
Laboratory and field trip reports د لابراتوار / ساحي راپورونه	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion and implication.	15
Quizzes صنفي ارزوني	Quizzes include teaching materials and assignments from two previous classes.	5

Midterm exam منځنی ازموینه	The midterm exam includes the covered topics.	20						
Final exam وروستی ازموینه	The final exam includes the covered topics after the midterm exam.	50						
	Total Course Marks د کورس مجموعي نمرې	100						
Relationship of this Course to Program Learning Outcome د مضمون اړیکه د څانګې له کلیدي بنوونیزو موخو سره								
No.	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7
		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team
1	To gain the knowledge of different types of biomass resources.	2	3	2	2	2	2	3
2	To understand and to analyze the different biomass to energy processes.	3	3	3	3	3	3	3
3	To understanding the appropriate use of biomass for energy generation.	3	3	3	3	3	3	3
4	To estimate of biomass resources for energy generation.	3	3	3	3	3	3	3
5	To analyze and design of biomass-based energy technologies.	3	3	3	2	2	2	2
Total		2.8	3.0	2.8	2.6	2.6	2.6	2.8
Average		2.7						
1= Some relation 2= Moderate relation 3=Extensive relation								

En. Ene 0621 Heating Ventilating and Air-Conditioning (HVAC)

Item موضوع	Description توضیحات		
Title عنوان یا مضمون	En. Ene 0621 Heating Ventilating and Air-conditioning (HVAC)		
Credits and no. of hour د کړېدونو او درسي ساعتونو شمير	Total ټوليزه	Theoretic نظري	Practical عملي
	3	2	1
Offering year and semester د تدريس کال او سمستر	Third year - Second semester		
Aim موخي	<p>Upon completing this course, the students will be able to:</p> <ul style="list-style-type: none"> • Understand and apply the fundamental physical mechanism of heat transfer through the building geometry. • Understand psychrometrics, comfort, and health-related issues in buildings • Understand and apply the knowledge of solar radiation, solar geometry, insulations and windows. • Apply this knowledge to solve problems relevant to the thermodynamics and fluid mechanics processes in buildings, • Apply this knowledge to determine the heating and cooling loads and find the annual energy consumption of buildings. • Analyze and design the heating and cooling equipment of the buildings (primary system). • Analyze and design ducts and pipes of the HVAC (Secondary system) • Evaluate different heating and cooling systems based on their part-load performances. • Analyze and design the control systems of HVAC <p>This course will also help you develop important problem-solving and critical thinking skills that will be broadly applicable throughout student lives and careers.</p>		
Key Learning Outcomes کلیدي بنوونيز نتايج	<p>Key learning outcomes of this course should be as follows:</p> <ul style="list-style-type: none"> • Explain the basics of HVAC and understand the importance of building in the world economy. • Describe and apply the physical mechanisms of heat transport by conduction, convection, and radiation through the building geometry. • Identify and understand the various processes of thermodynamics in buildings • Understand the psychrometrics, comfort, and health-related issues associated with buildings. • Understand the fundamentals of fluid mechanics in building systems and apply critical and creative thinking skills to solve complex problems associated with flow measurements, pressure, pressure 		

	<p>losses in piping and pipe fittings and ducts.</p> <ul style="list-style-type: none"> • Understand and apply the fundamentals of solar radiation, solar geometry, extraterrestrial insolation, insolation data and models, windows and the glazing effects. • Determine the heating and cooling loads of a building and set design conditions for the specific cases. • Apply methods to determine the annual energy consumption of buildings. • Analyze and design of primary system of HVAC. • Evaluate heating and cooling equipment based on part-load performances. • Analyze and design the secondary system of HVAC • Analyze and design the systems to control the overall HVAC systems
<p>Academic Staff Responsible د تدریس مسنول استاد</p>	
<p>Syllabus مفردات</p>	<p>I. <u>INTRODUCTION</u></p> <ol style="list-style-type: none"> 1. A Bit of History 2. Importance of Buildings in the World Economy 3. Role of HVAC Design Engineer 4. A Note on the Economics of Energy Efficiency 5. Units and Conversions 6. Orders of Magnitude <p>II. <u>ELEMENTS OF HEAT TRANSFER FOR BUILDINGS</u></p> <ol style="list-style-type: none"> 1. Introduction to Heat Transfer 2. Conduction Heat Transfer 3. Convection Heat Transfer 4. Radiation Heat Transfer 5. Evaporation and Moisture Transfer <p>III. <u>PSYCHROMETRICS, COMFORT, HEALTH</u></p> <ol style="list-style-type: none"> 1. Introduction and Definitions 2. Thermodynamic Fundamentals 3. The Psychrometric Chart and Tables of Air Properties 4. Psychrometric Processes for Buildings 5. Thermal Comfort 6. Air Quality and Ventilation <p>IV. <u>HEAT GAINS THROUGH WINDOWS</u></p> <ol style="list-style-type: none"> 1. Importance and Design Consideration 2. Optical Properties 3. Thermal Properties 4. Solar Heat Gains 5. External and Internal Shading 6. High Performance Glazing

-
- | | |
|--|---|
| | <p>V. <u>INFILTRATION AND NATURAL VENTILATION</u></p> <ol style="list-style-type: none">1. Importance and Basic Definitions2. Infiltration Rates across Building Stock3. Basic Flow Equation4. Induced Pressure Differences5. Engineering Component Models for Air Infiltration6. Simplifies Physical Models for Single zone Air Infiltration7. Molt zone Models8. Natural Ventilation Airflow through Large Openings9. Measuring Air Infiltration and Inter zone Flows10. Infiltration Heat Recovery <p>VI. <u>HEATING AND COOLING LOADS</u></p> <ol style="list-style-type: none">1. Introduction to Load Calculations2. Heating Versus Cooling Load Calculations3. Methods of Estimating Cooling Loads on Buildings4. Heating Load Calculations5. Estimation of the System Cooling Capacity <p>VII. <u>ANNUAL ENERGY ESTIMATION AND INVERSE MODELING</u></p> <ol style="list-style-type: none">1. General Approach2. Degree-Days Method3. Models for Estimating Degree-Days under Different Base Temperatures4. Bin Method5. Inverse Modeling <p>VIII. <u>HEAT GENERATION AND TRANSFER EQUIPMENT</u></p> <ol style="list-style-type: none">1. Introduction2. Natural Gas and Fuel Oil–Fired Equipment3. Electric Resistance Heating4. Electric Heat Pumps5. Heat Exchanger Design and Selection6. Low-Temperature Radiant Heating7. Solar heating8. Cogeneration Definition and Overview <p>IX. <u>COOLING EQUIPMENT</u></p> <ol style="list-style-type: none">1. Introduction2. Rankine Refrigeration Cycle3. Absorption Cycle4. Mechanical Cooling Equipment—Chillers5. Part-Load Performance of Chillers6. Rules for Chiller System Operation and Control in Commercial Buildings7. Evaporative Cooling Equipment |
|--|---|

	<p>X. <u>SECONDARY SYSTEMS FOR HEATING AND COOLING</u></p> <ol style="list-style-type: none"> 1. Air Distribution Systems 2. Duct Design 3. Piping Design 4. Complete HVAC Systems for Commercial Buildings
Pre-requisite مخکینی ارین مضامین	None
Related Courses ارونده مضامین	Thermodynamics-I & II, Heat Transfer, Fluid Mechanics and Energy Audit of Building Systems.
Teaching and Learning methods د تدریس میتود	Lectures, tutorials, and assignments
Computer Knowledge د کمپیوتر زده کری ته ارتیا	Moderate computer knowledge such as MS Word, MS Excel, MS PowerPoint, and CAD.
Course Materials and References د مضمون درسی مواد او اخلیکونه	<p><u>Text Books:</u> <u>درسی کتاب</u></p> <ul style="list-style-type: none"> • Jan F. Kreider, Peter S. Curtiss, and Ari Rabl, Heating and Cooling of Buildings: Design for Efficiency, Revised Second Edition, CRC Press, 2010, ISBN: 9781439811511 with CD-ROM of Appendices
	<p><u>Reference:</u> <u>اخلیکونه</u></p> <ul style="list-style-type: none"> • T. Agami Reddy, Jan F. Kreider, Peter S. Curtiss, Ari Rabl, Heating and Cooling of Buildings: Principles and Practice of Energy Efficient Design, 3rd Edition, CRC Press. • Joseph B. Wujek, Mechanical and Electrical Systems in Architecture, Engineering, and Construction, 5th Edition, Pearson. • Ashrae Handbook of Heating, Ventilating and Air-Conditioning Systems and Equipment Si edition, 2016, ISBN-13: 978-1939200273. • Ashrae Handbook, Fundamentals, SI edition, 2013, ISBN 978-1-936504-46-6 • Ashrae 55-213, Thermal Environmental Conditions for Human Occupancy, ASIN: B00Q63TV2S • Ashrae 62.1-2013, Ventilation for Acceptable Indoor Air Quality, 2013, ASIN: B00Q64H5CA • Rechad R. Janis, William K.Y.Tao, Mechanical and Electrical System in Buildings, 4e, Pearson, ISBN-13:0-9780135130131. • KriggerJ. Residential Energy: Cost Savings and Comfort for Existing Buildings (6th Edition). Pearson.

Evaluation activities and Grades د ارزوني فعاليتونه او نمرې								
Activity فعاليت	Scope هدف	Marks نمرې						
Attendance and class contribution حاضري او په درس كې برخه اخستل	Attending class, contributions to knowledge and relationships with the group.	5						
Assignments كورني دنده	Solving the indicated problems from the problem list and submitting on time.	5						
Laboratory and field trip reports د لابراتوار/ ساحي راپورونه	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion and implication.	15						
Quizzes صنفي ارزوني	Quizzes include teaching materials and assignments from two previous classes.	5						
Midterm exam منځنۍ ازموينه	The midterm exam includes the covered topics.	20						
Final exam وروستۍ ازموينه	The final exam includes the covered topics after the midterm exam.	50						
	Total Course Marks د كورس مجموعي نمرې	100						
Relationship of this Course to Program Learning Outcome د مضمون اړيکه د څانگې له كليدي بنوونيزو موخو سره								
No.	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7
		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team

1	Explain the basics of HVAC and understand the importance of building in the world economy.	1	1	1	3	2	2	2
2	Describe and apply the physical mechanisms of heat transport by conduction, convection, and radiation through the building geometry.	3	2	1	1	1	2	2
3	Identify and understand the various processes of thermodynamics in buildings	2	2	1	2	1	2	2
4	Understand the psychrometrics, comfort, and health-related issues associated with buildings.	2	1	1	2	1	2	2
5	Understand the fundamentals of fluid mechanics in building systems and apply critical and creative thinking skills to solve complex problems associated with flow measurements, pressure, pressure losses in piping and pipe fittings and ducts.	3	2	2	2	2	2	2
6	Understand and apply the fundamentals of solar radiation, solar geometry, extraterrestrial insolation, insolation data and models, windows and the glazing effects.	3	2	2	3	2	1	2
7	Determine the heating and cooling loads of a building and set design conditions for the specific cases.	3	3	3	2	2	2	3
8	Apply methods to determine the annual energy consumption of buildings.	3	3	3	3	3	3	3

9	Analyze and design of primary system of HVAC (cooling equipment).	3	3	3	3	3	3	3
10	Evaluate heating and cooling equipment based on part-load performances.	3	3	3	3	3	3	3
11	Analyze and design the secondary system of HVAC	3	3	3	3	3	3	3
12	Analyze and design the systems to control the overall HVAC systems	3	3	3	3	3	3	3
Total		2.7	2.3	2.2	2.5	2.2	2.3	2.5
Average		2.4						
1= Some relation 2= Moderate relation 3= Extensive relation								

En. Ene 0622 Solar Energy Engineering

Item موضوع	Description توضیحات		
Title عنوان یا مضمون	En. Ene 0622 Solar Energy Engineering		
Credits and no. of hour د کربدتونو او درسي ساعتونو شمير	Total توليزه	Theoretic نظري	Practical عملي
	3	2	1
Offering year and semester د تدريس کال او سمسټر	Third year - Second semester		
Aim موخي	Upon completing this course, students will be able to (i) understand solar geometry, radiation and characteristics of solar radiations. (ii) assess solar energy resources (iii) apply solar energy principles and analyze of various solar energy technologies (iv) Estimate heating loads and design appropriate solar energy technology for it. This course will also help students develop important problem-solving and critical thinking skills that will be broadly applicable throughout their lives and careers.		
Key Learning Outcomes کلیدی بنوونيز نتايج	Key learning outcomes of this course follow: <ul style="list-style-type: none"> • Understand the concepts in solar energy engineering. • Understand solar geometry, radiation and characteristics of solar radiations. • Learn principles and analyze of various solar energy technologies • Estimate energy needs for solar energy applications and choose the appropriate engineering system and technology 		

	<ul style="list-style-type: none"> • Develop knowledge of engineering analysis for solar thermal and PV systems • Balance theoretical and practical aspects of solar thermal design • Understand the solar resource and be able to use this knowledge for design of solar thermal systems
<p>Academic Staff Responsible د تدریس مسنول استاد</p>	
<p>Syllabus مفردات</p>	<p>I. <u>SOLAR RADIATION</u></p> <ol style="list-style-type: none"> 1. The Sun 2. The Solar Constant 3. Spectral Distribution of Extraterrestrial Radiation 4. Variation of Extraterrestrial Radiation 5. Definitions 6. Direction of Beam Radiation 7. Angles for Tracking Surfaces 8. Ratio of Beam Radiation on Tilted Surface to That on Horizontal Surface 9. Shading 10. Extraterrestrial Radiation on a Horizontal Surface <p>II. <u>AVAILABLE SOLAR RADIATION</u></p> <ol style="list-style-type: none"> 1. Definitions 2. Pyrheliometers and Pyrheliometric Scales 3. Pyranometers 4. Measurement of Duration of Sunshine 5. Solar Radiation Data 6. Atmospheric Attenuation of Solar Radiation 7. Estimation of Average Solar Radiation 8. Estimation of Clear-Sky Radiation 9. Distribution of Clear and Cloudy Days and Hours 10. Beam and Diffuse Components of Hourly Radiation 11. Beam and Diffuse Components of Daily Radiation 12. Beam and Diffuse Components of Monthly Radiation 13. Estimation of Hourly Radiation from Daily Data 14. Radiation on Sloped Surfaces 15. Radiation on Sloped Surfaces: Isotropic Sky 16. Radiation on Sloped Surfaces: Anisotropic Sky 17. Radiation Augmentation 18. Beam Radiation on Moving Surfaces 19. Average Radiation on Sloped Surfaces: Isotropic Sky 20. Average Radiation on Sloped Surfaces: KT Method 21. Effects of Receiving Surface Orientation on \bar{H}_T 22. Utilizability 23. Generalized Utilizability 24. Daily Utilizability

III. RADIATION CHARACTERISTICS OF OPAQUE MATERIALS

1. Absorptance and Emittance
2. Kirchhoff's Law
3. Reflectance of Surfaces
4. Relationships among Absorptance, Emittance, and Reflectance
5. Broadband Emittance and Absorptance
6. Calculation of Emittance and Absorptance
7. Measurement of Surface Radiation Properties
8. Selective Surfaces
9. Mechanisms of Selectivity
10. Optimum Properties
11. Angular Dependence of Solar Absorptance
12. Absorptance of Cavity Receivers
13. Specularly Reflecting Surfaces

IV. RADIATION TRANSMISSION THROUGH GLAZING: ABSORBED RADIATION

1. Reflection of Radiation
2. Absorption by Glazing
3. Optical Properties of Cover Systems
4. Transmittance for Diffuse Radiation
5. Transmittance-Absorptance Product
6. Angular Dependence of $(\tau\alpha)$
7. Spectral Dependence of Transmittance
8. Effects of Surface Layers on Transmittance
9. Absorbed Solar Radiation
10. Monthly Average Absorbed Radiation
11. Absorptance of Rooms
12. Absorptance of Photovoltaic Cells

V. FLAT-PLATE COLLECTORS

1. Description of Flat-Plate Collectors
2. Basic Flat-Plate Energy Balance Equation
3. Temperature Distributions in Flat-Plate Collectors
4. Collector Overall Heat Loss Coefficient
5. Temperature Distribution between Tubes and the Collector Efficiency Factor
6. Temperature Distribution in Flow Direction
7. Collector Heat Removal Factor and Flow Factor
8. Critical Radiation Level
9. Mean Fluid and Plate Temperatures
10. Effective Transmittance-Absorptance Product
11. Effects of Dust and Shading
12. Heat Capacity Effects in Flat-Plate Collectors
13. Liquid Heater Plate Geometries
14. Air Heaters
15. Measurements of Collector Performance

16. Collector Characterizations
17. Collector Tests: Efficiency, Incidence Angle Modifier, and Time Constant
18. Test Data
19. Thermal Test Data Conversion
20. Flow Rate Corrections to $FR(\tau\alpha)_n$ and FR_{UL}
21. Flow Distribution in Collectors
22. In Situ Collector Performance
23. Practical Considerations for Flat-Plate Collectors
24. Putting it all Together

VI. CONCENTRATING COLLECTORS

1. Collector Configurations
2. Concentration Ratio
3. Thermal Performance of Concentrating Collectors
4. Optical Performance of Concentrating Collectors
5. Cylindrical Absorber Arrays
6. Optical Characteristics of Nonimaging Concentrators
7. Orientation and Absorbed Energy for CPC Collectors
8. Performance of CPC Collectors
9. Linear Imaging Concentrators: Geometry
10. Images Formed by Perfect Linear Concentrators
11. Images from Imperfect Linear Concentrators
12. Ray-Trace Methods for Evaluating Concentrators
13. Incidence Angle Modifiers and Energy Balances
14. Paraboloidal Concentrators
15. Central-Receiver Collectors
16. Practical Considerations

VII. ENERGY STORAGE

1. Process Loads and Solar Collector Outputs
2. Energy Storage in Solar Process Systems
3. Water Storage
4. Stratification in Storage Tanks
5. Packed-Bed Storage
6. Storage Walls
7. Seasonal Storage
8. Phase Change Energy Storage
9. Chemical Energy Storage
10. Battery Storage

VIII. SOLAR PROCESS LOADS

1. Examples of Time-Dependent Loads
2. Hot-Water Loads
3. Space Heating Loads, Degree-Days, and Balance Temperature
4. Building Loss Coefficients
5. Building Energy Storage Capacity
6. Cooling Loads
7. Swimming Pool Heating Loads

	<p>IX. <u>SYSTEM THERMAL CALCULATION</u></p> <ol style="list-style-type: none"> 1. Component Models 2. Collector Heat Exchanger Factor 3. Duct and Pipe Loss Factors 4. Controls 5. Collector Arrays: Series Connections 6. Performance of Partially Shaded Collectors 7. Series Arrays with Sections Having Different Orientations 8. Use of Modified Collector Equations 9. System Models 10. Solar Fraction and Solar Savings Fraction <p>X. <u>SOLAR WATER AND SPACE HEATING</u></p> <ol style="list-style-type: none"> 1. Service Water Heating 2. Space Heating 3. Mathematical Modeling of Typical Liquid-Based Solar Heating System 4. Performance of Liquid Systems 5. Liquid System Design: The f-chart method 6. Performance and Design of Air-Based Solar Heating Systems 7. Performance and Design of Service Water System 8. The Utilizability Concept 9. The $\bar{\theta}, f$-chart Design Method 10. Economic Optimization of Solar Heating System
Pre-requisite مخکینی ارین مضامین	
Related Courses ارونده مضامین	Thermodynamics-I&II, Heat Transfer and Fluid Mechanics
Teaching and Learning methods د تدریس میتود	Lectures, tutorials, and assignments
Computer Knowledge د کمپیوتر زده کری ته اړتیا	Moderate computer knowledge such as MS Word, MS Excel, MS PowerPoint, and CAD.
Course Materials and References د مضمون درسي مواد او اخلیکونه	<p><u>Text Books:</u></p> <p><u>درسي کتاب</u></p> <ul style="list-style-type: none"> • John A. Duffie, William A. Beckman. Solar Engineering of Thermal Processes, 4th Edition. Wiley.
	<p><u>Reference:</u></p> <p><u>اخلیکونه</u></p> <ul style="list-style-type: none"> • D Yogi Goswami. Principles of Solar Engineering, 3rd Edition, CRC Press. • Kalogirou, Soteris A. Solar Energy Engineering Processes and Systems. Second Edition. Academic press.

Evaluation activities and Grades د ارزوني فعاليتونه او نمرې								
Activity فعاليت	Scope هدف	Marks نمرې						
Attendance and class contribution حاضري او په درس كې برخه اخستل	Attending class, contributions to knowledge and relationships with the group.	5						
Assignments كورني دنده	Solving the indicated problems from the problem list and submitting on time.	5						
Laboratory and field trip reports د لابراتوار/ ساحي راپورونه	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion and implication.	15						
Quizzes صنفي ارزوني	Quizzes includes teaching materials and assignments from two previous classes.	5						
Midterm exam منځنۍ ازموينه	The midterm exam includes the covered topics.	20						
Final exam وروستۍ ازموينه	The final exam includes the covered topics after the midterm exam.	50						
	Total Course Marks د كورس مجموعي نمرې	100						
Relationship of this Course to Program Learning Outcome د مضمون اړيکه د څانگې له كليدي بنوونيزو موخو سره								
No.	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7
		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team

1	To understand the concepts in solar energy engineering.	3	1	2	3	2	2	3
2	To understand the solar geometry	3	2	2	2	3	2	3
3	To estimate energy needs for solar energy applications and choose the appropriate engineering system and technology.	3	2	3	2	3	3	3
4	To develop knowledge of engineering analysis for solar thermal systems.	3	3	3	3	3	2	2
5	To balance theoretical and practical aspects of solar thermal design	3	2	3	2	2	2	2
6	To understand the solar resource and be able to use this knowledge for design of solar thermal systems	3	2	3	3	2	2	3
7	To learn principles of various solar energy technologies	3	2	3	2	2	3	3
Total		3.0	2.0	2.7	2.4	2.4	2.3	2.7
Average		2.5						
1= Some relation 2= Moderate relation 3=Extensive relation								

En. Ene 0623 Hydropower Engineering

Item موضوع	Description توضیحات		
Title عنوان یا مضمون	En. Ene 0623 Hydropower Engineering		
Credits and no. of hour د کړېدونو او درسي ساعتونو شمير	Total ټوليزه	Theoretic نظري	Practical عملي
	3	2	1
Offering year and semester د تدريس کال او سمستر	Third year - Second semester		
Aim موخي	This course introduces the concepts and methods of analysis of hydropower systems with a bias to micro and mini plants. It covers types of schemes, planning, background measurements, economic analysis, impacts and the design of hydropower plants.		
Key Learning Outcomes	After a successful completion of the course, the student should be able to:		

<p>کلیدی بنوونیز نتایج</p>	<ul style="list-style-type: none"> • Describe the water flow through a power station, • Perform theoretical calculations on hydropower dams and spillway discharge, • Analyze and perform calculations on hydraulic parameters for different turbine concepts and hydraulic transients occurring in the waterways, • Describe the principles of the electrical components and perform calculations of the parameters of the electrical system, • Explain voltage and turbine regulation and how these affect the electrical grid and the mechanical system with turbine and generator, • Discuss the environmental effects of hydropower installations, • Work together in a project related to the course contents.
<p>Academic Staff Responsible د تدریس مسنول استاد</p>	
<p>Syllabus مفردات</p>	<p>I. <u>DEVELOPMENT OF HYDROPOWER</u></p> <ol style="list-style-type: none"> 1. Ancient History of Waterpower 2. Waterpower’s Contribution to the Industrial Revolution 3. Drivers of and Deterrents to Hydropower Development <p>II. <u>Basics of Hydropower</u></p> <ol style="list-style-type: none"> 1. Hydropower Types and Their Components 2. Power Output from Hydroelectric Power Plants 3. Types and Components of Hydropower 4. Storage Type Hydroelectric Plants <p>III. <u>Site Selection and Feasibility Study for Hydropower Projects</u></p> <ol style="list-style-type: none"> 1. Overview 2. Measurement of Head 3. Measurement Procedure 4. Flow Measurement Using Float Method 5. Sizing of a Micro or Mini Hydropower Plant 6. Site Selection 7. Project Implementation Schedule <p>IV. <u>Intake and Diversion Works</u></p> <ol style="list-style-type: none"> 1. Overview 2. Types of Intake 3. Trash Racks for Intakes 4. River Training Works <p>V. <u>Headrace</u></p> <ol style="list-style-type: none"> 1. Overview 2. Basic Criteria for Headrace Sizing 3. Other Considerations for Headrace Canals

	<ul style="list-style-type: none"> 4. Headrace Canal Design 5. Spillways 6. Headrace Pipe
VI.	<u>Gravel Trap, Settling Basin, and Forebay</u> <ul style="list-style-type: none"> 1. Overview 2. Sediment Transport Capacity of River 3. Theory of Sedimentation 4. Gravel Trap 5. Settling Basin 6. Forebay 7. Spillway 8. Structural Design of Settling Basin and Forebay
VII.	<u>Penstocks</u> <ul style="list-style-type: none"> 1. Overview 2. Selection of the Penstock Alignment 3. Profile of the Selected Alignment 4. Selection of Pipe 5. Surge Pressure in Penstock 6. Pipe Wall Thickness 7. Penstock Accessories 8. Pipe Jointing 9. Pipe Lengths 10. Exposed versus Buried Penstock 11. Expansion Joints 12. Painting 13. Installation 14. Maintenance 15. Checklist for Penstock Work
VIII.	<u>Powerhouse</u> <ul style="list-style-type: none"> 1. Overview 2. Classification of the Powerhouse 3. Equipment and Accessories in the Powerhouse 4. Layout of Powerhouse 5. Components of Powerhouse Structure 6. Site Selection of the Powerhouse 7. Design of the Powerhouse 8. Design of Machine Foundation 9. Design of Superstructure 10. Construction of Powerhouse 11. Tailrace
IX.	<u>Hydraulic Turbines</u> <ul style="list-style-type: none"> 1. Basic Theory 2. Types of Turbines
X.	<u>Impulse Turbines</u> <ul style="list-style-type: none"> 1. Pelton Turbines

	<ol style="list-style-type: none"> 2. Turgo Turbines 3. Cross-Flow Turbine <p>XI. <u>Reaction Turbines</u></p> <ol style="list-style-type: none"> 1. Basic Calculations 2. Draft Tubes 3. Cavitation 4. Francis Turbine 5. Axial Flow Reaction Turbines: Propeller and Kaplan 6. Governors 7. Pumps as Turbines 8. Reversible Pump Turbines for Pumped Storage <p>XII. <u>Very Low Head and River Current Turbines</u></p> <ol style="list-style-type: none"> 1. Very Low Head Turbines 2. Water Current Turbines <p>XIII. <u>Electrical Power</u></p> <ol style="list-style-type: none"> 1. Fundamentals of Electricity and Magnetism 2. Generators 3. Electronic Control of Hydropower Systems 4. Transmission and Distribution
Pre-requisite مخکینی ایرین مضامین	None
Related Courses اړونده مضامین	Electrical Machines and Drives and Fluid Mechanics
Teaching and Learning methods د تدریس میتود	Lectures, tutorials, and assignments
Computer Knowledge د کمپیوتر زده کړی ته اړتیا	Moderate computer knowledge such as MS Word, MS Excel, MS PowerPoint, and CAD.
Course Materials and References د مضمون درسي مواد او اخلیکونه	<u>Text Books:</u> <u>درسي کتاب</u> <ul style="list-style-type: none"> • Bikash Pandey and Ajoy Karki. HYDROELECTRIC ENERGY, Renewable Energy and the Environment, CRC Press
	<u>Reference:</u> <u>اخلیکونه</u> <ul style="list-style-type: none"> • Bryan Leyland. Small Hydroelectric Engineering Practice 1st Edition, ISBN-13: 978-1138000988, ISBN-10: 1138000981 • K N Sharma & M Dandekar. Water Power Engineering, Second Edition, ISBN 9789325968981 • Subahash Chander Mittal. Hydropower for common understanding,

Evaluation activities and Grades د ارزوني فعاليتونه او نمري								
Activity فعاليت	Scope هدف	Marks نمري						
Attendance and class contribution حاضري او په درس كې برخه اخستل	Attending class, contributions to knowledge and relationships with the group.	5						
Assignments كورني دنده	Solving the indicated problems from the problem list and submitting on time.	5						
Laboratory and field trip reports د لابراتوار/ ساحي راپورونه	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion and implication.	15						
Quizzes صنفي ارزوني	Quizzes include teaching materials and assignments from two previous classes.	5						
Midterm exam منځني ازموينه	The midterm exam includes the covered topics.	20						
Final exam وروستي ازموينه	The final exam includes the covered topics after the midterm exam.	50						
	Total Course Marks د كورس مجموعي نمري	100						
Relationship of this Course to Program Learning Outcome د مضمون اړيکه د ځانګي له کليدي بنوونيزو موخو سره								
No.	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7
		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team
1	To describe the water flow through a power station	1	2	2	2	2	2	3
2	To perform theoretical calculations on hydropower dams and spillway discharge,	3	3	3	3	3	3	3
3	To analyze and perform calculations on hydraulic	3	3	3	3	3	3	3

	parameters for different turbine concepts and hydraulic transients occurring in the waterways							
4	To describe the principles of the electrical components and perform calculations of the parameters of the electrical system,	2	2	2	2	2	2	2
5	To explain voltage and turbine regulation and how these affect the electrical grid and the mechanical system with turbine and generator,	2	2	2	2	2	2	2
6	To discuss the environmental effects of hydropower installations,	2	2	2	2	3	3	3
7	To work together in a project related to the course contents.	3	3	3	3	3	2	2
Total		2.3	2.4	2.0	2.4	2.6	2.6	2.7
Average		2.4						
1= Some relation 2= Moderate relation 3=Extensive relation								

En. Ene 0624 Thermal Power Plant

Item موضوع	Description توضیحات		
Title عنوان یا مضمون	En. Ene 0624 Thermal Power Plant		
Credits and no. of hour د کريدتونو او درسي ساعتونو شمېر	Total ټوليزه	Theoretic نظري	Practical عملي
	3	2	1
Offering year and semester د تدريس کال او سمسټر	Third Year -Second Semester		
Aim موخي	This course introduces the concept of power plants and analysis steam power plants, fuels and combustion, diesel power plant, Gas turbine power plant, nuclear power plant, Hydro-electric power plant and their related electrical systems.		
Key Learning Outcomes کلیدي بنوونيز نتيجه	Key learning outcomes of this course should be as follows: <ul style="list-style-type: none"> • Use of Thermodynamics knowledge to analyze and solve problem related to power plants. • Understand the various types of power plants and the appropriate energy resources for them. • Students learn energy planning and will be able to analyze and design the selected power plants. 		

Academic Staff Responsible د تدریس مسنول استاد	Engineer
Syllabus مفردات	<p>I. <u>FUNDAMENTAL OF POWER PLANT</u></p> <ol style="list-style-type: none"> 1. Introduction 2. Concept of Power Plants 3. Classification of Power Plants 4. Energy 5. Types of Energy 6. Power 7. Resources for Power Generation 8. Present Power Position in Afghanistan 9. Future Planning for Power Generation 10. Review of Thermodynamics Cycles Related to Power Plants 11. Classification of Power Plant Cycle 12. Fuels and Combustion 13. Steam Generators 14. Steam Prime Movers 15. Steam Condensers 16. Water (Hydraulic) Turbines <p>II. <u>POWER PLANT ECONOMICS AND VARIABLE LOAD PROBLEM</u></p> <ol style="list-style-type: none"> 1. Terms and Factors 2. Factor Effecting Power Plant Design 3. Effect of Power Plant Type on Costs 4. Effect of Plant Type on Rates (Tariffs or Energy Element) 5. Effect of Plant Type on Fixed Elements 6. Effect of Plant Type on Customer Elements 7. Investor's Profit 8. Economics in Plant Selection 9. Economic of Power Generation 10. Industrial Production and Power Generational Compared 11. Load Curves 12. Ideal and Realized Load Curves 13. Effect of Variable Load on Power Plan Design 14. Effect of Variable Load on Power Plant Operation <p>III. <u>STEAM POWER PLANT</u></p> <ol style="list-style-type: none"> 1. Introduction 2. Essentials of Steam Power Plant Equipment 3. Coal Handling 4. Fuel Burning Furnaces 5. Method of Fuel Firing 6. Automatic Boiler Control 7. Pulverized Coal 8. Pulverized Coal Firing 9. Pulverized Coal Burners

-
10. Water Walls
 11. Ash Disposal
 12. Smoke and Dust Removal
 13. Types of Dust Collectors

IV. STEAM GENERATOR

1. Introduction
2. Types of Boilers
3. Cochran Boilers
4. Lancashire Boiler
5. Locomotive Boiler
6. Babcock Wilcox Boiler
7. Industrial Boilers
8. Merits and Demerits of Water Tube Boilers over Fire Tube Boilers
9. Requirements of a Good Boiler
10. High Pressure Boilers

V. STEAM TURBINE

1. Principle of Operation of Steam Turbine
2. Classification of Steam Turbine
3. The Simple Impulse Turbine
4. Compounding of Impulse Turbine
5. Pressure Compounded Impulse Turbine
6. Simple Velocity-Compounded Impulse Turbine
7. Pressure and Velocity Compounded Impulse Turbine
8. Impulse-Reaction Turbine
9. Advantages of Steam Turbine over Steam Engine
10. Steam Turbine Capacity
11. Capability
12. Steam Turbine Governing
13. Steam Turbine Performance
14. Steam Turbine Testing
15. Choice of Steam Turbine
16. Steam Turbine Generators
17. Steam Turbine Specifications

VI. FUELS AND COMBUSTION

1. Introduction
2. Coal
3. Coal Analysis
4. Coal Firing
5. Mechanical Stokers
6. Pulverized-Coal Firing
7. Cyclone Furnaces

VII. DIESEL POWER PLANT

1. Introduction
2. Operating Principle
3. Basic Types of IC Engines

	<ol style="list-style-type: none"> 4. Advantage of Diesel Power Plant 5. Disadvantage of Diesel Power Plant 6. Application of Diesel Power Plant 7. General Layout of Diesel Power Plant 8. Performance of Diesel Engine 9. Fuel System of Diesel Power Plant 10. Lubrication System of Diesel Power Plant 11. Air Intakes and Admission System of Diesel Power Plant 12. Supercharging System of Diesel Power Plant 13. Exhaust System of Diesel Power Plant 14. Cooling System of Diesel Power Plant 15. Diesel Plant Operation 16. Efficiency of Diesel Power Plant 17. Heat Balance Sheet <p>VIII. <u>GAS TURBINE POWER PLANT</u></p> <ol style="list-style-type: none"> 1. Introduction 2. Classification of Gas Turbine Power Plant 3. Elements of Gas Turbine Power Plants 4. Regeneration and Reheating 5. Cogeneration 6. Auxiliary Systems 7. Control of Gas Turbines 8. Gas Turbine Efficiency 9. Operations and Maintenance Performance 10. Troubleshooting and Remedies 11. Combined Cycle Power Plants 12. Applications of Gas Turbine 13. Advantages of Gas Turbine Power Plant 14. Disadvantages of Gas Turbine Power Plant <p>IX. <u>Nuclear Power Plant</u></p> <ol style="list-style-type: none"> 1. Introduction 2. General History and Trend 3. The Atomic Structure 4. Summary of Nuclear Energy Concepts and Terms 5. Ethical Problems in Nuclear Power Regulation 6. Chemical and Nuclear Equations 7. Nuclear Fusion and Fission 8. Energy From Fission and Fuel Burn Up 9. Radioactivity 10. Nuclear Reactor 11. Conservation Ratio 12. Neutron Flux 13. Classification of Reactors 14. Cost of Nuclear Power Plant 15. Nuclear Power Station in India 16. Light Water Reactor (LWR) and Heavy Water Reactor (HWR) 17. Site Selection 18. Comparison of Nuclear Power Plant and Steam Power Plant
--	---

	19. Multiplication Factor 20. Uranium Enrichment 21. Reactor Power Control 22. Nuclear Power Plant Economics 23. Safety Measures for Nuclear Power Plants 24. Site Selection and Commissioning Procedure 25. Major Nuclear Power Disasters 26. Chernobyl Nuclear Power Plant 27. Safety Problems in Chernobyl Reactor Design 28. Other, Earlier, Soviet Nuclear Accidents	
Pre-requisite مخکینی ایرین مضامین	Thermodynamics-I & II Heat Transfer	
Related Courses ایرونده مضامین	Physics-II, Engineering Mechanics: Statics	
Teaching and Learning methods د تدریس میتود	Lectures, tutorials and assignments	
Computer Knowledge د کمپیوتر زده کری ته اړتیا	Moderate Computer Knowledge such as, using MS Word, MS Excel, MS PowerPoint and CAD,	
Course Materials and References د مضمون درسی مواد او اخلیکونه	<u>Text Books:</u> <u>درسی کتاب</u> <ul style="list-style-type: none"> Raja. A.k. Srivastava A.P. and Dwivedi M. (2006). <i>Power Plant Engineering</i>. New Age International (P) Ltd., Publishers 	
	<u>Reference:</u> <u>اخلیکونه</u> <ul style="list-style-type: none"> DIPAK K. SARKAR, (2015). THERMAL POWER PLANT (Design and Operation), Elsevier Inc. All rights reserved. Nag, P. K. (2008). Power Plant Engineering (3rd Edition). Tata McGraw Hill 	
Evaluation activities and Grads د ارزونی فعالیتونه او نمری		
Activity فعالیت	Scope هدف	Marks نمری
7. Attendance and class contribution حاضری او په درس کی برخه اخستل	Attending the class, contribution to the knowledge and relationship with the group.	5
8. Assignments کورنی دنده	Solving the indicated problems from the problem list and submitting on time.	5
9. Laboratory and field trip reports د لابراتوار/ ساحی راپورونه	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion and implication.	15
10. Quizzes صنفی ارزونی	The quiz includes teaching materials and assignments	5

		from two previous classes.						
11. Midterm exam منحنی آزمونه	The midterm exam includes the covered topics		20					
12. Final exam وروستی آزمونه	The exam includes the covered topics after the midterm exam		50					
	Total Course Marks د کورس مجموعي نمري		100					
Relationship of this Course to Program Learning Outcome د مضمون اړیکه د څانګې له کلیدي بشوونیزو موخو سره								
No.	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7
		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team
1	Use of thermodynamics knowledge to analyze and solve problem related to power plants.	2	2	2	2	2	2	2
2	Understand the various types of power plants and the appropriate energy resources for them.	3	3	3	3	3	3	3
	Analyze and design of the mentioned powerplant	3	3	3	3	3	3	3
3	Learn energy planning for the mentioned power plants.	3	3	3	3	3	3	3
Total		2.75	2.75	2.75	2.75	2.75	2.75	2.75
Average		2.75						
1= Some relation 2= Moderate relation 3= Extensive relation								

En. Ene 0727 Electrical Systems of Buildings

Item موضوع	Description توضیحات		
Title عنوان یا مضمون	En. Ene 0727 Electrical Systems of Buildings		
Credits and no. of hour د کريدتونو او درسي ساعتونو شمير	Total ټوليزه	Theoretic نظري	Practical عملي
	3	2	1
Offering year and semester د تدريس کال او سمستر	Fourth year - First semester		
Aim موخي	Upon completing this course, students will be able to (i) understand lighting and daylighting in buildings (ii) understand electrical circuits and its components (iii) Analyze and design of electrical protection systems in buildings (iv) Analyze and design of electrical systems in residential buildings (v) analyze and design of electrical systems in commercial buildings (vi) Draw electrical maps of buildings using electrical Auto CAD and create final bidding documents for the electrical systems of buildings. This course will also help students develop important problem-solving and critical thinking skills that will be broadly applicable throughout their lives and careers.		
Key Learning Outcomes کلیدي ښوونیز نتایج	Key learning outcomes of this course follow: <ul style="list-style-type: none"> • Explain basics of electrical systems of buildings and understand its importance. • Understand lighting and daylighting in buildings • Understand electrical circuits and its components • Analyze and design of electrical protection systems in buildings • Analyze and design of electrical systems in residential buildings • Analyze and design of electrical systems in commercial buildings • Draw electrical maps of buildings using electrical Auto CAD and create final bidding documents for the electrical systems of buildings. 		
Academic Staff Responsible د تدريس مسنول استاد			
Syllabus مفردات	<p>I. <u>INTRODUCTION</u></p> <ol style="list-style-type: none"> 1. Introduction 2. Overview of Building Electrical Distribution Systems 3. General Design Approach <p>II. <u>LIGHTING AND DAYLIGHTING OF BUILDINGS</u></p> <ol style="list-style-type: none"> 1. A Chronicle of Artificial Lighting 2. Elements of Seeing 		

-
3. Light
 4. The Color of Light
 5. Characteristics of Artificial Lighting
 6. Types of Artificial Light Sources
 7. Forms of Architectural Lighting
 8. Lighting Installations
 9. Light Distribution and Glare
 10. Illuminance and Luminance
 11. Principles of Lighting Design
 12. Lighting Design Practices and Considerations
 13. Lighting System Controls
 14. Daylighting Principles

III. OVERVIEW OF ELECTRICAL CIRCUITS AND COMPONENTS

1. Introduction
2. Review of DC and AC Circuits
3. Multiphase AC Systems
4. Power Factor Correction
5. Building Electrical Service Equipment
6. Overcurrent Protection: Fuses and Circuit Breakers
7. Utilization Equipment and Devices
8. Conductors
9. Enclosures and Raceways
10. Electric Motors

IV. PROTECTION SYSTEMS

1. Introduction
2. Impact of Electricity on Humans
3. Basic Operation of Protection Devices
4. Types of Protection Devices
5. Grounding and Bonding

V. BRANCH CIRCUITS AND FEEDERS

1. Introduction
2. Size and Rating of Conductors
3. Design of Conductors
4. Selection of Conduits
5. Branch Circuits and Feeders for Non-motor Loads
6. Branch Circuits and Feeders for Motors

VI. ELECTRICAL SYSTEMS FOR RESIDENTIAL BUILDINGS

1. Introduction
2. General Design Approach
3. Main Service Entrance Design
4. Branch Circuits for Residential Buildings
5. General Design Procedure
6. Electrical Systems for Apartment Buildings

	<p>VII. <u>ELECTRICAL SYSTEMS FOR COMMERCIAL BUILDINGS</u></p> <ol style="list-style-type: none"> 1. Introduction 2. Short-Circuit Currents 3. Lighting and Power Panels 4. Motor Control Centers Design 5. Switchboards and Unit Substations 6. Emergency Systems <p>VIII. <u>DRAWING OF ELECTRICAL MAPS USING AUTOCAD</u></p> <ol style="list-style-type: none"> 1. Drawing of Electrical Maps for Residential Buildings 2. Drawing of Electrical Maps for Commercial Buildings 	
Pre-requisite مخکینی ارین مضامین	Engineering Circuits Analysis	
Related Courses ارونده مضامین	Engineering Physics III, Engineering Circuits Analysis	
Teaching and Learning methods د تدریس میتود	Lectures, tutorials, and assignments	
Computer Knowledge د کمپیوتر زده کری ته ارتیا	Moderate computer knowledge such as MS Word, MS Excel, MS PowerPoint, and CAD.	
Course Materials and References د مضمون درسی مواد او اخلیکونه	<p><u>Text Books:</u></p> <p><u>درسی کتاب</u></p> <ul style="list-style-type: none"> • Moncef Krarti, Energy Efficient Electrical Systems for Buildings. CRC Press, 2017. ISBN 13: 978-1-4822-5833-2 	
	<p><u>Reference:</u></p> <p><u>اخلیکونه</u></p> <ul style="list-style-type: none"> • Joseph B. Wujek, Frank R. Dagostino, Mechanical and Electrical Systems in Architecture, Engineering, and Construction, 5th Edition, Prentice Hall, 2010, ISBN 13: 978-0-13-500004-5. • Rechar R. Janis, William K.Y. Tao, Mechanical and Electrical Systems in Buildings, 4th Edition, Prentice Hall, 2008. 	
<p>Evaluation activities and Grades</p> <p>د ارزونی فعالیتونه او نمري</p>		
Activity فعالیت	Scope هدف	Marks نمري
Attendance and class contribution حاضري او په درس کي برخه اخستل	Attending class, contributions to knowledge and relationships with the group.	5
Assignments کورني دنده	Solving the indicated problems from the problem list and submitting on time.	5

Laboratory and field trip reports د لابراتوار/ ساحي راپورونه	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion and implication.	15						
Quizzes صنفي ارزوني	Quizzes include teaching materials and assignments from two previous classes.	5						
Midterm exam منځني ازموينه	The midterm exam includes the covered topics.	20						
Final exam وروستي ازموينه	The final exam includes the covered topics after the midterm exam.	50						
	Total Course Marks د کورس مجموعي نمري	100						
Relationship of this Course to Program Learning Outcome د مضمون اړيکه د ځانګي له کليدي بنوونيزو موخو سره								
No.	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7
		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team
1	Understand lighting and daylighting in buildings.	1	1	1	2	3	2	2
2	Understand lighting and daylighting in buildings	2	2	2	2	3	2	2
3	Understand electrical circuits and its components	2	2	2	2	3	2	2
4	Analyze and design of electrical protection systems in buildings	3	3	3	2	3	2	3
5	Analyze and design of electrical systems in residential buildings	3	3	3	2	3	2	3
6	Analyze and design of electrical systems in commercial buildings	3	3	3	2	3	2	3
7	Draw electrical maps of buildings using electrical Auto CAD and create final bidding documents for the	3	3	3	3	3	2	3

	electrical systems of buildings.							
Total		2.4	2.4	2.4	2.1	3.0	2.0	2.6
Average		2.4						
1= Some relation		2= Moderate relation			3= Extensive relation			

En. Ene 0728 Energy Efficiency

Item موضوع	Description توضیحات		
Title عنوان یا مضمون	En. Ene 0728 Energy Efficiency		
Credits and no. of hour د کړېدونو او درسي ساعتونو شمیر	Total ټوليزه	Theoretic نظري	Practical عملي
	3	2	1
Offering year and semester د تدريس کال او سمسټر	Fourth year - First semester		
Aim موخي	This course presents simplified analysis methods to evaluate energy conservation opportunities in buildings, industries and transport.		
Key Learning Outcomes کلیدي ښوونيز نتایج	<p>By the successful completion of this course, students will be able to:</p> <ul style="list-style-type: none"> Understand the procedure of building energy audits. Understand and applying different energy conservation measures. Evaluate energy conservation measure from the economic point of view. Learn the usage of energy analysis tools. Understand energy efficient electrical systems. Understand and apply methods for estimating energy savings. Evaluate different energy conservation measures by retrofitting building envelope, secondary HVAC system, lighting and other electrical equipment. Manage energy and understand control systems Understand cogeneration benefits Analyze energy conservations by heat recovery Analyze energy conservation by water management in buildings. Understand the integration of energy efficiency with renewable generation Conduct energy audit of industries Conduct energy audit of urban transportation 		
Academic Staff Responsible د تدريس مسؤل استاد			

<p>Syllabus مفردات</p>	<p>I. <u>INTRODUCTION TO ENERGY AUDIT</u></p> <ol style="list-style-type: none"> 1. Introduction 2. Types of Energy Audits 3. General Procedure for a Detailed Energy Audit 4. Common Energy Conservation Measures 5. Case Study 6. Verification Methods of Energy Savings <p>II. <u>ENERGY SOURCES AND UTILITY RATE STRUCTURES</u></p> <ol style="list-style-type: none"> 1. Introduction 2. Energy Resources 3. Electricity Rates 4. Natural Gas Rates 5. Utility Rates for Other Energy Sources <p>III. <u>ECONOMIC ANALYSIS</u></p> <ol style="list-style-type: none"> 1. Introduction 2. Basic Concepts 3. Inflation Rate 4. Compounding Factors 5. Economic Evaluation Methods among Alternatives 6. Life-Cycle Cost Analysis Method 7. General Procedure for an Economic Evaluation 8. Financing Options <p>IV. <u>ENERGY ANALYSIS TOOLS</u></p> <ol style="list-style-type: none"> 1. Introduction 2. Ratio-Based Methods 3. Inverse Modeling Methods 4. Forward Modeling Methods <p>V. <u>ELECTRICAL SYSTEMS</u></p> <ol style="list-style-type: none"> 1. Introduction 2. Electrical Motors 3. Lighting Systems 4. Electrical Appliances 5. Energy Efficient Electrical Equipment 6. Electrical Distribution Systems 7. Power Quality <p>VI. <u>BUILDING ENVELOPE RETROFIT</u></p> <ol style="list-style-type: none"> 1. Introduction 2. Basic Heat Transfer Concepts 3. Simplified Calculation Tools for Building Envelope Audit 4. Selected Retrofits for Building Envelope <p>VII. <u>SECONDARY HVAC SYSTEMS RETROFIT</u></p> <ol style="list-style-type: none"> 1. Introduction 2. Types of Secondary HVAC Systems
----------------------------	--

	<ol style="list-style-type: none"> 3. Ventilation Systems 4. Ventilation of Parking Garages 5. Indoor Temperature Controls 6. Upgrade of Fan Systems 7. Common HVAC Retro-t Measures <p>VIII. <u>ENERGY CONSERVATION MEASURE IN HEATING EQUIPMENT</u></p> <ol style="list-style-type: none"> 1. Introduction 2. Basic Combustion Principles 3. Boiler Efficiency Improvements <p>IX. <u>ENERGY CONSERVATION MEASURE IN COOLING EQUIPMENT</u></p> <ol style="list-style-type: none"> 1. Introduction 2. Chiller Replacement 3. Chiller Control Improvement 4. Alternative Cooling Systems <p>X. <u>ENERGY MANAGEMENT CONTROL SYSTEMS</u></p> <ol style="list-style-type: none"> 1. Introduction 2. Basic Control Principles 3. Energy Management Systems 4. Control Applications <p>XI. <u>COMPRESSED AIR SYSTEMS</u></p> <ol style="list-style-type: none"> 1. Introduction 2. Review of Basic Concepts 3. Common Energy Conservation Measures for Compressed Air Systems <p>XII. <u>THERMAL ENERGY STORAGE SYSTEMS</u></p> <ol style="list-style-type: none"> 1. Introduction 2. Types of TES Systems 3. Principles of TES Systems 4. Charging/Discharging of TES systems 5. TES Control Strategies 6. Measures for Reducing Operating Costs <p>XIII. <u>POWER GENERATION AND COGENERATION SYSTEMS</u></p> <ol style="list-style-type: none"> 1. Introduction 2. Benefits of Cogeneration 3. History of Cogeneration 4. Types of Fuel-Based Generation Systems 5. Evaluation of Cogeneration Systems 6. Case Study <p>XIV. <u>HEAT RECOVERY SYSTEMS</u></p> <ol style="list-style-type: none"> 1. Introduction
--	---

	<ol style="list-style-type: none"> 2. Types of Heat Recovery Systems 3. Performance of Heat Recovery Systems 4. Simplified Analysis Methods
	<p>XV. <u>WATER MANAGEMENT</u></p> <ol style="list-style-type: none"> 1. Introduction 2. Indoor Water Management 3. Outdoor Water Management 4. Swimming Pools
	<p>XVI. <u>METHODS FOR ESTIMATING ENERGY SAVINGS</u></p> <ol style="list-style-type: none"> 1. Introduction 2. General Procedure 3. Energy Savings Estimation Models 4. Applications 5. Uncertainty Analysis
	<p>XVII. <u>OPTIMAL INTEGRATION OF ENERGY EFFICIENCY WITH RENEWABLE GENERATION</u></p> <ol style="list-style-type: none"> 1. Introduction 2. Optimization Approaches 3. Near-Optimal Analysis Methodology 4. Case Study 1: Optimal Retrofit and Design of Homes 5. Case Study 2: Design of Optimal Hybrid Systems
	<p>XVIII. <u>CASE STUDIES</u></p> <ol style="list-style-type: none"> 1. Reporting Guidelines 2. Case Study 1: Walk-rough Audit of a Residence 3. Case Study 2: Standard Audit of a Residence 4. Case Study 3: Audit of a Museum
	<p>XIX. <u>MANAGING ENERGY EFFICIENCY IN INDUSTRY</u></p> <ol style="list-style-type: none"> 1. Introduction 2. Energy Management in Industry 3. Considering the Complexity of a System 4. Transition in Organizations 5. Transactional Analysis in Relation to Energy Management 6. Establishing Energy Management Within an Organization 7. Energy Management: The Need to Lead While Delegating Leadership 8. Delegating Authority and Taking Risk 9. The Adoption of an Energy Strategy 10. To Concretize: Success Factors for In-House Energy Management
	<p>XX. <u>ENERGY EFFICIENT URBAN TRANSPORT</u></p> <ol style="list-style-type: none"> 1. Introduction 2. Barriers to Urban Transport System Efficiency 3. Government Policy Role to Remove Barriers

Pre-requisite مخکینی ایرین مضامین	None	
Related Courses اړونده مضامین	Solar Energy, Heat Transfer and HVAC	
Teaching and Learning methods د تدریس میتود	Lectures, tutorials, and assignments	
Computer Knowledge د کمپیوتر زده کړې ته اړتیا	Moderate computer knowledge such as MS Word, MS Excel, MS PowerPoint, CAD and eQUEST	
Course Materials and References د مضمون درسي مواد او اخليکونه	<u>Text Books:</u> <u>درسي کتاب</u>	
	<ul style="list-style-type: none"> Krarti.Moncef (2011). Energy Audit of Building Systems, an Engineering Approach (2nd Edition). CRC Press. 	
	<u>Reference:</u> <u>اخليکونه</u>	
	<ul style="list-style-type: none"> Moncef Krarti, Energy Efficient Electrical Systems for Buildings. CRC Press, 2017. ISBN 13: 978-1-4822-5833-2 Patrik Thollander, Jenny Palm, Improving Energy Efficiency in Industrial Energy Systems, (2013), Springer ISBN 978-1-4471-4161-7 Ming Yang , Xin Yu, Energy Efficiency, (2015), Springer, ISBN 978-1-4471-6665-8 Penni McLean-Conner, Energy Efficiency: Principles and Practices, (2009), PennWell. 	
Evaluation activities and Grades د ارزونې فعالیتونه او نمرې		
Activity فعالیت	Scope هدف	Marks نمرې
Attendance and class contribution حاضري او په درس کې برخه اخستل	Attending class, contributions to knowledge and relationships with the group.	5
Assignments کورني دنده	Solving the indicated problems from the problem list and submitting on time.	5
Laboratory and field trip reports د لابراتوار/ ساحي راپورونه	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion and implication.	15
Quizzes صنفي ارزونې	Quizzes includes teaching materials and assignments from two previous classes.	5
Midterm exam منځني ازمويڼه	The midterm exam includes the covered topics.	20
Final exam وروستي ازمويڼه	The final exam includes the covered topics after the midterm exam.	50
	Total Course Marks د کورس مجموعي نمرې	100

Relationship of this Course to Program Learning Outcome								
د مضمون اړیکه د ځانګې له کلیدي بشوونیزو موخو سره								
No.	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7
		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team
1	Understand the procedure of building energy audits.	1	1	1	2	3	2	2
2	Understand and applying different energy conservation measures.	3	2	2	2	3	2	2
3	Evaluate energy conservation measure from the economic point of view.	3	3	3	3	3	2	2
4	Learn the usage of energy analysis tools.	2	3	3	3	3	2	3
5	Understand energy efficient electrical systems.	3	3	3	2	3	2	3
6	Understand and apply methods for estimating energy savings.	3	3	3	3	3	2	3
7	Evaluate different energy conservation measures by retrofitting building envelope, secondary HVAC system, lighting and other electrical equipment.	3	3	3	3	3	2	3
8	Manage energy and understand control systems	3	3	3	3	3	3	3
9	Understand cogeneration benefits	3	2	2	2	2	2	3
10	Analyze energy conservations by heat recovery	3	3	3	3	3	2	3
11	Analyze energy conservation by water management in buildings.	3	3	3	3	3	2	3
12	Understand the integration of energy efficiency with renewable generation	3	3	3	3	3	2	3
13	Conduct energy audit of industries	3	3	3	3	3	3	3
14	Conduct energy audit of urban transportation	3	3	3	3	3	3	3
Total		2.8	2.7	2.7	2.7	2.9	2.2	2.8
Average		2.7						
1= Some relation		2= Moderate relation			3= Extensive relation			

En. Ene 0729 Wind Energy Engineering

Item موضوع	Description توضیحات		
Title عنوان یا مضمون	En. Ene 0729 Wind Energy Engineering		
Credits and no. of hour د کړېدونو او درسي ساعتونو شمير	Total ټوليزه	Theoretic نظري	Practical عملي
	3	2	1
Offering year and semester د تدريس کال او سمسټر	Fourth year-First semester		
Aim موخي	The objectives of the proposed course is to provide a broad understanding of the wind energy industry from component design and manufacturing, electric generation, transmission, and grid operations.		
Key Learning Outcomes کلیدي ښوونيز نتايج	<p>Key learning outcomes of this course should be as follows:</p> <p>Able to understand various winds such as local and global winds.</p> <p>Able to understand variuous types of wind turbine aerodynamics</p> <p>Able to understand connecting the wind power to the grid</p> <p>Able to assess the wind power resources.</p> <p>Able to design wind power station</p>		
Academic Staff Responsible د تدريس مسئول استاد			
Syllabus مفردات	<p>I. <u>THE WIND RESOURCE</u></p> <ol style="list-style-type: none"> 1. Introduction 2. Types of Wind 3. Wind Profiling 4. Turbulence 5. Hill and Tunnel Effect 6. Energy in The Wind 7. Energy Production 8. Energy and Power 9. Energy Pattern Factor 10. Siting <p>II. <u>THE WIND POWER PLANT</u></p> <ol style="list-style-type: none"> 1. Introduction 2. Wind Turbine Classes 3. Rotor 4. Nacelle 5. Tower 6. Electric Substation 7. Foundation <p>III. <u>WIND ENERGY CONVERSION</u></p> <ol style="list-style-type: none"> 1. Introduction 		

	<ol style="list-style-type: none"> 2. Rotation Principle 3. Forces on A Rotor Blade 4. Factors Affecting Performance of Rotor 5. Thrust and Torque on the Rotor 6. Power Curve 7. Lift Base VAWT
	<p>IV. <u>WIND TURBINE AERODYNAMICS</u></p> <ol style="list-style-type: none"> 1. Aerodynamic Power Regulation 2. Stall Controlled WPP 3. Pitch Controlled WPP 4. Active-stall Controlled WPP 5. Halting of WPP 6. Other Method of Aerodynamic Control
	<p>V. <u>WIND POWER CONTROL STRATEGIES</u></p> <ol style="list-style-type: none"> 1. Introduction 2. Power Control Classification 3. Integrated Aerodynamic and Electric Control Strategies 4. Power Electronic Converters 5. Constant Speed and Variable Speed WPPs 6. Back to Back PEC in WPP
	<p>VI. <u>QUALITY ISSUES OF WIND POWER</u></p> <ol style="list-style-type: none"> 1. Introduction 2. Wind Power Impacts 3. Local Impacts of Wind Power 4. System Wide Impacts of Wind Power 5. Wind Power Variability 6. Islanding 7. WPP Electrical Safety and Grid 8. WPP Inertia 9. Plant Load Factors 10. Capacity Credit
	<p>VII. <u>GRID INTERGRTION OF WIND POWER</u></p> <ol style="list-style-type: none"> 1. The Electrical Grid 2. Embedded Generation 3. WPP in the Electric Grid 4. Interface Issues 5. Operational Issues 6. Per Unit Calculation 7. Simulation of Grid Connected WPP
	<p>VIII. <u>WIND RESOURCE ASSESSMENTS TECHNOLOGIES</u></p> <ol style="list-style-type: none"> 1. Wind Resource Assessment 2. Wind Resource Assessment Sensors 3. Meteorological Mast

4. Data Logger
5. Wind Vane
6. Anemometer
7. Temperature Sensor
8. Barometric Pressure Sensor
9. Pyranometer
10. Relative Humidity Sensor
11. Modem
12. Area Required by WPP
13. Software Analytical Tools

IX. DESIGNE CONSIDERATION OF WIND POWER PLANT

1. WPP Design Process
2. Generalized Rotor Design
3. Aerodynamic Regulation Choice
4. Blade Number
5. Blade Design
6. Blade Manufacture
7. Nacelle Design
8. Gearbox Choice
9. Disc Brake Selection
10. Electric Generator Choice
11. Electronic Controller Choice
12. Hydraulic and Lubrication System
13. Tower Design
14. Substation Design
15. Foundation Design
16. Key Equation for WPP Design Analysis
17. Specific Ratings of WPP

X. SMALL WIND TURBINES

1. Need of SWT
2. SWT Classification
3. VAWT and HAWT
4. Drag and Lift Based VAWTs
5. HAWT Features
6. Upwind and Downwind SWTs
7. SWT Components
8. Geared and Direct Drive HAWTs
9. Speed Regulation of SWTs
10. Off Grid and on Grid SWTs
11. Hybrid Wind Energy System
12. Hybrid Wind Diesel System
13. Consumer Labelling
14. Choice of SWT
15. SWT Siting
16. Maintenance Issues
17. Health Objection to SWT
18. SWT Industry Challenges

Pre-requisite مخکینی ایرین مضامین	None			
Related Courses ایرونده مضامین	Electrical Machines & Drives			
Teaching and Learning methods د تدریس میتود	Lectures, tutorials, and assignments			
Computer Knowledge د کمپیوتر زده کری ته اړتیا	Moderate computer knowledge such as MS Word, MS Excel, MS PowerPoint, and CAD.			
Course Materials and References د مضمون درسي مواد او اخلیکونه	<u>Text Books:</u> <u>درسي کتاب</u>			
	<ul style="list-style-type: none"> Earnest J. (2015). <i>Wind Power Technology</i> (2nd Edition). PHI Learning Private Limited. 			
	<u>Reference:</u> <u>اخلیکونه</u>			
	<ul style="list-style-type: none"> James F. Manwell, Jon G. McGowan, Anthony L. Rogers (2009). <i>Wind Energy Explained: Theory, Design and Application</i> (2nd Edition) Wiley. Hemami A. (2012). <i>Wind Turbine Technology</i>. Cengage Learning. Nelson V. (2009). <i>WIND ENERGY, Renewable Energy and the Environment</i>. CRC Press. 			
Evaluation activities and Grades د ارزوني فعالیتونه او نمرې				
Activity فعالیت	Scope هدف			Marks نمرې
Attendance and class contribution حاضري او په درس کي برخه اخستل	Attending class, contributions to knowledge and relationships with the group.			5
Assignments کورني دنده	Solving the indicated problems from the problem list and submitting on time.			5
Laboratory and field trip reports د لابراتوار/ ساحي راپورونه	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion and implication.			15
Quizzes صنفي ارزوني	Quizzes include teaching materials and assignments from two previous classes.			5
Midterm exam منځنی ازموینه	The midterm exam includes the covered topics.			20
Final exam وروستی ازموینه	The final exam includes the covered topics after the midterm exam.			50
	Total Course Marks د کورس مجموعي نمرې			100
Relationship of this Course to Program Learning Outcome د مضمون اړیکه د ځانگي له کلیدي بنوونیزو موخو سره				
Skills / knowledge مهارتونه / زده کړه	None هیڅ	Some یوڅه	Moderate متوسط	Extensive زیات

Apply mathematics, science and engineering				X				
Design/conduct experiments/analyze data				X				
Use modern tools and techniques				X				
Critical thinking and apply knowledge concurrence with other disciplines				X				
Understand professional and ethical responsibility				X				
Communicate effectively				X				
Ability to function in a group and in multi-disciplinary team				X				
Remarks ملاحظات								
No.	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7
		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team
1	Understand various winds such as local and global winds.	1	1	1	2	3	2	2
2	Understand various types of wind turbine aerodynamics	2	2	2	2	3	2	2
3	Understand connecting the wind power to the grid	2	2	2	2	3	2	2
4	Assess the wind power resources.	3	3	3	2	3	2	3
5	Design wind power station	3	3	3	2	3	2	3
Total		2.4	2.4	2.4	2.1	3.0	2.0	2.6
Average		2.4						
1= Some relation 2= Moderate relation 3= Extensive relation								

En. Ene 0730 Solar Photovoltaic

Item موضوع	Description توضیحات		
Title عنوان یا مضمون	En. Ene 0730 Solar Photovoltaic		
Credits and no. of hour د کربدتونو او درسي ساعتونو شمير	Total ټوليزه	Theoretic نظري	Practical عملي
	2	1	1
Offering year and semester د تدريس کال او سمستر	Fourth year - First semester		
Aim موخي	This course will explore and develop an understanding the electrical characteristics of PV energy sources, the variability of the solar resource, techniques to mitigate the variability of the electrical generation, requirements for interconnection to a smart-grid AC utility system, and the system-level electronic circuits and controls needed to perform the interconnection.		
Key Learning Outcomes کلیدي بنوونيز نتايج	<p>At the end of the course students should be able to:</p> <ul style="list-style-type: none"> • Understand PV markets and applications • Understand safety basics • Understand electricity basics • Understand solar energy fundamentals • Understand PV module fundamentals • Design PV systems • Design PV system mechanical parts • Understand performance analysis • Maintain and troubleshoot PV systems • Describe the grid-interconnection requirements for PV energy systems. 		
Academic Staff Responsible د تدريس مسئول استاد			
Syllabus مفردات	<p>I. <u>BACKGROUND</u></p> <ol style="list-style-type: none"> 1. Introduction to Electricity 2. Voltage 3. Current 4. Electric Power 5. Electrical Energy 6. DC Power and AC Power 7. Measurement of Electrical Quantities <p>II. <u>INTRODUCTION TO PV SYSTEM</u></p> <ol style="list-style-type: none"> 1. How Solar Cells are Better than any Conventional Sources of Electricity 		

	<ol style="list-style-type: none"> 2. What is a Solar Cell? 3. How Solar Cell Generates Electricity? 4. Parameters of Solar Cells 5. Solar Cell Technologies 6. Factor Affecting Electricity Generated by a Solar Cell <p>III. <u>SOLAR PV MODULE</u></p> <ol style="list-style-type: none"> 1. What is a Solar PV Module? 2. Ratings of PV Module 3. Standard PV Module Parameters 4. Factors Affecting Electricity Generated by a Solar PV Module 5. Measuring Module Parameters <p>IV. <u>SOLAR PV MODULE ARRAY</u></p> <ol style="list-style-type: none"> 1. Connection of Modules in Series 2. Connection of Modules Parallel Combination 3. Connection of Modules in Series and Parallel (Mixed Combination) <p>V. <u>BATTERIES</u></p> <ol style="list-style-type: none"> 1. Some Basics about Batteries 2. How Does a Battery Work? 3. Types of Battery 4. Parameters of Battery 5. Comparison of Various Rechargeable Batteries 6. How to Select a Battery? 7. Batteries for Photovoltaic (PV) Systems <p>VI. <u>APPLICATION OF BATTERIES IN SOLAR PV SYSTEM</u></p> <ol style="list-style-type: none"> 1. Why to Connect Batteries Together? 2. Estimating Number of Batteries Required in Series 3. Estimating Total Energy Stored in Series Connected Battery Array 4. Estimating Maximum Power form Series Connected Battery 5. Parallel Connection 6. Battery Bank Installation and Commissioning 7. Battery Capacity 8. Physical Maintenance <p>VII. <u>CHARGE CONTROLLER, MPPT AND INVERTERS</u></p> <ol style="list-style-type: none"> 1. Need for BOS 2. Power Converters and Their Efficiency 3. Ac to DC Converters 4. DC to AC Converters (Inverters) 5. DC to DC Power Converters 6. Charge Controllers 7. Maximum Power Point Tracking (MPPT)
--	---

	<p>VIII. <u>SOLAR PV SYSTEM DESIGN</u></p> <ol style="list-style-type: none"> 1. Types of Solar PV Systems 2. Design Methodology for SPV System <p>IX. <u>GRID-CONNECTED SOLAR PV POWER SYSTEMS</u></p> <ol style="list-style-type: none"> 1. Introduction to Grid-connected PV Systems 2. Configuration of Grid-connected Solar PV Systems 3. Components of Grid-connected Solar PV Systems 4. Grid-connected Solar PV Systems Design for small Power Application 5. Grid-connected Solar PV Systems Design for Power Plant <p>X. <u>MECHANICAL CONSIDERATIONS</u></p> <ol style="list-style-type: none"> 1. Important Properties of Materials 2. Establishing Mechanical System Requirements 3. Design and Installation Guidelines 4. Forces Acting on PV Arrays 5. Array Mounting System Design 6. Computing Mechanical Loads and Stresses 7. Standoff, Roof Mount Examples
Pre-requisite مخکینی ارین مضامین	None
Related Courses ارونده مضامین	Solar Energy Engineering and Engineering Circuit Analysis I
Teaching and Learning methods د تدریس میتود	Lectures, tutorials and assignments
Computer Knowledge د کمپیوتر زده کری ته ارتیا	Moderate Computer Knowledge such as, using MS Word, MS Excel, MS PowerPoint and CAD.
Course Materials and References د مضمون درسی مواد او اخلیکونه	<p><u>Text Books:</u></p> <p><u>درسی کتاب</u></p> <ul style="list-style-type: none"> • Konrad Mertens. (2018) PFundamentals, Technology and Practice. 2nd Edition. • Chetan Singh Solanki. (2013) Solar Photovoltaic Technology and system.
	<p><u>Reference:</u></p> <p><u>اخلیکونه</u></p> <ul style="list-style-type: none"> • Mike Holt's Illustrated Guide to Understanding NEC Requirements for Solar Photovoltaic Systems. (2014) • State Renewable Energy (2014). The Complete Guide to Understanding Solar Electricity. Kindle Edition. State Renewable Energy. • Michael Boxwell. (2018) Solar Electricity Handbook: A simple, practical guide to solar energy: designing and installing solar

	photovoltaic systems. Greenstream Publishing <ul style="list-style-type: none"> • Heinrich Häberlin. (2012). Photovoltaics: System Design and Practice. 1st Edition. Wiley • James P. Dunlop. (2012). Photovoltaic Systems, 3rd Edition • Amer Technical Pub 							
Evaluation activities and Grades د ارزوني فعاليتونه او نمري								
Activity فعاليت	Scope هدف	Marks نمري						
Attendance and class contribution حاضري او په درس كي برخه اخستل	Attending the class, contribution to the knowledge and relationship with the group.	5						
Assignments كورني دنده	Solving the indicated problems from the problem list and submitting on time.	5						
Laboratory and field trip reports د لابراتوار/ ساحي راپورونه	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion and implication.	15						
Quizzes صنفي ارزوني	The quiz includes teaching materials and assignments from two previous classes.	5						
Midterm exam منځني ازمويڼه	The midterm exam includes the covered topics	20						
Final exam وروستي ازمويڼه	The exam includes the covered topics after the midterm exam	50						
	Total Course Marks د كورس مجموعي نمري	100						
Relationship of this Course to Program Learning Outcome د مضمون اړيکه د ځانگي له کليدي بنوونيزو موخو سره								
No.	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7
		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team
1	To understand PV Markets and Applications	1	2	2	3	3	3	3

2	To understand Electricity Basics	1	2	2	2	3	2	3
3	To understand Solar Energy Fundamentals	2	2	3	2	3	3	3
4	To understand PV Module Fundamentals	2	2	3	2	3	3	3
5	To design the PV System	3	3	3	2	2	2	2
6	To understand Maintenance and Troubleshooting of PV system	3	3	3	3	2	2	3
7	To understand and describe the grid-connected solar PV systems.	3	3	3	3	3	3	3
8	To understand the Mechanical parts of PV System	2	2	2	2	2	3	2
9	To understand Safety Basics	2	2	2	2	3	3	3
Total		2.1	2.3	2.6	2.3	2.7	2.7	2.8
Average		2.5						
1= Some relation 2= Moderate relation 3=Extensive relation								

En. Ene 0833 Energy Policies And Politics

Item موضوع	Description توضیحات		
Title عنوان یا مضمون	En. Ene 0833 Energy Policies and Politics		
Credits and no. of hour د کربنتونو او درسي ساعتونو شمېر	Total ټوليزه	Theoretic نظري	Practical عملي
	3	3	0
Offering year and semester د تدريس کال او سمستر	Fourth Year-Second Semester		
Aim موخي	<p>Energy and politics are intrinsically interlinked. A country's ability to access energy supplies and the ways in which it uses energy crucially determine the state of its economy, its national security, and the quality and sustainability of its environment. The prevailing lifestyle and structure of global society today is that of "hydrocarbon man"-and the way hydrocarbon man produces goods, wages war, and even finds entertainment is dependent on regular access to fossil fuels. Moreover, for energy exporters and important energy transit states, energy supply policy is as much a part of the policy arsenal as other economic tools, military power, and diplomatic tactics. States are no more likely to refrain from using energy to promote their policy goals than to ignore economic or military means of doing so.</p>		
Key Learning Outcomes کلیدي بشوونيز نتيایج	<p>Energy Politics discusses the relationship between energy and international politics. It focuses on the politics of oil and natural gas since more than any other energy sources, their production, transport and supply are entwined in international politics. It reaches a number of major findings.</p> <ul style="list-style-type: none"> • Energy and politics are inseparable. Energy trends and international politics are innately interconnected and energy security is an integral part of the foreign and national security policies of states. • Energy use affects the structure of the international system itself: oil use creates an element of interdependency in the international system. Since oil is a global commodity, each country's demand affects the price and supply availability of oil for all consumers. • Tight oil market conditions lead to increased internationalization of domestic political developments in oil producers and key transit states. Under tight conditions in the world oil markets, local political instability in an oil exporter or major transit state can have international reverberations. • Energy creates an additional link between the domestic and foreign policies of states. The impact of hydrocarbon use on climate change, energy prices, and concerns about energy supply availability have made a state's domestic energy consumption 		

	habits and policies a matter of international political interest and concern.
Academic Staff Responsible د تدریس مسنول استاد	Teaching Asst. Wais
Syllabus مفردات	<p>I. ENERGY AND REGIME TYPE</p> <p>II. FOREIGN POLICY</p> <p>III. PIPELINE TRENDS AND INTERNATIONAL POLITICS</p> <p>IV. CONFLICT</p> <p>V. SECURITY</p> <p>CLIMATE CHANGE</p> <p>VI. RUSSIA</p> <p>VII. EUROPE</p> <p>VIII. THE UNITED STATES</p> <p>IX. CHINA</p> <p>X. IRAN</p> <p>XI. SAUDI ARABIA</p> <p>XII. CONCLUSION</p>
Pre-requisite مخکینی اړین مضامین	None
Related Courses اړونده مضامین	Climate Change, Management, Foreign Policy
Teaching and Learning methods د تدریس میتود	Lectures, tutorials and assignments
Computer Knowledge د کمپیوتر زده کړې ته اړتیا	Moderate Computer Knowledge such as, using MS Word, MS Excel, MS PowerPoint and CAD,
Course Materials and References د مضمون درسي مواد او اخلیکونه	<u>Text Books:</u> <u>درسي کتاب</u> <ul style="list-style-type: none"> S. Brenda, Energy Politics, 2009. University of Pennsylvania Press
	<u>Reference:</u> <u>اخلیکونه</u> <ul style="list-style-type: none"> H. Llewelyn, Y. L. Phillip, 2013. The Politics of Energy.

Evaluation activities and Grads د ارزوني فعاليتونه او نمري								
Activity فعاليت	Scope هدف	Marks نمري						
13. Attendance and class contribution حاضري او په درس كې برخه اخستل	Attending the class, contribution to the knowledge and relationship with the group.	5						
14. Assignments كورني دنده	Solving the indicated problems from the problem list and submitting on time.	10						
15. Laboratory and field trip reports د لابراتوار/ ساحي راپورونه	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion and implication.	0						
16. Quizzes صنفي ارزوني	The quiz includes teaching materials and assignments from two previous classes.	10						
17. Midterm exam منځني ازموينه	The midterm exam includes the first and the second part.	20						
18. Final exam وروستي ازموينه	The exam includes from Part 3 to Part 5.	55						
Total Course Marks د كورس مجموعي نمري		100						
Relationship of this Course to Program Learning Outcome د مضمون اړيکه د څانگې له كليدي بشونيزو موخو سره								
No.	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7
		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team
1	Understanding the Energy trends and international politics are innately interconnected and energy security is an integral part of the foreign and national security policies of states	1	1	1	2	1	2	1

2	Able to use Energy effects on the structure of the international system itself	1	2	1	2	2	2	1
3	Develop Linkage between energy, economy, environment and climate change	2	1	3	1	2	2	2
4	Understanding Major energy producers and consumers	1	2	1	2	1	2	2
5	Developing how energy has become a source of conflict	1	1	2	1	3	1	2
Total		1.2	1.4	1.6	1.6	1.8	1.8	1.6
Average		1.6						
1= Some relation 2= Moderate relation 3=Extensive relation								

Item موضوع	Description توضیحات		
Title عنوان یا مضمون	En. Ene 0835 Engineering Management		
Credits and no. of hour د کربدتونو او درسي ساعتونو شمير	Total توليزه	Theoretic نظري	Practical عملي
	3	3	0
Offering year and semester د تدريس کال او سمسټر	Fourth year - Second semester		
Aim موخي	Provide comprehensive information about construction industry, construction business, construction management, and professional affiliations.		
Key Learning Outcomes کلیدي بنوونيز نټايچ	<p>Key learning outcomes of this course follow:</p> <ul style="list-style-type: none"> • Know the history of the construction industry • Review the basics, including industry sectors, project players, and professional affiliations. • Construction management importance in the industries. • Well-known societies of construction management. • Find out what it takes to be an effective and efficient project manager. • Understand the complete process of project life cycle. • Learn how to estimate project costs, administer contracts and job site management. • Ability to measure performance, monitor safety, and control quality. • Planning and control. • TQM (total quality management QA/QC) • Identify, evaluate, and manage project risks. • How to set up an organization. • How to start construction business. 		
Academic Staff Responsible د تدريس مسنول استاد			
Syllabus مفردات	<p>I. <u>THE CONSTRUCTION INDUSTRY</u></p> <ol style="list-style-type: none"> 1. The Construction Industry 2. “It’s Just Construction” 3. Industry Sectors 4. The Project Players 5. The Industry Image 6. Career Opportunities <p>II. <u>WHAT IS CONSTRUCTION MANAGEMENT?</u></p> <ol style="list-style-type: none"> 1. Construction Management Defined 2. The Construction Project 3. The Owner Sets the Stage 		

-
4. Project Delivery Methods
 5. Project Delivery Selection
 6. What Does a Construction Manager Do?
 7. What It Takes to Be a Construction Manager

III. HOW WE GET THE WORK

1. Finding the Work
2. The Competition
3. How We Play the Game
4. Making the Bid/No Bid Decision
5. A Final Note

IV. THE CONSTRUCTION CONTRACT

1. The Contract Documents
2. The Construction Specification Institute
3. Contract Types

V. PROJECT STAGES

1. The Design and Construction Process
2. The Successful Project

VI. ESTIMATING PROJECT COSTS

1. What Is an Estimate?
2. The Characteristics of a Good Estimator
3. Factors Impacting Project Cost
4. Types of Estimates
5. Understanding Project Costs
6. The Estimating Process
7. Putting it All Together
8. Completing the Estimate

VII. CONTRACT ADMINISTRATION

1. Starting Off Right
2. Who's on First?
3. Coordinating Construction Details
4. Getting Paid
5. Schedule Issues
6. Making Changes
7. When Things Go Wrong

VIII. CONSTRUCTION OPERATIONS AND JOB SITE

1. Management
2. Construction Impacts
3. The Superintendent
4. Documenting Construction Activity
5. Public Relations
6. Company Image and Publicity

IX. PROJECT PLANNING AND SCHEDULING

	<ol style="list-style-type: none"> 1. It's All about Time! 2. Types of Schedules 3. Building the Schedule 4. Communicating and Updating the Schedule <p>X. <u>MONITORING PROJECT PERFORMANCE</u></p> <ol style="list-style-type: none"> 1. The Project Control Cycle 2. Factors Impacting Project Performance 3. Tracking Quality, Cost and Time 4. Assessing Overall Project Status 5. Documenting Project Performance <p>XI. <u>MANAGING QUALITY AND SAFETY</u></p> <ol style="list-style-type: none"> 1. Attitude Is Everything 2. Developing the Quality Management Plan 3. The QA/QC Functions 4. Safety as a Component of Quality 5. A Dangerous Business 6. Developing the Safety Management Plan 7. The Economics of Quality and Safety <p>XII. <u>MANAGING PROJECT RISKS</u></p> <ol style="list-style-type: none"> 1. A Systematic Process 2. The Risk Mitigation Plan 3. The Risk Management Team <p>XIII. <u>BUILDING INFORMATION MODELING</u></p> <ol style="list-style-type: none"> 1. What Is a Building Information Model? 2. Designing in BIM 3. Using BIM to Manage Construction 4. Implementing BIM 5. Implications for the Future
Pre-requisite مخکینی ایرین مضامین	None
Related Courses اړونده مضامین	None
Teaching and Learning methods د تدریس میتود	Lectures, tutorials, and assignments
Computer Knowledge د کمپیوتر زده کړی ته اړتیا	Moderate computer knowledge such as MS Word, MS Excel, MS PowerPoint, and CAD.
Course Materials and References د مضمون درسي مواد او اخليکونه	<u>Text Books:</u> <u>درسي کتاب</u> <ul style="list-style-type: none"> • Barber J. Jackson, PhD, DBIA, Construction Management 2nd Edition 2014
	<u>Reference:</u> <u>اخليکونه</u>
Evaluation activities and Grades د ارزونې فعالیتونه او نمرې	

Activity فعالیت	Scope هدف	Marks نمري
Attendance and class contribution حاضري او په درس كې برخه اخستل	Attending class, contributions to knowledge and relationships with the group.	5
Assignments كورني دنده	Solving the indicated problems from the problem list and submitting on time.	5
Laboratory and field trip reports د لابراتوار/ ساحي راپورونه	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion and implication.	15
Quizzes صنفي ارزوني	Quizzes include teaching materials and assignments from two previous classes.	5
Midterm exam منځني ازمويڼه	The midterm exam includes the covered topics.	20
Final exam وروستي ازمويڼه	The final exam includes the covered topics after the midterm exam.	50
	Total Course Marks د كورس مجموعي نمري	100

Relationship of this Course to Program Learning Outcome

د مضمون اړيکه د ځانګې له کلیدي بشوونیزو موخو سره

No.	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7
		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team
1	Know the history of the construction industry	2	2	2	2	2	2	2
2	Review the basics, including industry sectors, project players, and professional affiliations.	3	3	3	3	3	3	3
3	Understand construction management importance in the industries.	3	3	3	3	3	3	3
4	Find out what it takes to be an	3	3	3	3	3	3	3

	effective and efficient project manager.							
5	Understand the complete process of project life cycle.	3	3	3	3	3	3	3
6	Learn how to estimate project costs, administer contracts and job site management.	3	3	3	3	3	3	3
7	Be able to measure performance, monitor safety, and control quality.	3	3	3	3	3	3	3
8	Plan and control the projects.	3	3	3	3	3	3	3
Total		2.9	2.9	2.9	2.9	2.9	2.9	2.9
Average		2.9						
1= Some relation		2= Moderate relation			3= Extensive relation			

Item موضوع	Description توضیحات		
Title عنوان یا مضمون	En. Ene 0836 Energy and Environment		
Credits and no. of hour د کریڈٹونو او درسی ساعتونو شمپر	Total تولیزہ	Theoretic نظری	Practical عملی
	3	3	0
Offering year and semester د تدریس کال او سمسٹر	Fourth Year-Second Semester		
Aim موخی	This course will focus on understanding the relationship between energy and environment and its technical, economic, and policy considerations related to achieving a profitable reduction in fossil fuel consumption through energy efficiency and renewable energy across a range of sectors and technologies, providing industry ready knowledge and skills.		
Key Learning Outcomes کلیدی بنوونیز نتایج	<p>On successful completion of this course, students will be able to:</p> <ul style="list-style-type: none"> • Deal with the fundamental aspects of the environmental Management. • Provide details of energy sources on our earth, including conventional fuels (coal, oil and gas) and non-conventional energy sources such as Solar, water and wind. • Identify factors causing rising 'Peak' and 'Base' load electricity demand, and how renewable energy, energy management, and energy efficiency can reduce such demand. • Present how various forms of renewable energy can be generated, with consideration of strengths and weaknesses of each. • Explain specific opportunities to reduce greenhouse gas emissions of a city, with specific reference to the 'Carbon Neutral Adelaide' Program, and explain considerations related to their implementation. • Debate the relative pro's and con's of various options for reducing greenhouse gas emissions in specific industries from a technical, economic and policy context. 		
Academic Staff Responsible د تدریس مسؤل استاد	Teaching Asst. Wais		
Syllabus مفردات	<p>I. <u>FUNDAMENTALS OF ENVIRONMENTAL MANAGEMENT</u></p> <ol style="list-style-type: none"> 1. Our Planet-The Earth 2. Constituents of Earth 3. Ecological Systems 4. Pollutant Type and Their Impact Zone 5. Air on Earth 6. Airborne Pollutants and Their Health Hazard 7. Air Quality Standards 8. Water 		

	<ul style="list-style-type: none"> 9. Land and Soil 10. Noise Pollution (Environmental Noise) 11. Thermal Pollution 12. Electromagnetic Radiation Hazard 13. Hazards from Radioactivity
	<p>II. <u>ENERGY AND ITS SOURCES</u></p> <ul style="list-style-type: none"> 1. Energy and Its Forms 2. Sun as a Source of Energy 3. Energy Sources on the Earth 4. Merits and Limitations of Various Energy Sources 5. Nuclear Energy 6. Global Energy Scenario 7. Energy Users in the World 8. Energy and Environment Relationship
	<p>III. <u>ENVIRONMENTAL AWARENESS</u></p> <ul style="list-style-type: none"> 1. Awareness about Environmental Issues 2. Stockholm-1972: First International Environmental Conference 3. Other Important Conferences Related to Environment 4. The United Nations Environment Program 5. Indian Initiative Towards Environmental Program 6. Sustained Industrial Development
	<p>IV. <u>METALLURGICAL INDUSTRIES AND ENVIRONMENT</u></p> <ul style="list-style-type: none"> 1. Metals in the Service of Mankind 2. Classification of Metallurgical Industries 3. Conventional Integrated Iron and Steel Plants 4. Integrated Steel Plants Having Coal-Based DRI (Sponge Iron) 5. Integrated Steel Plants Having Gas-Based DRI (Sponge Iron) 6. Integrated Steel Plants Having Smelting Reduction 7. Integrated Steel Plants Based on EAF Scrap Remelting 8. Ferroalloy Plants 9. Foundry Industries 10. Aluminum Producing Industries 11. Copper Extraction Industries 12. Zinc and Lead Producing Industries 13. Emission from Other Metallurgical Industries
	<p>V. <u>ENERGY MANAGEMENT IN METALLURGICAL INDUSTRIES</u></p> <ul style="list-style-type: none"> 1. Energy Need and Its Role 2. Energy Audit-What, Why and How? 3. Energy Need for Steel Industries 4. Energy Needs of Primary Aluminum Industry 5. A review of Energy Use by Major Metallurgical Processes 6. Possible Solutions to Problems Caused by Energy Use 7. Hydrogen as a Renewable Reductant and Energy Source for Iron
	<p>VI. Biomass Carbon as a Renewable Energy Source for Iron and Steel Industry</p> <p><u>ENVIRONMENTAL ASPECTS OF PLANT LOCATION AND LAYOUT</u></p>

	<ol style="list-style-type: none"> 1. Introduction 2. Factors Considered for Selecting Metallurgical Plant Site 3. Techno-Economic Issues Affecting Site Selection 4. Environmental Issues 5. Natural Disasters 6. Health Issues 7. Plant Security 8. Metallurgical Plant Layout Considerations 9. Distribution of Land Area in two Typical Steel Plants <p>VII. <u>OCCUPATIONAL HEALTH AND SAFETY</u></p> <ol style="list-style-type: none"> 1. Introduction 2. Legal Provisions 3. Role of Management 4. Accident Record 5. Accident Statistics 6. Accident Responsibility 7. Typical Cases, Findings and Lessons 8. General Safety at Work 9. Occupational Health Monitoring and Record 10. Disaster and Its Type 11. Hazards in Steel Industry and Their Classification 12. Common Hazards in Industry 13. Disaster Management <p>VIII. <u>ENVIRONMENTAL LEGISLATIONS AND RELATED ISSUES</u></p> <ol style="list-style-type: none"> 1. Introduction 2. Environmental Laws 3. Forest Laws 4. Other Relevant Laws 5. Environment Management Systems 6. Carbon Credit 7. Green Rating Project (GRP)
Pre-requisite مخکینی ارین مضامین	Basic knowledge of geology and climate change.
Related Courses ارونده مضامین	Economics, Management, Geology
Teaching and Learning methods د تدریس میتود	Lectures, tutorials and assignments
Computer Knowledge د کمپیوتر زده کری ته اړتیا	Moderate Computer Knowledge such as, using MS Word, MS Excel, MS PowerPoint and CAD,
Course Materials and References د مضمون درسي مواد او اخلیکونه	Text Books: <u>درسي کتاب</u>
	Reference: <u>اخلیکونه</u>

Evaluation activities and Grads د ارزوني فعاليتونه او نمري		
Activity فعاليت	Scope هدف	Marks نمري
Attendance and class contribution حاضري او په درس کي برخه اخستل	Attending the class, contribution to the knowledge and relationship with the group.	5
Assignments کورني دنده	Solving the indicated problems from the problem list and submitting on time.	10
Laboratory and field trip reports د لابراتوار/ ساحي راپورونه	Weekly laboratory/field trip reports that include abstract, introduction, method, result, conclusion and implication.	0
Quizzes صنفي ارزوني	The quiz includes teaching materials and assignments from two previous classes.	10
Midterm exam منځني ازمويڼه	The midterm exam includes the first and the second part.	20
Final exam وروستي ازمويڼه	The exam includes from Part 3 to Part 5.	55
Total Course Marks د کورس مجموعي نمري		100

Relationship of this Course to Program Learning Outcome

د مضمون اړیکه د ځانګې له کلیدي ښوونیزو موخو سره

No.	Course Outcomes	Program Outcomes						
		1	2	3	4	5	6	7
		Apply mathematics, science and engineering	Design/conduct experiments/analyze data	Use modern tools and techniques	Critical thinking and apply knowledge concurrence with other disciplines	Understand professional and ethical responsibility	Communicate effectively	Ability to function in a group and in multi-disciplinary team
1	To acquire general knowledge of the energy, environment and sustainability and its dimensions	2	2	2	2	2	2	1
2	To learn about the energy and environment sustainability constraints	1	2	1	2	2	2	1

	and solutions							
3	To gain an in-depth understanding of the types of renewable energy resources and technologies for a green and sustainable environment	2	2	3	2	2	1	2
4	To gain the renewable energy exploitation techniques for sustainable environment	1	2	2	2	3	2	2
5	To improve the skills and knowledge for distinguish, analysis and comparison of the local renewable energy sources deployment in traditional and modern design for urban and rural planning of power supply system	2	2	2	3	3	2	2
Total		1.6	2	2	2.2	2.4	1.8	1.6
Average		1.9						
1= Some relation 2= Moderate relation 3=Extensive relation								

En. Ene 732 Professional Elective I and En. Ene 0837 Professional Elective II

One of the following courses can be selected as professional electives (3 credits) in the fourth year- first and second semesters:

1. Energy Efficient buildings
2. Energy Storage Technologies
3. Conventional energy technologies
4. Modelling of energy systems
5. Energy and sustainability
6. Energy and urban planning
7. Energy Markets
8. Geothermal Energy
9. Rural Electrification
10. Sustainable Power Generation
11. Energy Management
12. Fuel Cell Technology
13. Petroleum and Gas Engineering
14. Nuclear Energy

En. Ene 0731 Seminar II (Research/Project Proposal)

A research/project is conducted by a student or a group of students in the final year of their study. Students are expected to choose their research/project topics with their respected advisors in the beginning of the seventh semester. They will be responsible for preparing their research/project proposal in the seventh semester. After a successful defense of the proposal, students will be allowed to proceed their research/projects and their proposal preparation will be counted 2 credits.

En. Ene 0834 Research/Project Design

Students who have passed their proposal defense will be allowed to proceed their research/project in the eight semester of their study. They will be responsible for completing their research/project based on the proposal accepted in the seventh semester. After successful defense of the research/project, it will be counted for 4 credits. Students are highly encouraged to write papers from their researches/projects and publish them in the international journals.

4.7.Course Policy

1. One day late assignment will be graded with –10% of total assignments grade.
2. Students can rework on 50% of low-graded assignments. The reworking decision must be made within one week of the returned graded assignment.
3. Exam is not only going to be from handouts and lecture notes, but class discussion and other sources are parts of the exam.
4. Instructor is not able to cover all the mentioned topics in the class; hence, students are asked to seek personal knowledge.
5. Exam questions must cover the taught topics but may be arranged and include a broad application.
6. Attendance is strictly required from each student.
7. Excellent performance, creative participation, and regular responses will be counted as outstanding class participation.
8. Talking during lecture is evaluated as program interruption, and each student is seriously required to avoid it.
9. Phone call is not allowed inside the class.
10. Plug off all electrical equipment in the end of class.

4.8. Advising Protocol

Academic advisors help students to recognize and achieve their educational goals. The role of the academic advisor extends beyond course and program scheduling. Advisors can assist the student with virtually all aspects of the academic experience and provide information regarding campus resources as needed. Some of the specific responsibilities of academic advisors include but are not limited to;

-
- Clarifying university policies, regulations, programs, and procedures for the advisee
 - Assistance with personal growth and career development
 - Selection of educational program
 - Monitoring academic progress
 - Assistance with academic issues
 - Assistance with personal concerns
 - Navigation within the campus environment
 - Assistance with campus resource identification & utilization
 - Motivating advisees for overall academic improvements.
 - Guidance in conducting the research/project.

References

- [1] Accreditation Board for Engineering and Technology (ABET).
<http://www.abet.org/wp-content/uploads/2018/02/E001-18-19-EAC-Criteria-11-29-17.pdf>

-
- [2] Asian Institute of Technology (AIT), Thailand, Energy. <http://serd.ait.ac.th/energy-3/>
- [3] Quaid-e-Awam University of Engineering, Science & Technology Nawabshah, Sindh, Pakistan, Department of Energy & Environment Engineering. https://www.quest.edu.pk/departments/ee_intro.php
- [4] University of Engineering and Technology, Peshawar, Pakistan. U.S.- Pakistan Center for Advanced Studies in Energy (USPCAS-E). <https://uspcase.uetpeshawar.edu.pk/>
- [5] National University of Sciences & Technology, Islamabad, U.S.- Pakistan Center for Advanced Studies in Energy (USPCAS-E) <http://www.nust.edu.pk/INSTITUTIONS/Centers/CES/ap/pg/MSESE/Pages/default.aspx>
- [6] Sharif University of Technology, Tehran, Iran, Department of Energy Engineering. <http://energy.sharif.edu/~web/index.php/en/>
- [7] University of Tehran, Energy Systems Engineering- Environmental. <https://kish.ut.ac.ir/en/-/energy-systems-engineering-environmental>
- [8] Carl Von Ossietzky University of Oldenburg, Germany. https://uol.de/en/students/course-of-study?id_studg=611&cHash=120372d3a913610f91e848d6ecbf7a3
- [9] Teri School of Advanced Studies, Department of Energy and Environment, <https://www.terisas.ac.in/department-of-energy-and-environment.php>

Appendix

Curriculum Development Committee at Kandahar University, Afghanistan

No	Name	Position	Email

1	Senior Teaching Asst. Agha Mohammad Fazli	Head of the Curriculum Committee	agha7437@gmail.com
2	Senior Teaching Asst. Mujtaba Manavi	Curriculum Committee Member	mujtabamanavi@gmail.com
3	Teaching Asst. Abdul Ghani Noori	Curriculum Committee Member	ghani.1001@yahoo.com
4	Teaching Asst. Wais	Curriculum Committee Member	wsamadi.khan@gmail.com
5	Teaching Asst. Ahmad Shah Ameen	Curriculum Committee Member	amin.kafg@gmail.com
6	Teaching Asst. Ahmad Shah Irshad	Curriculum Committee Member	irshad786.kdru@gmail.com
7	Senior Teaching Asst. Abdul Tawab Balakarzai	Curriculum Committee Member	tawab.kdr@gmail.com
8	Senior Teaching Asst. Mohammad Aslam	Curriculum Committee Member	aslam.haziq@gmail.com
9	Senior Teaching Asst. Abdul Habib Ghapoorzai	Curriculum Committee Member	habib.kdr@gamil.com
10	Teaching Asst. Naqibullah Kargar	Curriculum Committee Member	eng.naqib.k@gmail.com
11	Senior Teaching Asst. Mohammad Karam Ikram	Curriculum Committee Member	ikramkdr@gmail.com
12	Teaching Asst. Fida Mohammad Sahil	Curriculum Committee Member	fida.sahil@yahoo.com

Curriculum Development Committee at Texas A&M University, USA

No	Name	Position	Email
1	Professor Mark Holtzapple	Head of the Curriculum Committee	m-holtzapple@tamu.edu
2	Professor Lee Lowery	Curriculum Committee Member	Lowery@tamu.edu
3	Professor Glen Shinn	Curriculum Committee Member	glen.shinn@gmail.com
4	Professor Reid Stevens	Curriculum Committee Member	stevens@tamu.edu
5	Professor Homa Khosravian	Curriculum Committee Member	hkhosravian@tamu.edu
6	Professor Charles Culp	Curriculum Committee Member	cculp@tamu.edu
7	Professor David Claridge	Curriculum Committee Member	dclaridge@tamu.edu
8	Professor Costas Kravaris	Curriculum Committee Member	kravaris@tamu.edu
9	Professor John Tyler	Curriculum Committee Member	jetyler@tamu.edu
10	Professor Mehrdad Ehsani	Curriculum Committee Member	m-ehsani@tamu.edu
11	Professor Michael Pate	Curriculum Committee Member	mpate@tamu.edu
12	Professor Sergio Capareda	Curriculum Committee Member	scapareda@tamu.edu
13	Professor Ying Li	Curriculum Committee Member	yingli@tamu.edu
14	Professor Ben Zoghi	Curriculum Committee Member	zoghi@tamu.edu
15	Professor Robert Balog	Curriculum Committee Member	rbalog@tamu.edu
16	Professor Charles Aubeny	Curriculum Committee Member	caubeny@civil.tamu.edu
17	Professor John Pappas	Curriculum Committee Member	johnpappas@tamu.edu
18	Professor Joseph Bracci	Curriculum Committee Member	j-bracci@tamu.edu
19	Professor Tahir Cagin	Curriculum Committee Member	tcagin@tamu.edu
20	Professor Yogesh Koirala	Curriculum Committee Member	ykoirala@tamu.edu
21	Professor Mahmoud El-Halwagi	Curriculum Committee Member	el-halwagi@tamu.edu
22	Professor Micah Green	Curriculum Committee Member	micah.green@tamu.edu
23	Professor James Griffin	Curriculum Committee Member	jmgriffin@tamu.edu

Energy Engineering Cluster in the Directorate of Academic Programs Development (DAPD)

NO	Name	Position	Phone No.	Email
1	Senior Teaching Asst. Agha Mohammad Fazli	Head of the Curriculum Committee	<u>+93700318464</u>	<u>agha7437@gmail.com</u>
3	Senior Teaching Asst. Abdul Ghani Noori	Curriculum Committee Member	<u>+93700891906</u>	<u>ghani.1001@yahoo.com</u>
4	Teaching Asst. Wais	Curriculum Committee Member	<u>+93700263014</u>	<u>wsamadi.khan@gmail.com</u>
5	Teaching Asst. Najib Rahman Sabory	Curriculum Committee Member	<u>+93780549607</u>	<u>najibsabory@gmail.com</u>
6	Teaching Asst. Hameedullah Zaheb	Curriculum Committee Member	<u>+93786743472</u>	<u>hameedzaheb@gmail.com</u>
7	Teaching Asst. Mohammad Shuaib Mohsini	Curriculum Committee Member	<u>+93794002222</u>	<u>shuaib.mohsini@gmail.com</u>
8	Teaching Asst. Nisar Ahmad Rahmany	Curriculum Committee Member	<u>+93796833270</u>	<u>Nisar.rahmany@gmail.com</u>